Towards a context-relevant, institution-based ICT integration model of teacher education curriculum in Zimbabwe

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Abstract

21st Century requirements for teaching and learning, driven by ICT advancements have opened doors for the development of models to guide and enhance ICT integration. Some countries have adopted international models and others have adapted them to suit their own environments. Zimbabwe still remains silent on what model it is using as there is no clear framework (policy related to ICT in education). In this paper, the authors focus on the Zimbabwean teacher education landscape in the absence of a distinct localised model . Using literature review, document analysis and reviews of a proposed model, by six teacher educators from three secondary school teacher education colleges in Zimbabwe (carried out through semi structured interviews) this paper seeks to propose a framework for the integration of ICTs in teacher education curriculum. Drawing from literature around the Zimbabwean ICT landscape and its ICT policy framework, models proposed in the broader African and global contexts, we argue for a context-relevant and institution-based model of ICT integration for the teacher education curriculum in Zimbabwe. This proposed model privileges the localised contextual issues and takes a critical view of models which assume similarity of conditions across countries and institutions. Moreover, the model has relevance for ICT integration in the teacher education programmes of countries facing political and socio-economic challenges similar to those which Zimbabwe is facing.

Key words: Context-relevant, institution-based, teacher education curriculum, technology

Introduction

With advances in technology, there has been a shift from traditional teaching to technology-based strategies leading to changes in teachers' required competencies. To guide and advance the development of digital pedagogy skills among teachers, a few models have been developed. These models have been adopted by some countries as frameworks for developing ICT skills.

Kenya, for instance, has adapted the models to suit their own contextual realities. For some, ICT in education policies were drafted in line with global models to direct the process of adopting and implementing ICTs in education. Zimbabwe, in turn, developed a National ICT Policy in response to the global demands and shifts in technology growth but does not have ICT Integration Framework. The ICT policy is generic with no detailed references to ICTs in education. For teacher training colleges, which are under the auspices of the University of Zimbabwe's Department of Teacher Education, the only reference to ICT is the directive for all pre-service teachers to pass a basic computer literacy course before they can graduate. Studies in Zimbabwe have shown that there is a gap in teaching, with teachers remaining attached to traditional non-technological methods of delivery in a context that requires technological integration (Rubaya & Chademana, 2020).

Various reasons have been proffered to explain the inability of teachers to technology integration. Among these reasons are, inadequacy of technology tools and infrastructure, the digital divide and lack of internet connectivity. The digital divide is defined by Srinuan & Bolin (2011, p. 1) as "the gap separating those who have access to new forms of information technology from those who do not." Despite reported enthusiasm and positive attitudes towards the use of technology for teaching and learning, research has shown that teachers do not possess the relevant skills for teaching with technology (Musarurwa, 2011). This implies a gap in training, leading to the following research questions:

1. What are the salient features of the policies and frameworks that guide curriculum development and implementation in pre-service teacher education in Zimbabwe?
2. What are the gaps/shortcomings in the Zimbabwean secondary school teacher training colleges' ICT integration curricula?

In order to answer these questions, semi structured interviews were carried out with pre-service teacher educators (TEs) based on a proposed framework designed by the researchers. The TEs were asked what frameworks they use to guide and support their teaching and learning. They were also asked to outline the tenets of their institutions' ICT policy.

In this paper we therefore try to answer the question as to the efficacy, if any, of the current ICT integration models that guide teacher education curriculum development and implementation in Zimbabwe. In the absence of a national ICT integration framework, we suggest context and institution-based ICT integration models as various teacher training

institutions face different levels of difficulty in technology adoption and implementation which consequently affects ICT integration into their preparation of pre-service teachers.

We respond to the research questions by reviewing literature on the UNESCO-ICT Competency Framework, and comparing it to current practices within teacher education colleges in Zimbabwe. The ICT Competency Frameworks are key as a reference source for what learning outcomes are necessary and should be developed in teachers. A question which thus arises is whether teacher training colleges, in Zimbabwe, through their various curriculum, enable the development of ICT and ICT integration skills? The paper presents a new dimension to the debate on possible framework for best-practice to be adopted for the effective integration of ICT in Zimbabwean education. In this regard we suggest a context-relevant ICT integration model at both the national and institutional levels. This is a departure from many of the models currently extant in the literature which do not take into account national and institutional technological and human resource realities.

The Zimbabwean context and ICT policy framework

In this section, the Zimbabwean political, social and economic context as well as the country's ICT policy framework is discussed. It is prudent to point out that Zimbabwe does have a National ICT Policy which generally covers all government departments but lacks a dedicated ICT in Education Policy which, arguably could better direct and serve the education sector as it implements ICT integration onto the curriculum. Rubaya and Chademana (2020) posit that without a dedicated national ICT in education policy, it will be difficult to improve the integration of ICTs in teaching and learning in Zimbabwe. The paper then looks at some of the ICT models that have been proposed for use in education. This is followed by a presentation of how the possible model by the authors was taken to lecturers at secondary school teachers colleges for their review. Discussed after this is the institutional ICT- in-education policy in the Zimbabwean context. This is done considering the participating lecturers' responses to the proposed model. The paper concludes with an emphasis on the need for contextual factors to be taken into consideration in the integration of ICT into education for pre-service teachers.

Zimbabwe's political, social and economic environment is riddled with many challenges which affect effective implementation of ICT in teaching and learning. Despite the existence of a National ICT Policy, there are constraining circumstances to its implementation. Economically, the country is operating in a hyperinflationary environment in which the after-effects of the Covid-19 are still being felt, for example, in terms of sub-optimal productivity.

According to Nyamunda (2021), the Zimbabwean economy will remain weak and the economic crisis will deepen due to sharply declining real wages and soaring inflation. The country is reeling under high and persistent poverty with a large number of its citizens having limited access to essential social services such as health, education and water sanitation (Wadzanai, Zhou & Chirisa, 2018). In terms of ICTs, it is characterised by lack of resources, lack of computer skills, poor internet connectivity, lack of knowledge and awareness, lack of technical assistance, interrupted power cuts and high costs of computer hardware and software (Ndlovu & Moll, 2016; Musarurwa, 2011; Ndawi, Thomas & Nyaruwata, 2013). There are also systems and structural barriers such as rigid assessment structures, brain drain of human capital caused by a crumbling economy, lack of professional development programs and planning and management barriers (Ndawi, Thomas & Nyaruwata, 2013). There has been an outcry over the lack of commitment by government to provide funding and support structures for the adoption and implementation of ICT based education in education institutions across the country (Ndlovu & Moll, 2016).

Teacher education in Zimbabwe struggles against a background in which, borrowing from McMain & Crockett (2010), learners are digitally expectant and digitally savvy while teachers are believed to be neither. It is, thus, incumbent upon teacher preparation institutions to up-skill pre-service teachers to embrace digital technologies so that they can guide their learners in the process of knowledge creation (Kivunja, 2013). Integrating technology into the pre-service teacher education curriculum serves the purpose of providing a model that pre-service teachers can replicate in their classrooms after graduating. It also provides a foundation from which teachers can develop and sharpen more skills that support technology-based education. In an era where learners are more technologically adept, there is a need to create a confluence between teacher knowledge and skill, and learner knowledge and skill (Khan, Khan, Jazim, Al-Mamary, Abdurab, & Al-Ghurbani, 2021). Failing to move into 21st century technology driven teaching and learning practices "will perpetuate the mismatch between digitally savvy learners of the 21st century and teachers stuck in the orthodox traditional pedagogy of the last century" (Kivunja, 2013, p. 140). To ensure that there is no mismatch, teacher preparation institutions must rethink and redesign teacher preparation methods and strategies to ensure that pre-service teachers come out well equipped to function in the digital classroom (Khirwadkar, 2007; Kivunja, 2013; Dangwal & Srivastava, 2016; Sadiku et al., 2019). Pre-service teacher education has to change "the mental models that education is bound by in order to influence behaviour and professional practice to develop along the trajectory that

recognises that digital pedagogy is the new teaching and learning" (Costa, 2000, p. 132). Teacher education must therefore transform and recognise digital pedagogy as the new teaching and learning imperative. However, it is also critical to point out that the digital divide, globally, regionally and locally, can impede successful integration of ICT within the curriculum.

In Zimbabwe, while the government is encouraging the use of digital platforms for remote learning, research has shown that many households have no access to the internet and reliable internet. For those who have access, it is usually unreliable with only 5.21% of Zimbabweans having fixed internet broadband. Radio and television are also possible alternatives, but only 26.5% of households have televisions and radios (AfroBarometer, 2020). Although 83% of the Zimbabwean population is largely connected by mobile communication means with internet penetration standing at only 33.4% (AfroBarometer, 2021). Access to information technology, therefore, remains a huge challenge as smart phones and data charges remain high. Data charges in Zimbabwe remain too high for most of the citizens because of the harsh economic conditions and poor remuneration. For example, 25 gigabytes of data, which presumably lasts a month costs around 25USD (Econet, 2021), a figure too high for the ordinary citizen. With such high data and mobile tools costs, very few Zimbabweans have fixed access. The government has also not done much in terms of ICT infrastructure development within its various education institutions. There are simmering social and economic inequalities across Zimbabwean communities and in teacher education institutions, thus creating challenges for uniform ICT integration within the curriculum. It therefore becomes critical that ICT integration adopts the contextual realities within which the various education institutions operate.

Policy statement 11.1 in the Zimbabwe National ICT Policy (2015) focuses on ICT Skills Development, with the following strategic aims:

a) Work with relevant institutions and Government departments to develop programs that increase ICT human resource capacity and skills.

b) Facilitate the deployment and exploitation of ICTs in the educational system from primary school upwards. Work with the relevant Ministries to include ICT training and education in schools, colleges and universities.

c) Provide equitable access to ICT enabled education and training in all parts of the country, including disadvantaged communities.

d) Promote e-learning and use of e-learning materials throughout Zimbabwe.

e) Encourage, promote and apply research and development in ICTs in society. (Zimbabwe National ICT Policy, 2015, p. 28).

The Government of Zimbabwe's 'commitment' to the development of ICT skills to improve education shows the importance of integration of ICTs into teaching and learning. This means that education training institutions are expected to provide ICT human capacity skills as these are central to improved teaching and learning. There is, however, no specific ICT in Education policy and very little is being done to capacitate public schools and higher education institutions with ICTs. Policy statements are mere pronouncements which are rarely followed by practical implementation, thus causing inadequate attention to the actual resourcing of education institutions with technology. While other countries in Southern Africa have dedicated ICT in Education Policies, Zimbabwe has not shown any moves towards developing such policies that clearly outline the process of adoption and implementation for ICT in education. South Africa, Namibia and Botswana, for instance, have ICT in/for Education Policies that outline the objectives for ICT integration, procedures for adoption and implementation, minimum requirements for institutions in terms of ICT infrastructure and monitoring and evaluation parameters. The next section interrogates existing models that have been suggested to facilitate efficient and effective integration of ICTs in teaching and learning.

Methodology

The study adopted a qualitative methodology. As part of the fieldwork, the ICT in Education Policy was presented to six lecturers from three secondary teacher training colleges in Zimbabwe to collect views on how this model could possibly be applied in teacher education institutions. The lecturers were purposively sampled because of their involvement in teaching subject areas from which the main research was being conducted in courses across different curricula at the colleges.

To solicit TEs' views on the researchers' proposed framework, they were asked to provide a short review. The six TEs were part of a broader research which focuses on ICT integration strategies employed in developing pre-service teachers' digital pedagogy skills. Although the number of TEs could have been larger, the collection of data was carried out in a very limited amount of time and some TEs were not forthcoming as they indicated that they were not comfortable with being interviewed. Despite assurances that this was for research purposes, many refused to cooperate. However, in keeping with the view that in qualitative

research, the focus should be more on the depth of the questions asked than the size of the sample (Vasileiou, Barnett, Thorpe & Young, 2018), the researchers felt that the number of TEs selected would not negatively impact on the quality of the data gathered.

Existing models of integration

Models have been suggested at regional and global levels with the aim of guiding institutions in the process of ICT integration in teacher education curriculum. However, these models assume that all countries have similar experiences in terms of access to technology, connectivity, adequate resources and expertise in technology use. The models are interrogated in view of the existing contextual differences that exist between the various countries and institutions in which technology has to be integrated into the preparation of pre-service teachers.

UNESCO ICT Competency Framework

The United Nation Educational, Scientific and Cultural Organisation (UNESCO, 2018) suggests a framework for defining ICT competency based on the belief that:

> The use of new technologies in education implies new teacher roles, new pedagogies and new approaches to teacher education. The successful integration of ICT into the classroom will depend on the ability of teachers to structure the learning environment in new ways, to merge new technology with a new pedagogy, to develop socially active classrooms, encouraging co-operative interaction, collaborative learning and group work. This requires a different set of classroom management skills. The teaching skills of the future will include the ability to develop innovative ways of using technology to enhance the learning environment, and to encourage technology literacy, knowledge deepening and knowledge creation. Teacher professional learning will be a crucial component of this educational improvement. (p. 8)

Teachers are therefore expected to be competent at various levels of ICT knowledge and skills. In this regard ICT competency is measured by the teacher's ability to move through different levels competencies. These include the possession of ICT knowledge and skills at the levels of knowledge acquisition, deepening and creation in the context of policy and how it affects ICT integration, curriculum and assessment, pedagogy, application of digital skills, organisation and management as well as teacher professional literacy. Thus, teachers must possess content, technical and pedagogical skills to be recognised as ICT competent

professionals. Based on this argument, UNESCO (2018) provides an ICT Competency Framework, shown in Fig. 1 that summarises ICT competency for teachers.

	Knowledge Acquisition	Knowledge Deepening	Knowledge Creation
Understanding ICT	Policy Understanding	Policy Application	Policy Innovation
Curriculum and Assessment	Basic Knowledge	Knowledge Application	Knowledge Society skills
Pedagogy	ICT-enhanced Teaching	Complex Problem Solving	Self-Management
Application of Digital skills	Application	Infusion	Transformation
Organisation and Administration	Standard Classroom	Collaborative Groups	Learning and Organisation
Teacher Professional Learning	Digital Literacy	Networking	Teacher as Innovator

Fig. 1: UNESCO ICT Competency Framework for Teachers (UNESCO, 2018)

The competencies in Fig 1 above are categorised into three segments, namely, Knowledge Acquisition (KA), Knowledge Deepening (KD) and Knowledge Creation (KC) and are measured against understanding ICT, Curriculum Assessment, Pedagogy, Application of Digital Skills, Organisation and Administration, and Teacher Professional Learning. An ICT competent teacher should possess both knowledge and skills for acquisition, deepening and creation across the six parameters. At the Knowledge Acquisition level teachers are expected to gain basic knowledge and skills in using technology as well as basic ICT competencies. It is at this level that teachers need to appreciate the pros of integrating ICT into teaching and learning as well as understanding national policies for the betterment of the school and to help in making key decisions where ICT investments are being made.

What remains in question at this stage is the overlooked availability of technology tools in most institutions. For one to possess knowledge about any technological tools, the tools must be available for one to gain practical knowledge of its uses and operations. The UNESCO ICT

Competency Framework overlooks this important aspect of the process of knowledge building. Furthermore, technology tools availability needs to be complemented by skilled personnel who guide teachers in the process of knowledge acquisition. An important question that needs to be addressed at policy level is whether ICT in Education policies exist at national and institution level to support knowledge acquisition in ICT. Thus, if policies are neither specific nor supported by implementation, knowledge acquisition remains a theory.

At the Knowledge Deepening stage teachers gain ICT competencies for facilitating student centred, collaborative and cooperative learning environments (UNESCO, 2018). Furthermore, teachers develop the ability to "to link policy directives with real action in the classroom, have the capacity to build technology plans to maintain the school ICT assets, and forecast future needs. In addition, teachers can study further by linking to national and global teacher networks (UNESCO, ibid). Knowledge deepening is a critical element in the development of ICT competent teachers, but it can only take off when buttressed by an environment in which the most fundamental elements of ICT knowledge acquisition are in place. In the various institutions, it is critical to assess the capacity among teacher educators and teachers in training to utilise technology, link institutional policy directives with real action in lecture rooms and to network at institutional level before measuring ICT competency against the ability to implement ICT integration at national level. We argue that context-relevant and institution-based assessments are key in addressing ICT integration gaps at both infrastructural and skills development levels for more efficient national ICT integration in education curriculum.

The third and last level that shows understanding and mastery of complex technology skills is that of Knowledge Creation. Teachers develop competencies for modelling good practice and setting up learning environments in which learners feel encouraged to create novel knowledge of their own (UNESCO, 2018). Thus, teacher education colleges need to re-align and re-design training curricula to ensure that they meet the demands of the Fourth Industrial Revolution (4IR) as well as ensuring that both teachers and learners benefit from technology-based education. Re-designing and re-aligning curricula, however, has to be done with contextual realities and differences in mind. Although the teacher training colleges may be in the same country, they operate in different environments and are affected by different factors. For instance, some colleges have more technological resources than others. There may also be differences in individual teacher educators' attitude and knowledge as well as skills in using

ICT for teaching and learning. These contextual issues must be prioritised when making decisions about curriculum re-design.

According to UNESCO (2018), a fully ICT competent teacher must possess all three levels of competency. Teacher training colleges are expected to provide curricula that fully equip pre-service teachers with requisite skills for them to effectively and efficiently transfer knowledge to learners. Although the UNESCO ICT Framework is critical in guiding the development of teacher education programmes and curricula, its tenets are only possible and plausible in a context where ICT has been adequately embraced at access, adoption and implementation levels. The context in which teacher education is carried out plays a pivotal role in ensuring holistic development of a teacher who possesses all the critical competencies. The context must provide access to ICT tools, training, attitude change as well as supporting policy implementation frameworks. In this regard many African countries still lag behind in ICT due to various challenges at economic, social and political levels (International Telecommunications Union, 2021). Thus, there are contextual differences which must be taken into consideration to ensure that ICT development is carried out using context specific models.

ICT-Enhanced Teacher Standards for Africa (ICTeTSA)

The previously discussed model is a global framework developed to guide integration and development of ICT competencies in teachers. Having realised the existence of contextual differences in terms of infrastructure and adoption, the UNESCO International Institute of Capacity Building in Africa (IICBA) developed an ICT-enhanced Teacher Standards for Africa (ICTeTSA) working with input from 54 African countries, Zimbabwe included. This model is key to this discussion as it shows how countries can borrow from generic models to suit their own contexts. This implies that Zimbabwe could potentially have adapted this model to suit its own context. There is, however, no indication that such an adaptation has been made from neither the UNESCO Framework nor the ICTeTSA. The opportunity to draw from the framework is clearly laid out in the document in the form of the ICT for Teacher Development Model (ICT4TED) for Africa which takes account of the various challenges that African countries face in ICT integration (Engida, 2012). The model stresses the different stages through which pre-service teachers must be taken to develop effective ICT skills. Engida (2012, p. 67) stresses that each institution "has to work within the context of its own system to fit choices to what best suits its unique situation and culture." This shows that each country and institution has its own unique needs and challenges which must be embedded into the framing

and implementation of each pre-service curriculum. This implies a non-directive approach to ICT integration but instead a flexible framework from which African countries can develop their own relevant models. Fig. 2 outlines the successive stages in the continuum ranging from emerging through to transformation.
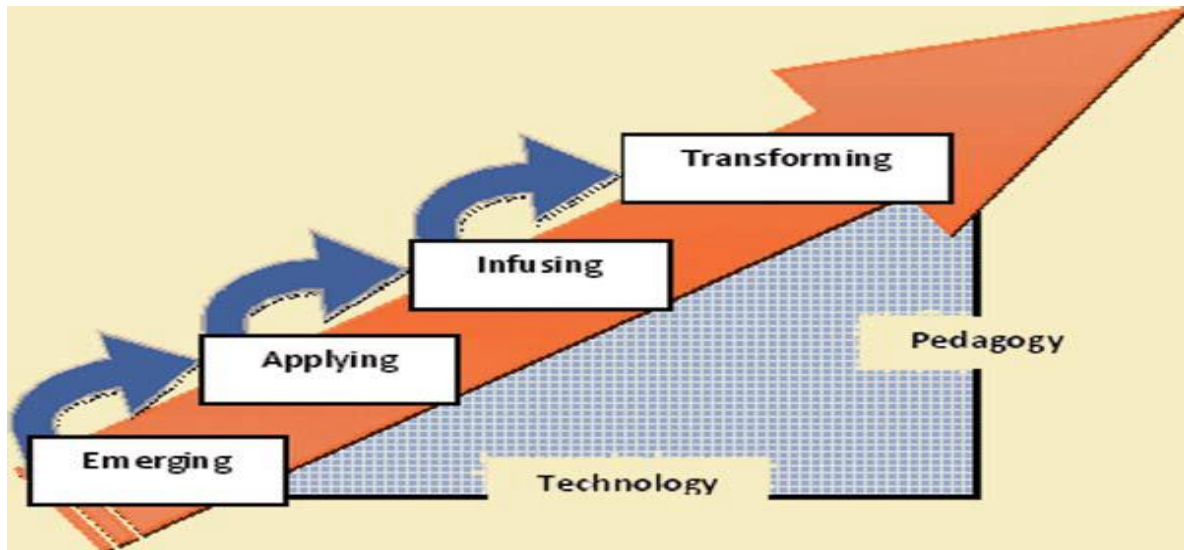

Fig 2: Stages of ICT for Teacher Education Development (UNESCO IICBA, 2012).

The Model is aimed at enabling teacher educators to develop ICT competencies for skills transfer to pre-service teachers. The stages in the model are as follows:

1. **Emerging stage**- focuses on the exploration of possibilities and consequences of using ICT for institutional management and ICT integration into curriculum. At this stage traditional/ teacher-centred strategies are still in use.

2. **Applying stage-** teacher educators integrate ICT for acquisition of subject-specific skills and knowledge. Methodology for teaching begins to transform through ICT support in both training and professional development.

3. **Infusing Stage-**Embedding ICT across curriculum through computer-based technologies in laboratories, classrooms and administrative offices. Teacher educators are expected to "merge subject areas to reflect real-world applications" (p.63). It is at this stage that we believe training should integrate technologies representative of the different contexts pre-service teachers will experience post-training.

4. **Transforming stage-**ICT becomes part of everyday life at the institutions from administration to teaching and learning. Teacher-centred strategies are replaced by learner-centred technology-based strategies.

The stages in the continuum are guidelines for how training institutions can integrate technology within curriculum. Unique differences existing among institutions imply that these stages are attained differently. Fig. 3 summarises the relationship between the stages and pedagogical uses of ICT.
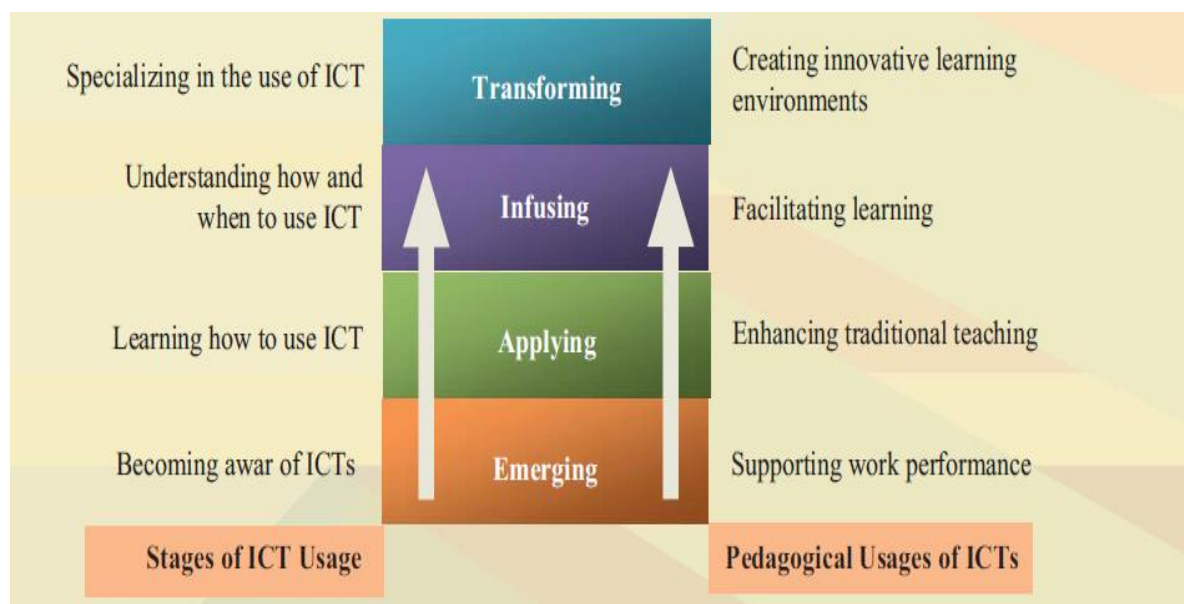

Fig 3: The link between ICT usage and Pedagogical uses (Engida, 2012).

Engida (2012, p. 64) states that "competencies of integration are neither competencies of technology alone nor competencies of pedagogy. Rather, competencies of integration are about the appropriate selection, use, mix, fusion and integration of many sets of competencies." For appropriate selection to occur, there must be a range of technologies to select from and Zimbabwe in particular faces the challenge of inadequate technology infrastructure in its schools. Arguably, teacher training colleges are affected by the same challenge, leading to ineffective or non-integration of ICT in the curriculum. UNESCO IICBA (2012) in developing the ICTeTSA Framework, believed that the interconnected relationship between continuum models, curriculum frameworks and ICT competency standards would positively influence the levels of ICT utilisation in teacher education in Africa. However, frameworks and models that do not consider the uniquely different contexts of countries and institutions may merely be on paper, without any effective or meaningful implementation taking place. The process of planning for ICT adoption and suggestions of models, must take place after considerations of infrastructural capacity-building models within the various sectors in which ICT is utilised.

Mukuna's Technology Integration Planning Model

The possibility of creating frameworks that suit country needs is evident in Mukuna's Model for Kenya. This model provides a reference and practical example for countries to not merely adopt models that do not best align with their contextual realities. Mukuna (2013) instead researched on what was missing in the teacher education curriculum in Kenya. The research conclusion was that it is important to inculcate knowledge and skills at pre-service teacher education stage so that they become effective in integrating technology into the curriculum post-service. Mukuna (2013) proposed a framework for ICT integration in teacher education in Kenya in which essential conditions for technology integration are set. Fig. 4 summarises the conditions.
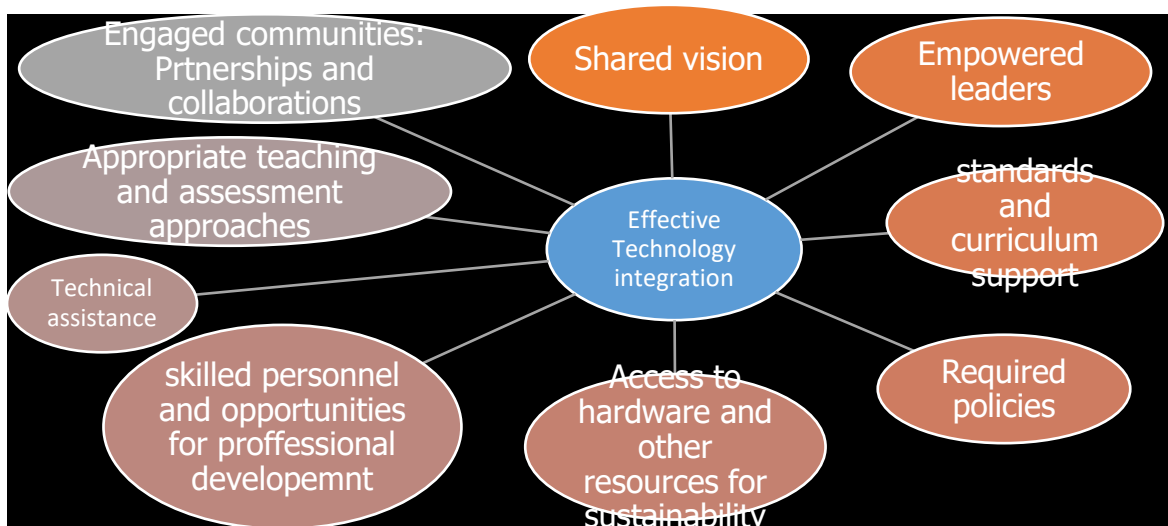

Fig. 4: Effective Technology Integration (Mukuna, 2013).

The conditions set by Mukuna (2013) are key in determining the needs of teacher education institutions and what their localised challenges are. Due to contextual differences, it is prudent that institutions measure and evaluate what their needs are to create a conducive environment for ICT integration commensurate with their levels of e-readiness. Mukuna (2013) further proposed a three-stage model (Planning, Implementation and Evaluation) with six phases for Kenyan Teacher Training Colleges (TTCs). The model can, however, be adopted by other African institutions. The Model is shown in Fig. 5.
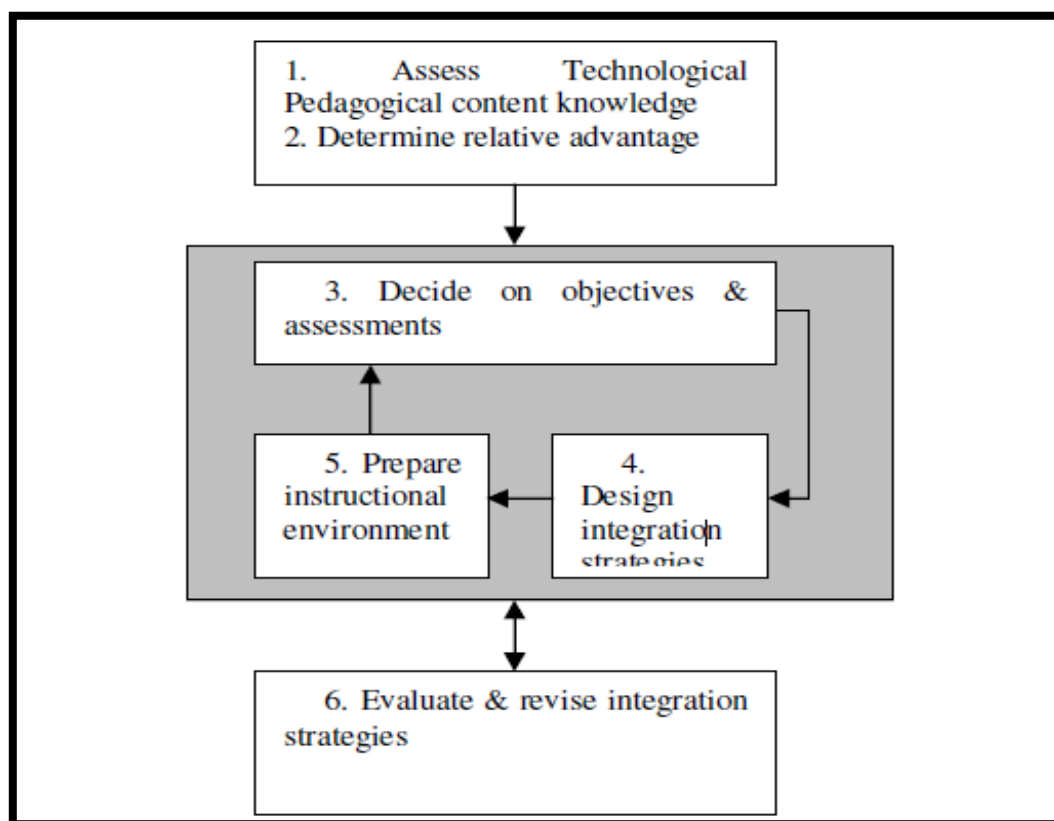
Fig. 5: Technology Integration Planning Model for Kenya (Mukuna, 2013)

Phases 1 and 2 represent the **Planning** stage where the institutions decide and determines on what the goals of integration are, what content is to be learnt, who the target learners are and what are their prior skills, knowledge and experiences, and their level of motivation. At this stage, the institution also determines ways for increasing and sustaining motivation, possible ways of learning and, the context and conditions under which learning must occur. This stage does not, however, indicate the importance of evaluating technology infrastructure available for the requisite integration. Planning should not ignore determination of available technology tools and infrastructure as well as technology support in the form of connectivity because without ICT infrastructure there will not be any integration. Assuming that technology is available becomes a flaw in the integration process as institutions may not have similar capacity for adoption and utilisation of ICTs.

Phases 3, 4 and 5 represent the **Implementation** stage. Mukuna (2013) proposes that for effective implementation to take place, the institutions must consider potential types of technology most applicable to the learning situation, benefits and costs for choosing and using the potential technology, steps and sequence of integration corresponding to learning experiences. Selection of monitoring and implementation team must also be done. Although

Mukuna's (2013) proposition considers contextual determination of relevant technologies for integration, it is critical that implementation be done in line with institutional policies that clearly outline what the objectives for integration are.

The last stage is **Evaluation** where the impact of ICT on learning experience is measured. Evaluation procedures, types of feedback which optimise technology use and key hindrances to integration are evaluated and measured. This model takes into consideration the localised contextual issues and is more relevant than the global models which assume similarity of conditions across countries and institutions. The argument for integrating technology at pre-service stage is that trainee teachers "have not yet formed habitual modes of instruction that are more difficult to change with experienced teachers. It is at pre-service stage that they are more open to learning how to infuse technology into instruction" (Mukuna, 2013, p. 5). The integration of technology at the pre-service stage must be followed by consistent in-service training as new forms of technology are introduced daily. This model is critical in ensuring that teacher training be implemented based on the needs and conditions of each institution.

Based on the arguments raised in the reviewed literature, the researchers propose a model for teacher education curriculum in Zimbabwe that draws inspiration from the UNESCO ICT Competency Framework, ICTeTSA and Mukuna's model.
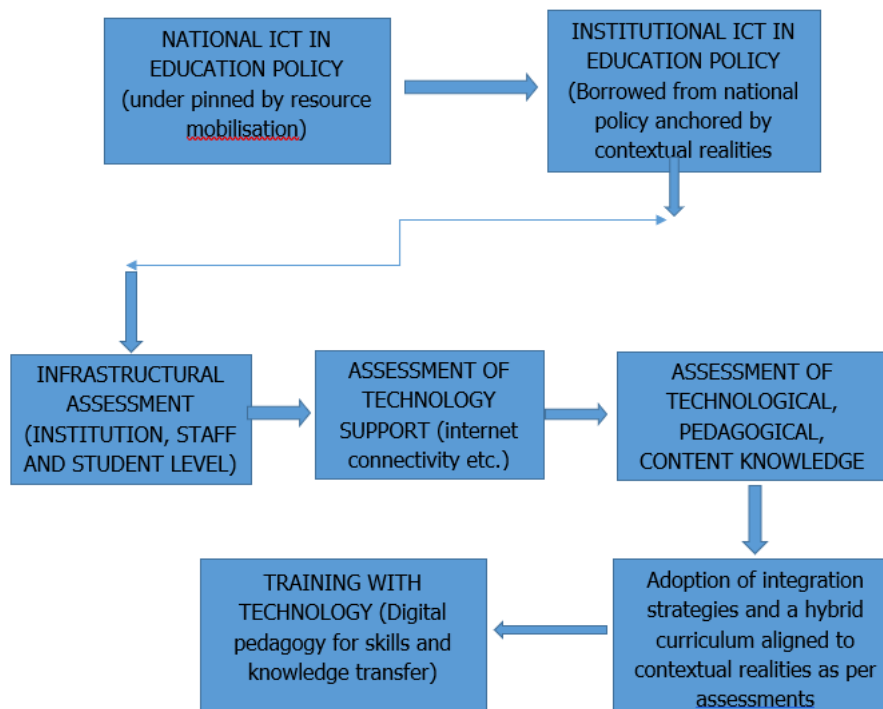
The Proposed Model

Fig 6: A Context-relevant, Institution-based ICT integration model for teacher education curriculum

Results: applying the model

National ICT in education policy

The model suggested above was presented to six lecturers from three of the secondary teacher training colleges in Zimbabwe to collect views on how this model could possibly be applied in teacher education institutions. The lecturers were purposively sampled based on their involvement in teaching subject areas from which the main research was being conducted in courses across different curricula at the colleges. All six lecturers interviewed, indicated the importance of an ICT in Education Policy to drive and guide education at all levels of education in Zimbabwe. The importance of a deliberate ICT in Education policy is that it will direct the implementation of ICT integrated approaches. However, according to Lecturer A the efficiency of such a policy,

> …can only be measured by the commitment of government to the provision of ICT resources and relevant support in developing the right skills among teachers and learners. Without adequate tools and skills as well as systems that support effective and efficient technology use, ICT integration across the curriculum will remain a dream.

This implies that the founding and grounding action towards ICT integration is steeped in policies that support and drive ICT use and integration. Lecturer B commented on the National ICT policy and averred that:

> It is an anomaly to have a policy that is not specific in terms of its outcomes and commitments to ICT integration for such a key sector as the education sector. It becomes very difficult to align programs for ICT integration in education if the government is not very clear about its vision for ICT in education, hence the need for an education specific ICT policy from which institutions can design their own institution-based policies which are more specific and more focused. We could draw lessons from other African countries that have specific policies around ICT in education. Namibia and South Africa are such examples.

Both lecturers concur that these policies must be further supported by tangible efforts towards ensuring equal access to technology as well as adequate resources to enable a smooth transition from traditional methods of teacher education and development. Resource mobilisation must therefore underpin the ICT in Education policy. The lectures further proposed that teacher education institutions must also play a key role in resource mobilisation by creating partnerships with private sector players who are in the ICT sector. Lecturer B pointed out that

While it is the role of government, through the relevant Ministry, to assist institutions with funding for ICT infrastructure teacher training institutions can also design plans and measures to increase ICT resources for themselves. It is not sustainable to place the responsibility squarely on the government.

Thus, teacher training institutions, in their policies, must outline strategies for ICT infrastructural development.

Institutional ICT in education policy

The second actionable step in ensuring ICT integration in teacher education curricula must also be supported by institutional policies that borrow from the National ICT in Education Policy. While the national policy is holistic in nature, institutional policies can be drawn from it by taking into consideration aspects that relate to the context of the institution. Each of the institutions must assess its readiness for ICT adoption and integration into the teacher education curriculum by taking into consideration the following factors as suggested by Lecturer A:

1. *Quantity and Quality of ICT tools- institutions must lay out plans for how they intend to resource their institutions*

2. *Key performance indicators (KPIs) in line with objectives set out for ICT integration in teacher education. That is, laying out the outcomes expected after each course level in line with the final outcomes of the total program that the pre-service teacher is undertaking. For instance, pre-service teacher must be able to create and deliver online content. Curriculum outcomes must be anchored in contextual realities. While it is pertinent that pre-service teachers gain high levels of skill in ICT integration, factors such as inadequacy of tools can be limiting. Hence, teacher training institutions must provide a foundation for integration of ICT in teaching and learning by using available resources.*

3. *An outline of potential ICT partners to assist in resource mobilisation and skills development. This is key in any institution.*

Institutional policies must, therefore, be grounded in the contextual realities of each of the institutions. Contextual realities is a term which generally considers "**the salient influences**, such as demographics, cultural norms and so on, which are region specific, and have explicit bearing on the usage" and application of various tools, policies and many other initiatives (Malhotra, 2015). What this implies is that each institution, in its attempt to integrate ICT into teacher education curriculum, is affected by different factors. For instance, colleges that have

lower enrolment might be in a position to fully resource with technology tools that cater for all students but might be affected by other factors such as connectivity if they are located in areas where connectivity is a challenge. Thus, each institution must fully assess its positioning as it draws up a relevant institutional ICT policy. Furthermore, all stakeholders within each institution must be committed to implementing the policy expectations.

Infrastructural assessment at institutional level is key to effective integration because studies have shown that the biggest hindrance to ICT integration in education is the lack of basic technological infrastructure (Apostolou, 2020). It is, therefore, critical that in developing curricula, institutions must understand what technology tools are available and accessible to both teacher educators and pre-service teachers in training. Lecturer F pointed out that while it is without question that ICT has transformed ways of learning and has created many opportunities for education, without infrastructure, teacher education institutions may fail to fully equip pre-service teachers with the right ICT competencies to transfer knowledge post-training. Lecturer A concurred with this opinion and stated that

> ICT integration should be done with cognizance of existing infrastructure. What this implies is that each institutional curriculum will have a different ICT integration plan based on available ICT tools.

Lecturers C & D also concurred with Lecturer B who stressed the need for context-relevant and institution-based ICT adoption and integration models in teacher education curriculum. Lecturer E further indicated that internet support in the form of software and connectivity is also a key area that must be considered when determining what forms of ICT integration should be linked to the curriculum. When asked if there existed an institutional ICT Policy all TEs pointed out that they were sure that it existed, but when asked to produce the policy as evidence and for analysis. In terms of some tenets that they could refer to, all the TEs could only state that students were expected to type their assignments and to pass the ICT course as per DTE requirements. The inability and hesitancy to produce an institutional ICT policy could potentially point to its inexistence. What this implies is that teacher education institutions are operating in blindness with regards to ICT integration in the subjects they train pre-service teachers in.

In response to a question regarding the various contextual challenges that their institutions face which hinder the smooth integration of ICTs, the lecturers responses are shown in as indicated in Table 1:

Table 1: ICT related challenges facing some teacher training institutions

Challenge	Lecturer A	Lecturer B	Lecturer C	Lecturer D	Lecturer E	Lecturer F
Hardware	✓	✓	✓	✓	✓	✓
Power/ Electricity	✓	✓	✓	✓	✓	✓
internet connectivity	✓	Partially	✓	✓	Partially	Partially
In-service training in ICT			✓	✓		
Software	✓	✓	✓	✓	✓	✓
Digital Pedagogy Skill	✓	✓	✓	✓	✓	✓
Technical Support			✓	✓	✓	✓

Source: Interview with lectures from three secondary teachers' training colleges in Zimbabwe

In the interviews, the lecturers were asked if the above challenges were affecting ICT integration in their institutions' curricula. The responses show that the challenges are not universal and each institution is affected by different factors. Lecturer A pointed out that electricity challenges are the most crippling and pose the most hindrance to the use of online based strategies as they may go for more than a day without electricity. At institution B, even though electricity is a challenge, it is not as bad compared to institution A because load shedding is only for a few hours on specific days of the week. This shows that institution A and B may have similar problems but at different levels of impact thus, their ICT integration models must be different to cater for these differences.

Coupled with infrastructure assessment, teacher education institutions should also focus on assessing levels of ICT knowledge and skills. This is important for ICT integration as it

focuses curriculum planning towards areas that are priority for training. Lecturer B stressed that

> Curriculum integration cannot be generalized across the various teacher education institutions as there are varying degrees of differences in the type of students enrolled, adequacy of ICT infrastructure, and access to internet support and various other contextual factors.

Level of ICT knowledge and skills of teacher educators is key to effective integration of technology because "the way teachers use technology in the classroom is one of the most important factors for the success of the ICT integration" (Apostolou, 2020, p. 563). Teacher educators play the role of modelling the knowledge and skills that pre-service teachers utilise post-training, therefore, it is important for institutions to adopt continuous in-service training for teacher educators. Similar to the case in classrooms where teachers may not be as tech savvy as the learners, at teacher training colleges, some pre-service teachers may be more knowledgeable and skilled than teacher educators. This implies the need for a collaborative approach to teaching and learning at teacher training institutions. The curriculum must provide opportunities for students to utilise technology and to share their experiences, knowledge and skills. This resonates with the UNESCO ICT Competency Framework for ICT integration which sets out collaborative classrooms and networking as key determinants of an ICT competent teacher. Thus, teacher educators' ICT knowledge and skills competency need to be evaluated and assessed in order to plan for both curriculum development and in-service training.

Adoption of integration strategies and a hybrid curriculum aligned with contextual realities can then be done following the assessments done by teacher education institutions. The lecturers interviewed stressed the difficulty of moving from traditional methods of lecturing which seem easier than the ICT based strategies. The socio-economic background of students also has an effect on ICT integration, particularly where online lectures are concerned. Lecturer A stressed the importance of involving students in the decision of what ICT tools are easily accessible and available to them to ensure ease of access to lectures and learning material.

Discussion

A national ICT policy is an important document that helps in directing the operations of specific departments at government or institutional level. Based on the lecturer participants' views, the

national ICT policy in itself is not adequate to influence real implementation on the ground. It must be supported by a dedicated National ICT in Education Policy and dedicated budget to support ICTs. The National ICT in Education Policy will become the source from which specific, context-bound institutional policies are drawn up and reviewed periodically to fit with occurring changes. The MOPSE and Ministry of Higher Education, Technology, Science and Innovation should spearhead the designing of the National ICT in Education Policy as the lead stakeholders in developing ICT Competencies in both learners and educators. This view is corroborated in the Namibian ICT for Education Policy (2003) where it is stated that,

> if government leaders, especially the Ministry of Education in particular, do not take steps to intensify and strengthen the use of information and communication technology (ICT) in our academic institutions and school, a generation of children-and a generation of adults as teachers- will be put at a colossal disadvantage with consequences and costs that will be difficult to reverse (p. 3).

Government leaders and relevant ministries should lead the drive for ICT integration into the curriculum. In the case of Zimbabwe, the Ministry of Higher Education Science and Technology Development, must show its commitment to the integration of technology in teacher education curricula by ensuring that teacher training institutions are well equipped with ICTs and have institutional policies that support ICT integration. In terms of this research, it appears that technology uptake, technology resource acquisition and integration has been solely left in the hands of teacher training institutions. These institutions are currently struggling to provide basic resources to their students as a result of the poor national economic conditions. Thus, without government support, the process of intensifying ICT use and integration in schools and teacher training institutions will not take hold. ICT integration must therefore be viewed as a holistic process which takes into consideration and collaboration all stakeholders. The Covid 19 pandemic exposed ICT skills deficiencies among teachers which affected continued learning through virtual learning which disadvantaged the majority of public schools in Zimbabwe.

As noted for South Africa by Ford & Botha (2010) "despite the noble intentions and efforts driving implementation of information communication technologies in education, the integration of ICTs into teaching and learning has been wrought with challenges Some of the challenges relate to the digital divide, adoption barriers and self-efficacy, inadequate ICT resources, limited access to the internet, social status of potential users of ICT, technophobia and fear of ICT adoption as a result of advanced age (Mooketsi & Chigona, 2016). These

problems are varied across differing contexts in which ICT is required thus leading to an implementation process "besieged with dispersed and uncoordinated implementation programs and projects' (Botha & Ford, 2010, p. 1). Such findings strengthen the argument for context-based adoption and implementation models supported by localised policy frameworks which take into consideration the realities across institutions of education. Zimbabwe is affected by the digital divide where access to technology across the country is unfavorably distributed. For instance, in a survey carried out by AfroBarometer in Zimbabwe, the findings made in July, 2018 highlighted that

- 95% of households in had cell phones, while 77% had radios, 49% had televisions, and only 23% had computers.

- Fewer than half (43%) of cell-phone owners – and only 28% in rural areas – said their phones had access to the Internet.

- Only a quarter of Zimbabweans said they used the Internet "every day" or "a few times a week". Six out of 10 (62%) said they "never" went online.

- As of mid-2018, almost half (45%) of Zimbabweans lived in areas without a public electricity grid. And only about three out of 10 respondents (31%) said their home had an electric connection that worked "most" or "all" of the time (Moyo-Nyede & Ndoma, 2020, p. 2).

It is within these contexts that the various teacher education institutions are situated. This implies that the institutions are also deeply affected by the challenges brought about by the digital divide. Thus, if institutions are encouraged to develop institutional policies for ICT integration that consider the context, ICT adoption and implementation would arguably be in better shape across the country's many education institutions. The suggested framework presented in this paper takes into account contextual issues that have a direct bearing on adoption and integration of ICT. ICT integration, we believe, should be subjective with options for continued learning and development. Teacher Education institutions' focus must be directed at developing basic ICT integration skills that allow for transfer of knowledge and provide a foundation for further training in-service in line with technological improvements so as to continuously build on existing skills.

Understanding the levels of ICT knowledge and skills in both teacher educators and students is important in determining digital pedagogy skills to employ in the case of the former and to impart to the latter. Teacher training institutions can determine levels of ICT knowledge

and skill among pre-service teachers through online surveys with incoming students. This will direct the levels of integration relevant for each particular intake and what kind of ICT knowledge and skills are requires by the incumbent students. Knowledge of ICT skills and content levels of teacher educators determine relevant in-service up skilling programs to develop teacher educators' skills in ICT integration. Teacher education institutions should also be clear on what level they want to integrate technology as it is critical to the selection of relevant tools and best practices for delivery of content. Abraham & Wadhwani (2013) suggest a range of levels at which ICT can be integrated into technology and these are:

- ICT for Computer Based Instruction (Digital Pedagogy Skills)
- ICT for Administrative work
- Computer Software knowledge and use
- ICT for Presentations
- ICT for Communication
- ICT for Research
- ICT for Evaluation
- ICT for Collaboration

This list is not exhaustive but serves as a foundation for selecting relevant ICT tools for integration into the curriculum to demonstrate how pre-service teachers can utilise technology to deliver content and enhance teaching and learning post service. Context-relevant and institution-based models of ICT integration create autonomy in the areas of teaching and learning that need to be prioritized. The ICT adoption process is not a single step but ongoing and continuous.

Conclusion

Integrating ICTs into the curriculum for teacher education, at diploma level**,** is the foundation for driving effective teaching and learning with technology in schools. Without the correct foundation for integrating technology, teaching and learning with technology will remain a dream for many. Fuller & Kim (2022, p. 2) clearly articulate the importance of marrying policy development with clear implementation frameworks in his observation:

> This blossoming policy discourse is replete with hopes for radically improving and transforming education systems. But how to define educational systems and then reshape them remains poorly defined. We cannot merely utter this ambitious goal

without precisely defining how to surround the system, identify potent levers for change, and rethink the aims and means of human learning on a fragile planet.

Ensuring a context relevant framework for ICT integration at pre-service level is key in creating a foundation for developing ICT competent teachers post-training. Contextual factors such as an organization's technical support, organization administrative support, organization infrastructure and resources, and organization ICT policy's effect on the commitment for use of technology are critical to the effective integration of ICTs. Pre-service ICT integration models must focus on providing teachers in training with experiences reflective of their lived realities with opportunities for continued learning and development. Collaborative effort should also be made to scale up internet access that will improve the virtual learning environments in the various institutions to enable inter-institution collaborations for enhancement of teacher education curriculum. This will enhance technology-based teaching and learning in the classrooms at national level and consequently improving teaching and learning.

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