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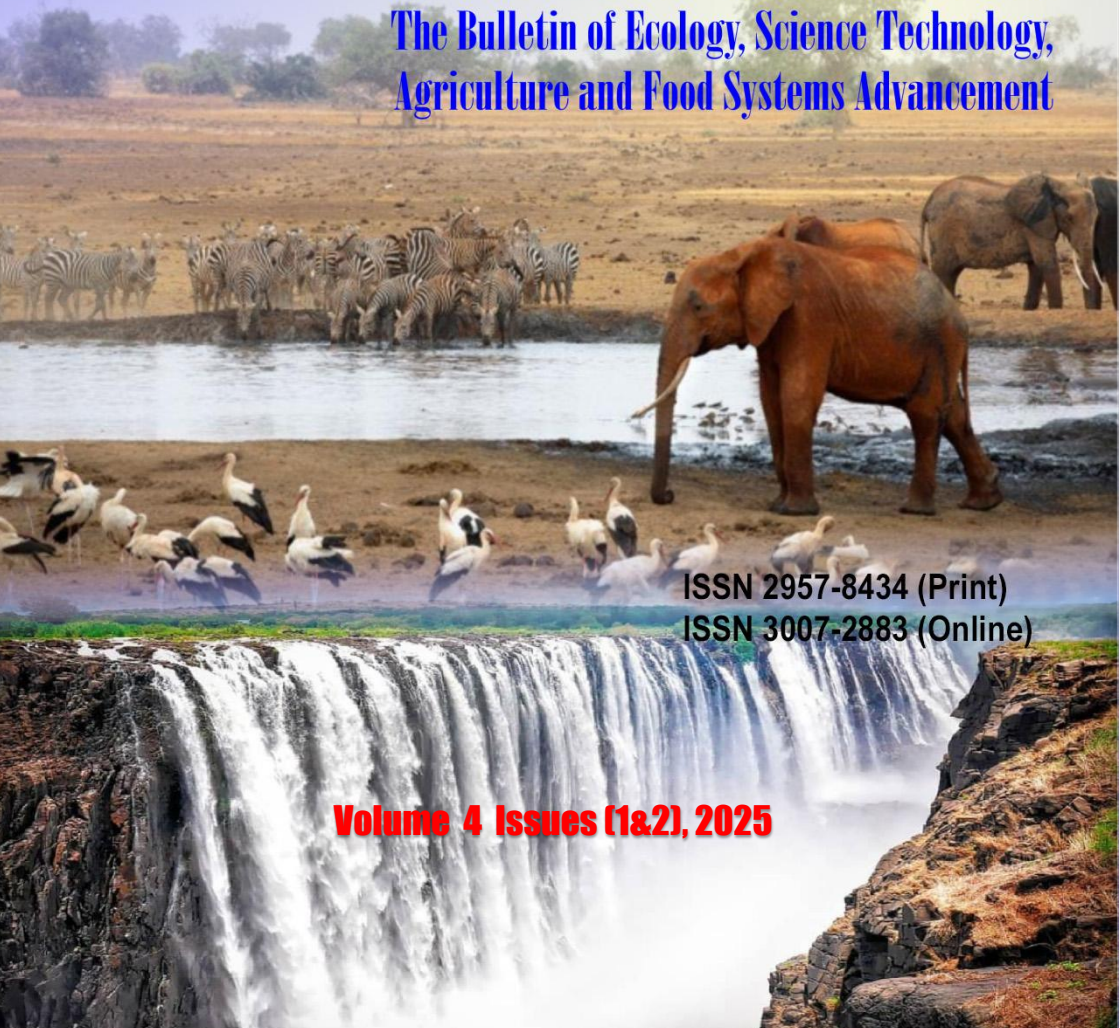

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The purpose of *the Oikos - The Zimbabwe Ezekiel Guti University Bulletin of Ecology, Science Technology, Agriculture and Food Systems Review and Advancement* is to provide a forum for scientific and technological solutions based on a systems approach and thinking as the bedrock of intervention.

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ENHANCING EARLY CHILDHOOD LEARNING THROUGH INFORMATION AND COMMUNICATION TECHNOLOGIES: THE ZIMBABWEAN PUBLIC-SCHOOL EXPERIENCE

MERJURY S. ZINGWENA[1] AND ALICE KUYAYAMA[2]

ABSTRACT

The advent of Information and Communication Technologies (ICTs) has been embraced in different organisations, education included. The response to the ICT policy in the Zimbabwe education system depends chiefly on the economic standing of the parents to the learners enrolled at a specific school. Thus, although adoption of ICTs in education, particularly in Early Childhood Development (ECD) programmes, has been oversubscribed, it draws deep into the pockets of parents to meet the requirements. Drawing from the Technology, Organisation and Environment model, the study explores the benefits of ICTs in ECD programmes in Zimbabwean public schools. A qualitative study is employed in which data are generated through observation, document analysis and focus group discussions (FGDs). The study adopted purposive sampling to conduct FGDs with Bachelor of Education degree students at one particular university in Zimbabwe as key informants. These were also practising ECD teachers at different primary schools in the Harare Metropolitan Province. Findings show that a number of ECD teachers had basic ICT skills but could not use them effectively in the teaching-learning activities due to lack of resources. Findings also reveal that these ICT resources were a result of

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initiatives from parents and well-wishers. The study therefore recommends the expansion of ICT resource mobilisation and staff development programmes in order to equip ECD educators.

Keywords: Early Childhood Development (ECD), Educational Technology, ICT Integration, Public school Technology, Organisation and Environment (TOE) model Public Schools, Resource Mobilisation, Staff Development, Teacher and Training.

Introduction

The United Nations Sustainable Development Goals (SDGs), adopted by the United Nations (UN) member states in 2015 emphasise the need for ICTs in order to achieve quality education by 2030 (Nazar *et al*., 2018). Zimbabwe, as a developing nation as well as a signatory to the UN, is part of the agenda. To this end, an ICT policy was rolled out in 2016. Among other issues, it stipulates that it shall promote and support the use of ICTs and ensure equitable access and benefits offered by ICTs across all sectors (Isaacs, 2007). Education, being part of the social sector, is seen as a natural platform for equipping the nation with ICT skills from the Early Childhood Development (ECD) level. Earlier studies (Dzinoreva and Mavunga, 2022; Mangena and Sibanda, 2024 and Mukomana and Chinhenga, 2025) reveal that there has been not much progress in implementing ICTs in education. particularly in ECD settings, especially in Masvingo Province (Manhibi, 2019). It is through this realisation that this study is carried out with ECD educators from various public primary schools in Harare to critically analyse integration of ICTs in ECD programmes.

Background

To realise increased access to ECD, Zimbabwe incorporated the three to five-year-olds programme into the primary school education system through Permanent Secretary's Circular Number 14 of 2004. Provisions in this circular ordinarily guide school heads on how to manage the programme with regards to the nature of teaching-learning activities. ECD is perceived as any kind of intervention designed to promote development during early childhood which is believed to last from birth

to eight years (Rao *et al*., 2014). In this article, ECD, therefore, is a comprehensive programme which focuses on the rights, needs and total development of children eight years and below. The inception of the ICT policy for primary and secondary education (2016), which was drawn from the National ICT Policy (2005), has also brought hope in bridging the digital gap among Zimbabwean learners. This was also a response to the Presidential Commission of Inquiry into Education and Training (CIET) of 1999. Adoption of ICTs was reinforced by the Competence-based Curriculum Framework 2015-2022 (Heritage-based curriculum) considered as crosscutting issues.

Furthermore, ICTs have dominated all human activities in the last decades. For instance, they were identified in the United Nations (UN) 2030 Agenda in 2015 as the cornerstone to drive international development (Nazar *et al*., 2018). The UN 2030 Agenda comprises 17 Sustainable Development Goals (SDGs), with SDG 4 thriving for quality education which, among others, can be achieved through adoption and use of ICTs (Boeren, 2019). To this end, it has greatly impacted ECD programmes, hence this study offers a deeper insight into the current situation in Zimbabwe public primary schools.

ICT resources for ECD learners

Sometimes ICT is used synonymously with IT (Information Technology). ICTs can be defined as a diverse set of technological tools and resources which can be used to create, store, manage, disseminate and communicate information (Kaware and Sain, 2015; Van Wart *et al*., 2017). For this study, ICTs refer to computer hardware and software, radios, televisions, fixed and mobile phones, digital and video cameras, internet, programmable toys and many other electronic devices which enhance communication in education. The 21st century has also brought with it the widespread use of interactive boards which are gradually replacing chalkboards (Khoza *et al*., 2019). These concur with Bukaliya and Mubika (2011) who postulate that, in computer age, traditional ways of teaching-learning have lost significance.

The Zimbabwe National Policy for Information and Communications Technology (ICT) (2016) advocates for the deployment and exploitation of ICTs in the education system. Therefore, it was necessary for

Zimbabwe to adopt strategies that ensure resources are maximised in order to realise its national goals. The Ministry of Primary and Secondary Education (MoPSE) (2015) emphasises that teaching and learning materials should be of good quality and user-friendly. Earlier research in Zimbabwe reveals that, although school management appreciates the benefits of ICTs in schools, their budgets show that inadequate funds are allocated towards ICT resources (Bukaliya and Mubika, 2011). A further study also reveals that there is generally lack of teaching and learning resources for ECD learners in Zimbabwean primary schools which negatively affected the implementation of the programme in general (Moyo *et al*., 2012; Chiparange, 2016) . This study intends to assess the availability of appropriate ICT resources at selected ECD centres in the Harare Metropolitan Province.

Research Objectives

The study is guided by the following objectives:

- To evaluate ICT adoption and integration in Zimbabwe public ECD programmes.
- To assess ICT resources and infrastructure in ECD settings.
- To identify strategies which can be used to improve access to ICTs by both ECD educators and learners in Zimbabwe

Literature Review

ICT in ECD curriculum

Use of ICTs has brought an enormous shift in teaching-learning and has proved to offer opportunities for physical, cognitive, creative as well as socio-emotional development in the early years (Ogegbo and Aina, 2020). Furthermore, it is claimed that, using ICTs in teaching-learning at ECD level, improves self-directed learning and self-esteem before enrolling for formal education (Berris and Miller, 2011, cited in Ogegbo and Aina, 2020). Use of ICTs in ECD is expected to be educational, stimulating, foster inclusion and support play-based learning as directed by policies. Research acknowledges use of digital stories to motivate learners as well as to capture their attention during lessons (Maureen *et al*., 2018). However, there is need for guidance from

educators with regards to screen time to avoid digital addition. Therefore, for effective adoption and use of ICTs in the early years, educators should be guided by the curriculum and theories of child development.

Integration of ICTs in ECD settings

Over a decade, several models of curriculum integration have evolved. Integration simply means combining into a whole, meaning an integrated approach to learning can result in greater intellectual curiosity and improved problem-solving skills (Wall and Leckie, 2017). For the purpose of this article, integration is combining ICTs with teaching-learning activities. In recent years, there has been increased demand for ICTs in all sectors across the globe with emphasis on the importance of developing digital literacy in young children in order to meet 21st century skills requirements. In view of this, it is critical for educators to incorporate them in early childhood development activities to cater for all learners, especially those who have little or no access to technology at home. Research claims that the success or failure of ICT integration in ECD lies in the teacher (Douglas *et al*., 2020; Masoumi, 2021). This study therefore seeks to investigate teachers' perceptions on ICT integration.

Although ICTs have replaced traditional teaching-learning and child play in some countries, there is insufficient integration of ICTs in early childhood education by teachers the world over (Nikolopoulou and Gialamas, 2015). For instance, earlier studies indicate lack of resources in some ECD settings (Manhibi, 2019). Other factors contributing to poor or no adoption of ICTs have been attributed to lack of confidence among teachers, lack of technical and administrative support as well as inadequate training opportunities for educators (Plumb and Kautz, 2016; Ogegbo and Aina, 2020). Thus, without appropriate training and suitable resources, it will be difficult for ECD practitioners to manipulate ICTs with confidence.

ICT Resources and Infrastructure

ICTs in early childhood education encompass a variety of tools such as computer hardware and software programmes, cameras, internet, phones (mobile and fixed), programmable toys, electronic whiteboards and others. Observations made by this study indicate that there is no consistency in both ICT infrastructure and resources in Zimbabwean primary schools which accommodate ECD learners. These come in different types and sizes which mostly do not cater for individual differences among learners, hence, the motivation of this study. Earlier research highlights that most homes are equipped with a variety of ICT resources which children can benefit from, these include smart phones, televisions, radios, laptops, printers and many more (Sehnalová, 2014). These should be available in schools to maintain consistency in learning. In line with this, Asante (2014) contends that from the earliest years, learners should be able to identify ICT tools such as computers and programmed toys and their uses and be able to manipulate them to support their learning. It is against this background that the study investigates resources available for ECD learners in Zimbabwe public centres.

Theoretical Framework

This study was chiefly influenced by the Technology, Organisation and Environment (TOE) model developed by Tornatzky and Fleisher (1990). The TOE framework elaborates that there are three different elements in an organisation which influence ICT adoption, namely technology, organisation and environment (Oliveira and Martins, 2011). Thus, it describes the process through which an organisation adopts and implements technology. The technological context includes all technologies that are relevant to the organisation, i.e., all those that are already in use in ECD settings, as well as those available on the market although not currently in use. Collins *et al.* (1988), cited in Baker (2012), assert that the organisation's existing technologies are essential in the adoption process because they set a broad limit on the scope and pace of technological change.

The organisational contexts are the characteristics and available resources of the organisation, such as its size, degree of centralisation,

formalisation managerial structure and human resources, among others. In light of this, ICT adoption is influenced by available resources for ECD teaching-learning purposes. These depend largely on the financial status of the parents of children enrolled at different schools. The environmental element entails the size and structure of the industry, competitors and the regulatory environment (Baker, 2012). Additionally, support systems, infrastructure and government policies also determine the rate at which technology is accepted. Thus, the theoretical framework inspires the study to analyse integration of ICTs in the ECD programmes in Zimbabwe.

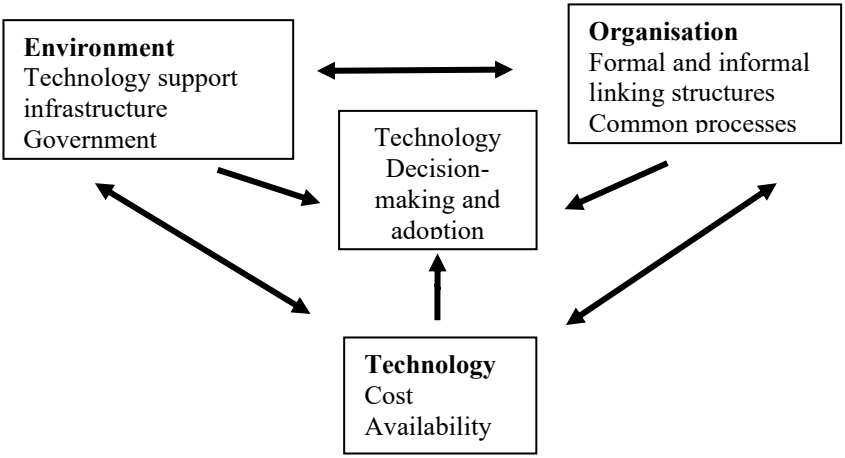

Figure 1: Technology, Organisation and Environment (TOE) model

Source: Oliveira and Martins (2011)

Methodology

The study was carried out at one institution of higher learning in Zimbabwe, the population comprised- 35 Bachelor of Education students specialising in ECD and also practising teachers from public ECD centres in the Harare Metropolitan Province. Ten participants were purposively selected because they were believed to be key informants and, hence, provided useful information with regards to ICT integration in Harare. Purposive sampling can also be employed in order to ensure

variation in perspectives, especially when selecting information-rich participants in qualitative research (Palinkas *et al.*, 2015). Given Harare's status as the capital city of Zimbabwe, it can be assumed that its primary schools are comparatively better positioned in terms of ICT infrastructure and resource availability, with higher potential for digital integration and policy-driven support than schools in other regions, hence, the interest to carry out this study in Harare. Data collected were merged to evaluate integration of ICTs into ECD programmes in Harare. In this study, narrative statistical analysis for observations, questionnaires and FGDs were used. Some of the photographs captured during data collection, however, are not included in the data presentation due to ethical considerations; these contributed immensely to data discussion. Data presentation and analysis were done concurrently. Thus, it was an on-going process as the research made reflections on ICTs in public ECD settings. In an effort to extract meaning from the findings, data were put into themes in line with study objectives and discussed.

Presentation of Findings and Discussions

Data were collected through questionnaires, observations and FGDs. Analysis was done qualitatively and simultaneously with data collection. All the participating teachers confirmed that they had ICT national syllabi 2015-2022 for infant classes, thus ECD "A" up to Grade Two. There was, however, no syllabus for infants and toddlers. In Zimbabwe, these children are either at preschools or still at home. The learning programmes for these children are simply designed by teachers and usually not exposed to computers at all.

ICTs resources for ECD settings

Findings from this study reveal that primary schools in Harare have separate classrooms for ICTs that cater for all learners. Most of them were donated by parents, churches as well as old students, but are not in good state. Some of them are malfunctioning and others are not age appropriate, especially for ECD children who struggle to reach the tables. During observations, it was also noticed that the most common ICTs available in these schools were desktops and laptops. To them, ICTs mean computers yet they encompass much more than that. Further

investigations reveal that the available computers are not even enough for the learners due to large enrolments in most schools. This is worsened by the common trend of locking ICT classrooms whenever there were no lessons. Lack of resources for ECD programmes is cited in earlier studies, particularly by Moyo *et al*. (2012) and Bukaliya and Mubika (2016). The majority of teachers who participated in FDGs also revealed that they ended up using any ICT tools at their disposal, mostly their own or borrowed from colleagues. These and other obstacles hinder integration of ICTs in most schools.

In addition, some ECD practitioners from high-density schools revealed that although they had a few computers acquired through the Presidential Computerisation Programme many years ago, they never used them due to a lack of power supplies. This, therefore, could mean that those computers were already outdated by the time of the study. This is consistent with an earlier study in Ghana which discovered that some school heads locked away computers due to a dearth of skills (Asante, 2014). Further investigations reveal that teachers expressed positive attitudes towards integration of ICTs and appreciated their contributions to teaching-learning. However, others expressed concern over the kind of supervision required when using ICTs to prevent children from exploring toxic materials especially on TVs and internet.

Integration of ICTs in ECD settings

ICTs and child development

From thre FGDs, it was established that ICTs contribute immensely to the development of learners in all facets, namely physical, cognitive and emotional. Physical development is a critical facet in ECD which practitioners need to understand and positively facilitate. It is viewed as the development of movement and all relevant stages contributing to locomotion, body growth and muscle control (O'Connor and Daly, 2016). Physical development is understood to depend on growth of the body and nervous system to send message from the brain to the muscles and stimulate movement. Use of tools such as keyboard, mouse and video games promote development of both gross and fine-motor skills. From the observations made, the infant syllabi (in which ECD 'A' and

'B' are included), were designed in such a way that ICTs promote physical development. For instance, all the syllabi indicate that children should have time to manipulate ICT tools. Computer games, typing, drawing and colouring also provide the learners with the opportunity to exercise their muscles. On appliance play, learners use different home appliances which enhance physical development. Naturally, young children enjoy playing to music. The syllabi give pupils the opportunity to dance to music, hence, developing large and small muscles.

Different ICTs have proved to develop learners in various ways; the intellectual part is not spared. There is quite a number of ICT programmes which enhance learners' cognitive development. These include computer and video games which help learners to improve their problem-solving skills. Children can also watch cartoons and stories on televisions and computers which assist them in language development. There is a growing body of evidence supporting contributions made by ICTs towards cognitive development (Mohammed *et al*., 2021; Weber and Greiff, 2023). Cognitive development is defined as advances in mental processes associated with perception, memory, reasoning, problem-solving, language-learning and other aspects related to brain development (Rao *et al*., 2014). In light of this, Piaget (1967) views cognitive development as a process of adaptation through assimilation and accommodation. He believes that children actively construct their own knowledge rather than it being poured into their minds (Lefa, 2014). The appliance play, for instance, provides the child with the opportunity to use household appliances in a play manner. The relationship between play and cognitive development is best described by two theories which seem to have gained respect in the early childhood over the year; they are Piaget's and Vygotsky's.

Findings show that there is suitable software for Grades One and Two in their ICT syllabus. Four-, five-year-olds need age-appropriate software. For example, there are programmes which enhance number skills such as addition and subtraction. Learners can also improve on language development because there are now able to read and follow instructions. Letter sounds are part of computer programmes meant for infant classes. Additionally, use of interactive applications by ECD

learners improves their ability to create abstract ideas and language abilities.(Miller, 2018). Furthermore, Sehnalova (2014) contends that use of technology in education continues to improve children's cognitive development and their participation in school activities required for the development of essential 21st century skills. However, it is suggested that primary schools and other ECD "A" and "B" centres acquire adequate ICT equipment in order to cater for all learners, especially those in urban high density and diverse contexts.

ICT programmes should also cater for children with special needs, such as those mentally and physically challenged. Overall, schools and parents play a prominent role in creating an ICT-rich environment.

Socio-emotional development remains an important component in the life of a child. During computer and appliances play, it is understood that young children increase their social competencies and emotional maturity. The appliance play provides the learners with the opportunity to play and socialise. Some of the games played on the computer also require team work. As they play these games, they learn to appreciate the idea of turn taking as well as accepting that sometimes they lose and at other times they win. During ICT play, learners have the opportunity to manipulate implements which help them release their pent-up emotions. This, therefore, means that the ECD curriculum for ICT promotes socio-emotional development.

The psychoanalytic theories endorsed that, besides art enriching artistic expression, it is emotionally satisfying (Rusu, 2017). As children draw and paint using computers, a significant amount of tension can be released while allowing expression of thoughts, ideas and emotions. As they manipulate the keyboard and mouse, anger and frustration are released in a healthy and acceptable way. Computer games are also common in young children's daily lives nowadays, also contributing positively towards emotional development in young children. There is also a sense of achievement in children when they compete in computer games, for example, *Zuma* and other racing games. Social skills through sharing and cooperating can be enhanced in young children through computer play and social interaction. From observations made at the 10

centres visited by the study, learners took turns to use ICT implements as well as to share space. These ICTs also help young children respect others and accept their ideas.

It was, however, noted with concern that these ICT tools were not standard in these schools. Teachers used any ICT tools available some of which were not child-friendly. Although some of the software incorporate verbal instructions, it is not guaranteed that the learners will be able to follow instructions because the programmes are mostly in English. For written instructions, most of the learners in this age range cannot read from the monitor except for Grades One and Two. From the observations, most of the activities that learners did in all curriculum areas have some relationship with ICTs. For instance, the syllabus requires learners to draw and colour; they can draw and colour shapes which they have learnt in mathematics and science using computers and print. That drawing and colouring is part of visual arts. Some of the games played assist children to develop mathematics concepts such as matching and serrating often accompanied by music. Language is also a crucial aspect as it is used to give the learners instructions to use the computer, operate a radio or a television set and other gadgets.

Participation of parents towards ICT integration in Zimbabwe primary schools

The Education Secretary's Circular Number 12 of 2005 emphasises on parental involvement on ECD programmes. A few schools received overwhelming support from parents towards the implementation of ICTs. For instance, at one primary school, parents sourced laptops from private suppliers for learners to carry out lessons at least once a week. Some parents have applied for permission from the Ministry of Primary and Secondary Education to collect a special levy to purchase computers and other accessories as well to build and furnish computer laboratories.

Through observation, it was also learnt that some parents offer free servicing of computers and updates of software. Some televisions and other ICT gadgets were also donated by parents. At one school, a group of parents have agreed to develop teachers on ICT for them to be

competent. Some classes have had non-working gadgets displayed on computer and appliance areas. This was due to lack of space in ECD classrooms as well as electric sockets for connection.

Recommendations

Based on the findings of the study, it is recommended that the Government of Zimbabwe, through the responsible ministries, fulfils the following;

- Design a sustainable training and development programme for ECD teachers in compliance with policy;
- Accelerate mobilisation of a variety of ICT tools and design suitable software programmes for teaching-learning in ECD settings; and
- Standardise ICT facilities for the ECD programme both in urban and rural settings, in order to reduce technology divide among learners

Conclusion

In conclusion, it was established that efforts were being made by both parents and the government of Zimbabwe through its ministry towards the implementation of the ICTs in schools starting from ECD level. However, most practising ECD teachers observed have limited computer knowledge and experience in teaching with and through ICTs. This makes it quite difficult for Zimbabwe to fully integrate ICTs in teaching-learning at the ECD level. Furthermore, FGDs revealed that, besides the poor state of ICT provisions and software in ECD settings, teachers cited gaps in teacher training programmes and the reality in the classrooms. Most of them indicated that curriculum content at higher institutions of learning did not match the demands of the HBC. Generally, computers seemed to be the most common ICT tool although most of them were in a poor state and not age-appropriate. Most of the participants expressed interest in integrating ICTs into teaching-learning, arguing that this would help learners to embrace technology at an early stage. Following the above conclusions, recommendations were made to improve ICT integration in ECD settings in Zimbabwe.

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