

UNESCO International Institute for Capacity Building in Africa (IICBA)

ICT-enhanced Teacher Standards for Africa (ICTeTSA)

1. Engage in **Instructional Design** Processes 2. Facilitate and **Inspire** Student Learning, **Innovation** and **Creativity**
3. Create and Manage Effective **Learning Environments**
4. Engage in **Assessment** and **Communication** of Student Learning
5. Engage in **Professional Development** and Model **Ethical Responsibilities**
6. Understand **Subject Matter** for Use in **Teaching**



United Nations
Educational, Scientific and
Cultural Organization



International Institute
for Capacity Building
in Africa

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ICT-enhanced Teacher Standards for Africa (ICTeTSA)

Synthesized by Temechegn Engida



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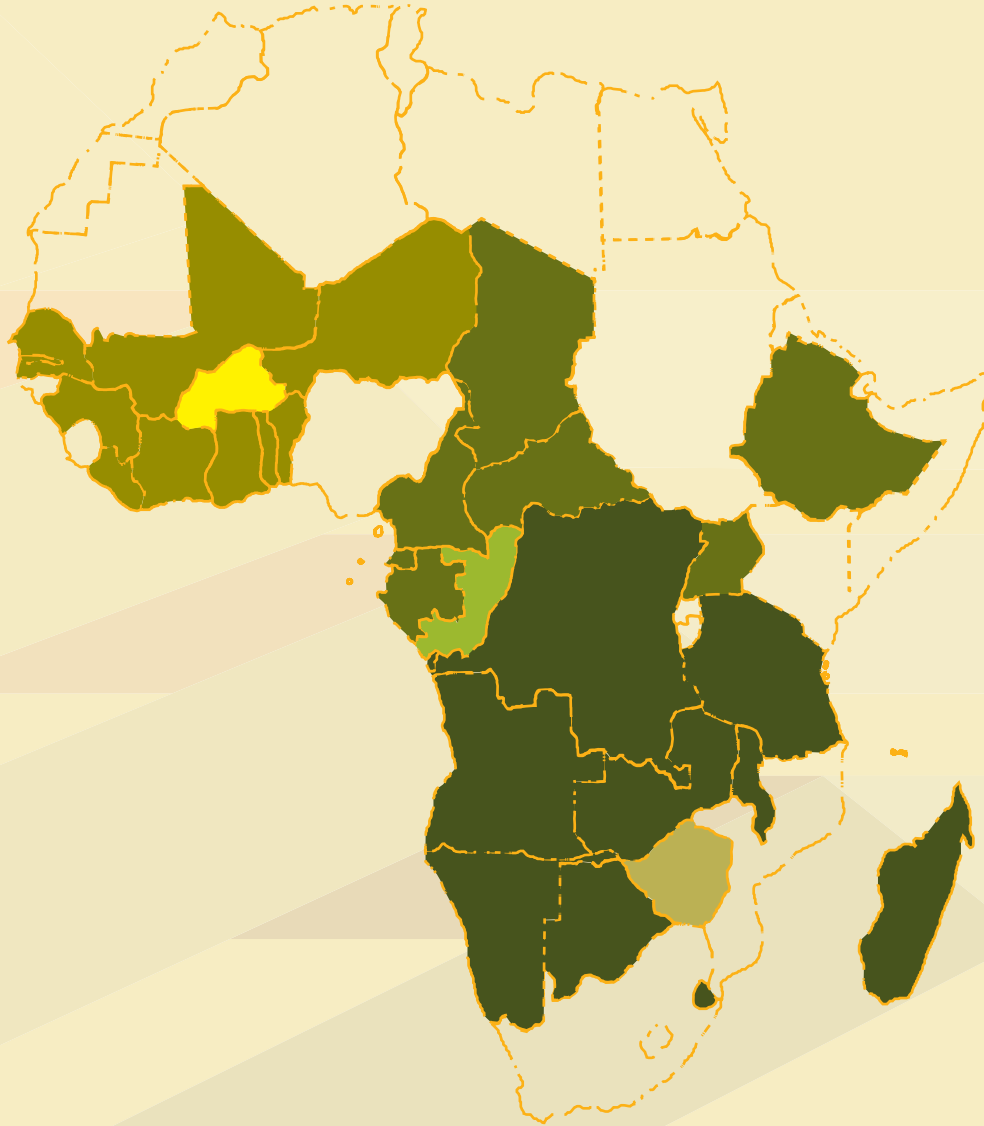
About IICBA

Established in 1999, the UNESCO International Institute for Capacity Building in Africa is one of eight UNESCO institutes and centers under the administrative direction of the UNESCO Secretariat. As the only UNESCO Institute in Africa, it is mandated to strengthen the capacities of teacher education institutions of its 54 Member States. This is carried out through a range of initiatives, including introducing information and communication technology for education; establishing networks of partner institutions to foster the sharing of experiences; undertaking research and development on teacher education institutions in Africa; utilizing distance education for improving the capacities of teacher education institutions, linking educational development to economic development through collaboration with the African Union and sub-regional and regional educational institutions; and promoting international cooperation for the development of education through the New Partnership for Africa's Development (NEPAD).

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Visual Map of Participating Countries in the Development of ICTeTSA



EAC/ECCAS/IGAD : Cameroun, Central African Republic, Chad, **Congo (Brazzaville)**, Ethiopia, Equatorial Guinea, Gabon and Uganda

ECOWAS : Benin, **Burkina Faso**, Côte d'Ivoire, Gambia, Ghana, Guinea, Liberia, Mali, Niger, Senegal and Togo

SADC : Angola, Botswana, DRC, Madagascar, Malawi, Namibia, Swaziland, Tanzania, Zambia, **Zimbabwe**

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Foreword

Good teaching is probably the most critical part of a solid education. The critical importance of teaching is also acknowledged by educators, practitioners, ministers of education, teacher unions, and society at large. The ways teachers are recruited, trained and deployed across schools play a key role in learning outcomes and in reducing inequalities. A high quality teacher education is of critical importance for the quality and relevance of education at all levels, and to the high status of the teaching profession itself.

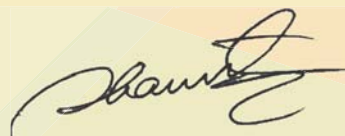
For quality teaching to materialize in the 21st century, we in UNESCO-IICBA believe that there is a need for teacher education programs to work towards high standards in terms of the pedagogical integration of ICTs. Standards need to be understood here not as binding statements but as the minimum guiding frameworks that are flexibly contextualizable to the specific needs of the Member States. This is so because the contexts in which teachers are working are multifaceted and are at various degrees of development both in pedagogical practices and technology use.

The development of the ICT-enhanced teacher standards for Africa (ICTeTSA) was thus conceptualized and initiated by UNESCO International Institute for Capacity Building in Africa (IICBA) in 2009 as one of the strategies of building the capacities for strengthening teacher development in Africa. The development of ICTeTSA was also based on a research work in Africa conducted by UNESCO-IICBA and UNECA in 2008. This study, conducted in representative 18 African countries, recommended that IICBA needs i) to use a consultative and participatory methods in developing and promoting ICT in education standards and ii) to introduce ICT in education courses for teacher educators in Africa.

Accordingly, IICBA organized three workshops for different regional economic communities (RECs) of the African Union. The first workshop was organized for Member States from the Economic Community for West African States (ECOWAS) and was held in Ouagadougou/Burkina Faso in July 2009. This first phase of the workshop was funded by the Chinese grant to UNESCO-IICBA. The second workshop was held in Harare/Zimbabwe in December 2009 for Member States from the Southern African Development Community (SADC). The workshop for SADC was funded by UNESCO-BREDA. The third workshop was organized for Member States from three RECs, namely East African Community (EAC), Economic Community for Central African States (ECCAS) and Inter-Governmental Authority for African Development (IGAD). It was conducted in Brazzaville/Republic of Congo and was funded by the Chinese grant to UNESCO-IICBA. Finally, a validation workshop was conducted in September 2011 in Addis Ababa/Ethiopia involving ICT in education experts from seven Member States of Africa. This validation workshop was sponsored by UNESCO-IICBA.

Whereas the focus of the various workshops was to develop ICTeTSA using a bottom-up approach, I believe that the development processes were also intended to build the capacities of the participants from Member States in developing standards that integrate technologies in their existing teacher competences. Such an approach clearly demonstrates IICBA's strategy of capacity building while, at the same time, producing tangible outputs through the processes.

ICTeTSA aims at providing a framework for a teacher's career and clarifies what progression looks like. It defines the characteristics of teachers at each career stage. Specifically it provides ICT-enhanced standards for the emerging stage, applying stage, infusing stage, and transforming stage. The standards refer to a teacher's competences stated in terms of his/her professional knowledge, skills and attitudes. ICTeTSA also provides clarity of the expectations at each career stage.



Arnaldo Nhavoto
Director, UNESCO-IICBA

1. Introduction

Back in 1996, UNESCO labeled the situation of teachers around the world a 'silent emergency.' A decade on, things have not improved much (Gable and Burns, 2005). This is primarily true in Sub-Saharan Africa where there is a serious shortage of qualified teachers and quite a considerable number of children lack access to basic education. There is thus a general consensus that such challenges can not be met without increasing both the supply and quality of teachers through expanding the breadth and depth of pre-service and in-service teacher professional development by using Information and Communication Technologies (ICTs).

One cannot reach the pursuit of distinguishing competent teachers from incompetent ones merely by stipulating that any particular set of standards is the answer. There is a need to identify and develop contextualized teacher and teaching competencies and standards. Professional associations, countries, states, or universities often collaborate within their larger educational community to establish ICT supported teacher standards and guidelines that describe the knowledge, skills, and dispositions teacher candidates are expected to demonstrate upon completion of their teacher education programs. According to the UNESCO's (2002) planning guide on ICTs in teacher education, these accepted standards not only provide guidance to universities and colleges when developing plans for infusion of technology into their teacher education programs, but also establish a measure of consistency among teacher education programs within a region. Many regions and countries in Europe, the USA, Asia, and Australia have adopted a set of ICT standards for pre-service and in-service teacher education.

Based on these premises the UNESCO International Institute for Capacity Building in Africa (IICBA) conceptualized a project in 2008 on the development of ICT-enhanced teacher standards for Africa (ICTeTSA) and conducted three workshops in 2009 and 2010 at regional economic communities (RECs) level towards that end. ICTeTSA aims at providing a framework for a teacher's career and clarify what progression looks like. It defines the characteristics of teachers at each career stage. Specifically it provides ICT-enhanced standards for the emerging stage, applying stage, infusing stage, and transforming stage. It also provides clarity of the expectations at each career stage. The standards refer to a teacher's professional knowledge, skills and attitudes.

After the initial training year teachers would be expected to continue to meet the broad standards and to broaden and deepen their professional knowledge, skills and attitudes within that context. This principle applies at all subsequent career stages.

ICTeTSA is progressive/developmental reflecting the progression expected of teachers as their professional knowledge, skills and attitudes develop and they demonstrate increasing effectiveness in their roles. In other words, ICTeTSA is based on the developmental view of teaching that recognizes teachers' knowledge, skills and attitudes to develop throughout their professional careers.

2. The Research Basis for ICTeTSA

A survey study (Farrel and Isaacs, 2007) on ICTs and education in 53 African countries in 2007 revealed that there is a great deal of variance in ICT policies for education among the African countries, with the largest group being made up of those countries that are in transition from a sustained period of conflict and economic instability. All of these countries are in Sub-Saharan Africa (SSA) and are among the neediest in terms of development assistance. These SSA countries are looking to ICT applications to help them meet a myriad of challenges – particularly the development of their human resource capacity. Although these countries have developed or are in the process of developing some sort of ICT in education plans/policies, the implementation of these plans remains very dependent on the support of partners from the donor community and the private sector. The survey further indicates the general lack of human resource capacity to provide ICT training and equipment servicing, and also the gap between the availability of ICT infrastructure and the ability of agrarian societies to integrate it to benefit national development. It is also learnt that the capacity of African universities, let alone teacher education institutions, to lead the process of integrating ICTs in education is, to say the least, inadequate. More specifically, most of the teacher training programmes in Africa involve the development of basic ICT skills, sometimes as an end in itself, through one-off, topic-led, short-term training programs that aim to develop specific computer skills of teachers, but which do not necessarily improve teachers professional standards in light of recommended competency frameworks.

UNESCO-IICBA (2008) also conducted a needs assessment study on ICT standards for African teachers (I-SAT). This study was commissioned by IICBA on behalf of the UN Economic Commission for Africa (UNECA) in the context of ECA's e-Policy Resource Network for Africa. The study was based on 18 representative countries covering the East African, Southern Africa and West African regions. The countries in the East African region were Ethiopia, Kenya, Mauritius, Sudan, Tanzania, and Uganda. In the West and Central African sub-region the representative countries were Ghana, Ivory Coast, Senegal, Congo, Cameroon, and Benin. In the South African region, the six countries included in the study were Zimbabwe, South Africa, Lesotho, Angola, Malawi, and Mozambique.

The UNESCO-IICBA (2008) study found that most of the universities and teacher training institutions (TTIs) in the 18 African countries had started to address the ICT infrastructure issues and had also introduced ICT curriculum standards. However, few had addressed ICT pedagogy issues or were even aware of UNESCO work in this area. Teacher standards that integrate ICT are either non-existent or poorly developed to meet the needs and contexts of African countries. It is also found out that African countries within and among the regional communities are at various

levels of ICT use in education. The study also forwarded recommendations, the most relevant being the following:

- Use a consultative and participatory method in developing and promoting ICT standards. This would increase awareness and chances of adoption of the standards.
- Develop ICT pedagogy standards. In addition, introduce ICT pedagogy courses for lecturers or tutors of TTIs, particularly the university-based TTIs in each country.

3. The Processes Used to Develop ICTeTSA

The project on the 'Development of ICT-enhanced Teacher Standards for Africa (ICTeTSA)' was conceptualized in late 2008 as part of the ICT in Education program of IICBA. By then IICBA has already decided that its interventions in African Member States have to be implemented at the level of the regional economic communities (RECs) established by the African Union. So the project was designed to be implemented at RECs' level.

Once the project was conceptualized and got approved by IICBA, the Program Officer for ICT in Education (Mr. Temechegn Engida) developed the training materials that consisted of two parts (see Appendix III). These two materials were translated into French for use by francophone participants. The project then was implemented by three facilitators, all of whom were IICBA staff, namely: Mr. Temechegn Engida (Lead trainer and Program Officer for ICT in Education), Mr. Abdoulaye Barry (Trainer and Head of IICBA's Dakar Node), and Mr. Julien Daboué (Trainer and Officer-in-Charge of IICBA, July 2008 to November 2011).

Participation in the workshop was limited to those professionals working in the Ministries of Education of the respective RECs and nominated by their respective Ministers. The invitation letters sent to the Ministers clearly stated that participants should be selected from those departments of the Ministries of Education dealing with teacher education, ICT in teacher education and planning. While IICBA promised to sponsor the expenses of one participant per country, the Ministries were encouraged to sponsor as many participants as they can. Some countries indeed sponsored one more participant for the workshops.

The first workshop was organized for Member States from the Economic Community for West African States (ECOWAS) and was held in Ouagadougou/Burkina Faso in July 2009. This first phase of the workshop was funded by the Chinese grant to UNESCO-IICBA.

The second workshop was held in Harare/Zimbabwe in December 2009 for Member States from the Southern African Development Community (SADC). The workshop for SADC was funded by UNESCO-BREDA.

The third workshop was organized for Member States from three RECs, namely East African Community (EAC), Economic Community for Central African States (ECCAS) and Inter-Governmental Authority for African Development (IGAD). It was conducted in Brazzaville/Republic of Congo and was funded by the Chinese grant to UNESCO-IICBA.

Finally, a validation workshop was organized for selected African experts on ICT in education. The experts were drawn from Côte d'Ivoire, Ethiopia, Ghana, Mali, Mozambique, Niger and Tanzania. Experts from Botswana, South Africa and Uganda were invited but they were not able to participate

for some reasons. The workshop was held in Addis Ababa/Ethiopia in September 2011 facilitated by Mr. Temechegn Engida and M. Arnaldo Nhavoto and was sponsored by UNESCO-IICBA.

As a prerequisite for the validation workshop, it was necessary to synthesize the works from the three workshops and to write the draft document. Initially, it was intended that a consultant, who was supposed to attend all the workshops with the trainers, will synthesize the outputs from all the workshops. However, this could not happen for some technical reasons. The synthesis and write-up of the document for validation was, therefore, done by the Program Officer of IICBA for ICT in Education.

The process of synthesizing the outputs of the three workshops that consisted of 8 groups altogether started by collecting the broad standards formulated by each group. This was followed by identifying a theme from each standard that could be considered as a component of teaching in general (see Appendix I). This second step, in turn, gave a clue to what kind of broad standards/domains of teaching could be more appropriate to the majority of the working groups. This led to the identification of five standards. In addition, one more standard was added by the person who did the synthesis based on current research on teaching and teachers. Altogether, therefore, ICTeTSA consists of six broad standards/domains of teaching, as presented and discussed in the next chapter. As can be seen from the first part of the next chapter, each standard is operationally defined and/or described to provide a common ground for the readers and users of the document. It is, however, necessary to note that such definitions/descriptions were not offered by the working groups that formulated the original standards during the three workshops.

The broad standards were then translated into competences in terms of knowledge, skills and attitudes expected of teachers. These competences were also synthesized from the works of the eight groups during the three workshops, first by the experts who participated in the validation workshop and then by the Program Officer. The competences are presented and discussed in the second part of the next chapter (see Tables 1-7).

4. The Structure and Domains of ICTeTSA

4.1. The Broad Standards

ICTeTSA is organized around six interrelated domains or broad standards of teachers, namely: *i) Engage in Instructional Design Processes, ii) Facilitate and Inspire Student Learning, Innovation and Creativity, iii) Create and Manage Effective Learning Environments, iv) Engage in Assessment and Communication of Student Learning, v) Engage in Professional Development and Model Ethical Responsibilities, and vi) Understand Subject Matter for Use in Teaching.* Each domain of teaching/teacher standard has its own competences/performance indicators that deal with the minimum knowledge, skills and attitudes expected of 21st century teachers in Africa.

The six standards are presented diagrammatically as in figure 1, with each standard emanating from the six sides of the holistic hexagonal ICTeTSA. In other words, teachers who meet the minimum of these separate but interrelated standards are believed to have mastered the ICT-enhanced teacher standards for Africa.

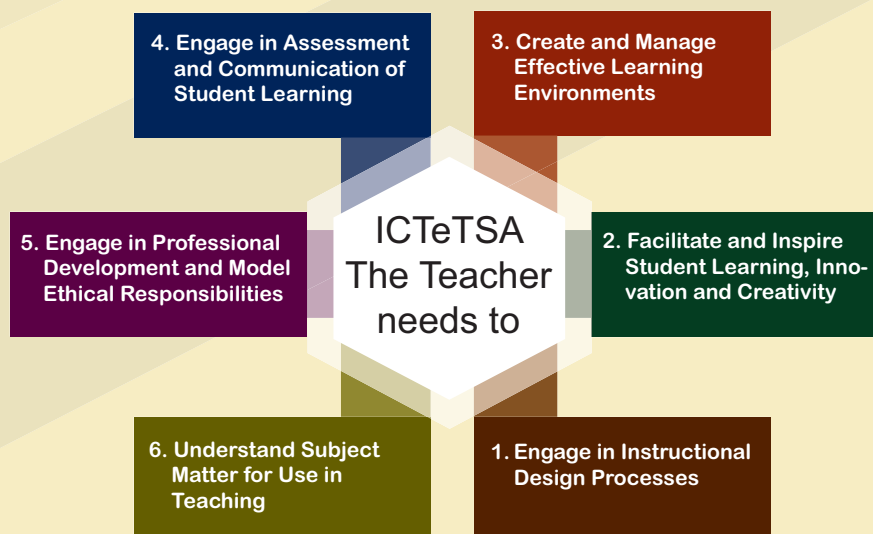


Figure 1: The Six Standards of ICTeTSA

ICTeTSA may work in contexts other than Africa. But because the development processes involved only African countries as described in the previous chapter, the scope of ICTeTSA is delimited to Africa.

At this stage it is necessary to briefly describe the nature of each of the six standards. It is also necessary to note from the outset that the enhancement of the standards with ICT is stage-wise, i.e., emerging, applying, infusing and transforming, and happens at the level of competences. In other words, the formulation of the six domains or standards may appear and be understood to be with or without ICT, as it is likely to happen at the initial/emerging stage of the teachers' development.

1. ENGAGE IN INSTRUCTIONAL DESIGN PROCESSES

Instructional design (ID) is conceptualized as the systematic development of instructional specifications using learning and instructional theory to ensure the quality of instruction/teaching. It is the entire process of analysis of learning needs and goals and the development of a delivery system to meet those needs. ID involves considerations of learning theories/educational philosophies/policy options, analyzing needs, setting objectives, determining the appropriateness and difficulty level of contents and activities for the target groups, selection of appropriate technology/medium for content organization and delivery, assessment and evaluation of the effectiveness and efficiency of the entire ID processes. As such this domain/standard of teaching involves teachers' content knowledge (CK), pedagogical knowledge (PK), technological knowledge (TK) and their amalgam knowledge areas. It also includes development of instructional materials and activities; and tryout and evaluation of all instruction and learner activities.

Elements of this standard were identified by six of the working groups during the three workshops. These groups were SADC_I, SADC_II, ECCAS_IGAD_I, ECCAS_IGAD_III, ECOWAS_I, and ECOWAS_III.

2. FACILITATE AND INSPIRE STUDENT LEARNING, INNOVATION AND CREATIVITY

Many educational institutions worldwide have taken up ICT. However, according to a policy brief by the European Communities (2008),

ICT has not had a transformative impact on teaching and learning in education and training institutions. While many education institutions all over Europe are currently experimenting with diverse digital tools, the approaches developed are not always creative or innovative. This is important, as the impact of ICT use on students is highly dependent on teaching approaches, and better skills result when student-centered guidance, group work and inquiry projects are used (p. 2).

This is true of educational institutions in Africa as well. Teachers need to develop the competencies to facilitate and inspire student learning that lead to innovation and creativity. To achieve this, in line with European Communities (2008) recommendation, pre-and in-service teacher education should disseminate insights and best practices with new innovative approaches, encouraging teachers to experiment with digital and media technologies and to reflect on the learning impacts of their own teaching practices. Establishing and participating in teacher networks and following innovative practice development of the field should become part of teacher training.

Elements of this standard were identified by seven of the working groups during the workshops, namely ECOWAS_III, ECOWAS_I, ECCAS_IGAD_III, ECCAS_IGAD_II, ECCAS_IGAD_I, SADC_II, and SADC_I.

3. CREATE AND MANAGE EFFECTIVE LEARNING ENVIRONMENTS

Teachers are expected to create learning environments for students that are supposed to be optimal for learning. Although various learning theories and educational philosophies propose different learning environments, learner-centered ones advocate for an environment that stimulate active knowledge construction and the acquisition of problem-solving skills.

Teachers therefore need to create such learning environments and strive to manage them throughout the teaching-learning processes. The technology offers tremendous opportunities for teachers and students to achieve the task of creating and managing effective learning environments. However, in spite of the fact that web technologies have made the Internet more creative, participative and socializing, it is not quite evident that this development also triggered a revolution in learning. In this regard, Blees and Rittberger (2009) question whether education and learning require re-thinking in view of the continuous change of information and communication technologies (ICTs), and whether we need new concepts and designs for respective working and learning environments.

Such and similar arguments call for the need for teachers to be able to create and manage effective learning environments. Five of the eight working groups in the workshops have also made references to this standard. The groups are ECOWAS_III, ECOWAS_II, ECCAS_IGAD_I, ECCAS_IGAD_II, and SADC_I.

4. ENGAGE IN ASSESSMENT AND COMMUNICATION OF STUDENT LEARNING

Assessment/evaluation and communication of student achievement and growth are essential parts of the teaching and learning process. Teachers should establish and clearly communicate learning goals for all students. Each part of the teaching and learning process should be a positive experience for students and promote personal growth. During the assessment and communication processes teachers need to collect information about student performance from a variety of sources and involve all students in assessing their own learning. They also need to exchange information about student learning with students, families and support personnel in ways that improve understanding and encourage further academic progress. Such practices should be carried out in such a way that they support continuous learning and development. The use technology supports and facilitates the assessment and communication processes.

All the eight groups in the three workshops of the ICTeTSA development identified this standard as essential for teacher development.

5. ENGAGE IN PROFESSIONAL DEVELOPMENT AND MODEL ETHICAL RESPONSIBILITIES

Teachers' professional development (TPD) is understood here as "the body of systematic activities to prepare teachers for their job, including initial training, induction courses, in-service training, and continuous professional development within school settings" (EU, 2010, p.19). Such conception of teachers' professional development is broader than career development—the growth that

occurs as the teacher moves through the professional career cycle—and also broader than staff development—the provision of organized in-service programs designed to foster the growth of groups of teachers (Villegas-Reimers, 2003).

TPD has been implemented traditionally in various forms, including participation in professional development schools (PDS). 21st century TPD could also be implemented using the various traditional models with the added use of technology. According to Villegas-Reimers' (2003) review such a model, "labeled 'ePDS', has been quite successful as it has all the advantages of the regular partnerships and professional-development schools, but with a supplementary 'cyberspace' dimension, which allows even closer and more frequent communication between all the members of the partnership" (p. 74).

Teachers have specific ethical responsibilities to their students and colleagues. Teachers, therefore, need not only develop professionally but also promote and model their responsibilities professionally. Ethical and responsible use of the technology is also an added responsibility of 21st century teachers.

Seven groups, out of eight, of the three workshops for the development of ICTeTSA made direct and indirect references to this standard. These groups are ECOWAS_III, ECOWAS_II, ECOWAS_I, ECCAS_IGAD_II, ECCAS_IGAD_I, SADC_II, SADC I.

6. UNDERSTAND SUBJECT MATTER FOR USE IN TEACHING

It is obvious that a teacher must first comprehend the material to be taught, that is, grasp the relevant content knowledge (CK). But a teacher's knowledge of subject matter should go beyond comprehension of the material to be taught—s/he must understand the subject matter for teaching purposes.

According to Cochran, King and DeRuiter (1991) a teacher and a content specialist differ in the following manner:

Teachers differ from biologists, historians, writers, or educational researchers, not necessarily in the quality or quantity of their subject matter knowledge, but in how that knowledge is organized and used. For example, experienced science teachers' knowledge of science is structured from a teaching perspective and is used as a basis for helping students to understand specific concepts. A scientist's knowledge, on the other hand, is structured from a research perspective and is used as a basis for the construction of new knowledge in the field (p. 5).

Teachers use their knowledge of student development, subject matter, instructional resources and teaching strategies to make subject matter accessible to all students. Though there is no direct reference to this standard during the various workshops for the development of ICTeTSA, it is believed that understanding subject matter for use in teaching should be one of the broad standards for teachers. It is specifically believed that understanding subject matter for use in teaching using ICTs should be one of the minimum standards for 21st century teachers.

4.2. The Competences

The term competence has been in the literature for a long time. But there seems to be quite different, at times contradicting, conceptions of competence. Many international organizations such as UNESCO have also been working on it for quite sometime to arrive at a common conceptual basis for the term competence.

For the purpose of ICTeTSA, competence is conceptualized in terms of knowledge, skills and attitudes expected of teachers to effectively perform their duties as teachers of a given subject area in the 21st century Africa. In other words, ICTeTSA expects teachers to have and demonstrate the knowledge, skills and attitudes composed of subject matter, pedagogy and technology in order to help their students learn best in a given context.

In line with EI & ON (2011), competence is regarded not as trained behavior but as critical thinking skills, reflective capabilities and a developmental process involving teachers. Competence includes domain-specific knowledge, broader life skills and cultural and socio-emotional attributes, and should take into account both personal factors that affect teachers' performance and the educational context.

ICTeTSA recognizes the fact that "teacher competence is one way of looking at teacher quality, as it can provide a framework for talking about essential qualities that are expected of teachers" (EI and ON, 2011, p.19). It, however, adds that teacher quality in the 21st century needs to involve the integration of ICTs in all aspects of teachers' activities. It also argues that the knowledge, skills and attitudes teachers are expected to have are progressive and developmental not only in terms of pedagogy but also of content and technology.

ICTeTSA, therefore, defines competence holistically as the possession and development of a complex combination of ICT-enhanced knowledge, skills and attitudes displayed in the context of task performance. It recognizes competence not as trained behavior but thoughtful capabilities and a developmental process. The development of these competences is supposed to progress developmentally from an initial stage of emerging through to the highest stage of transforming in terms of technology, pedagogy and content, with the context playing a pivotal role in the extent of the integration. Taken all together, the development of these competences is believed to lead to the fulfillment of the six interrelated broad standards discussed in the previous section.

ICTeTSA is context-based. As such it is believed that a document for multinational contexts such as this one needs to be more generic. According to EI and ON (2011) generic competences are needed in all content domains and can be utilized in new professional situations. They identify shared attributes, which could be general to any degree, such as the capacity to learn, decision making, communication abilities, teamwork and management. It is thus believed that the specific African countries and their teacher education institutions will contextualize the broad standards and competences of ICTeTSA to their specific situations.

The competences of ICTeTSA were first reduced from the original eight groups of the RECs' participants to two groups by the experts who participated in the validation workshop in September 2011. Then IICBA's Program Officer for ICT in Education synthesized them. The synthesized competences are designed around core knowledge, skill and attitude indicators for all the six standards. These core indicators, stated in terms of key verbs and phrases for each of the stages, are presented as in Table 1.

For instance, the knowledge expected of a teacher at the: i) emerging stage is to ***“Be aware of the importance of”*** the broad standard, ii) applying stage is to ***“Recognize and describe the approaches for”*** the broad standard, iii) infusing stage is to ***“Explain and criticize the pros and cons of various approaches for the broad standard in terms of related broad standard theories, appropriateness of ICT tools, content requirements (pedagogical approaches) within a subject area and contextual factors”***, and iv) transforming stage is to ***“Master the approaches and techniques that promote the standard within and across grade levels of a given subject as well as across the institute's/school's curricula using ICTs”***.

As it is expected, the competences and indicators for all the knowledge, skills and attitudes are becoming increasingly complex and demanding as one goes from emerging through applying and infusing to transforming stage. The core competences and indicators presented in Table 1 are repeated in each of the six broad standards discussed above and are presented in Tables 2-7.

Table 1: Core Competences/Indicators for All Broad Standards

		Title of broad standard		
		Competencies/Indicators		
Stage		Knowledge	Skills	Attitudes
Emerging		<i>Be aware of the importance of ...</i>	<i>Review various approaches to ...</i>	<i>Develop interest in using ...</i>
Applying		<i>Recognize and describe the approaches for ...</i>	<i>Use available approaches that are claimed by the authors for ... using ICTs in the specified subject areas</i> <i>Evaluate the appropriateness of ... for their target learners</i>	<i>Demonstrate positive attitudes in using ... developed by others and that ... in their subjects using ICTs</i>
Infusing		<i>Explain and criticize the pros and cons of various approaches for ... in terms of ... theories, appropriateness of ICT tools, content requirements (pedagogical approaches) within a subject area and contextual factors</i>	<i>Produce ... using ICTs for their subject areas and target groups</i> <i>Use one's produced ... for the target group</i> <i>Evaluate the effectiveness and efficiency of one's produced approaches</i>	<i>Appreciate the care and rigor needed in ... for target learners using available ICT tools</i>
Transforming		<i>Master the approaches and techniques that ... within and across grade levels of a given subject as well as across the institute's/school's curricula using ICTs</i>	<i>Demonstrate creativity in ... using ICTs in their institutions/schools and beyond</i>	<i>Demonstrate motivation, dedication and sensitivity to ... to various target groups using ICTs</i>

Table 2: Competences/Indicators for Standard 1

1. Engage in instructional design processes			
Competencies/Indicators			
Stage	Knowledge	Skills	Attitudes
Emerging	<i>Be aware of the importance of instructional design in teaching-learning</i>	<i>Review various approaches to instructional design</i>	<i>Develop interest in using instructional design in teaching-learning</i>
Applying	<i>Recognize and describe the approaches for 1) analyzing needs and tasks for instruction, 2) designing and developing instruction using appropriate media and delivery systems, 3) implementing instruction, 4) evaluating instruction</i>	<i>Use available approaches that are claimed by the authors for instructional materials using ICTs in the specified subject areas</i> <i>Evaluate the appropriateness of the designed and used materials for their target learners</i>	<i>Demonstrate positive attitudes in using instructional materials developed by others and that promote instructional design approaches in their subjects using ICTs</i>
Infusing	<i>Explain and criticize the pros and cons of various approaches for 1) analyzing needs and tasks for instruction, 2) designing and developing instruction, 3) implementing instruction, and 4) evaluating instruction in terms of instructional design theories, appropriateness of ICT tools, content requirements within a subject area and contextual factors</i>	<i>Produce instruction by 1) conducting needs and tasks analysis for instruction, 2) designing and developing instruction using ICTs for their subject areas and target groups</i> <i>Use one's produced instruction for the target group</i> <i>Evaluate the effectiveness and efficiency of one's produced approaches</i>	<i>Appreciate the care and rigor needed in designing instruction for target learners using available ICT tools</i>
Transforming	<i>Master the approaches and techniques that promote instructional design within and across grade levels of a given subject as well as across the institute's/school's curricula using ICTs</i>	<i>Demonstrate creativity in instructional design principles and procedures using ICTs in their institutions/schools and beyond</i>	<i>Demonstrate motivation, dedication and sensitivity to designing instructions to various target groups using ICTs</i>

Table 3: Competences/Indicators for Standard 2

2. Facilitate and inspire student learning, innovation and creativity			
Competencies/Indicators			
Stage	Knowledge	Skills	Attitudes
Emerging	<i>Be aware of the importance of student learning, innovation and creativity in the educative processes</i>	<i>Review various approaches that promote student learning, innovation and creativity</i>	<i>Develop interest in promoting student learning, innovation and creativity</i>
Applying	<i>Recognize and describe the approaches and techniques of teaching that promote student learning, innovation and creativity using ICTs</i>	<i>Use available approaches that are claimed by the authors for teaching to promote student learning, innovation and creativity using ICTs in the specified subject areas</i> <i>Evaluate the appropriateness of the approaches for their target learners</i>	<i>Demonstrate positive attitudes in using teaching approaches and techniques developed by others and that promote student learning, innovation and creativity in their subjects using ICTs</i>
Infusing	<i>Explain and criticize the pros and cons of the various approaches and techniques used for 1) student learning, 2) innovation, and 3) creativity in terms of teaching-learning theories, appropriateness of ICT tools, content requirements within a subject area and contextual factors</i>	<i>Produce teaching approaches and techniques that promote and inspire student learning, innovation and creativity using ICTs for their subject areas and target groups</i> <i>Use one's produced teaching approaches and techniques for the target group</i> <i>Evaluate the effectiveness and efficiency of one's produced approaches</i>	<i>Appreciate the care and rigor needed in producing and facilitating teaching approaches that inspire student learning, innovation and creativity for target learners using available ICT tools</i>
Transforming	<i>Master the approaches and techniques that inspire student learning, innovation and creativity within and across grade levels of a given subject as well as across the institute's/school's curricula using ICTs</i>	<i>Demonstrate creativity in inspiring student learning, innovation and creativity using ICTs in their institutions/schools and beyond</i>	<i>Demonstrate motivation, dedication and sensitivity to inspiring student learning, innovation and creativity to various target groups using ICTs</i>

Table 4: Competences/Indicators for Standard 3

3. Create and manage effective learning environments			
Competencies/Indicators			
Stage	Knowledge	Skills	Attitudes
Emerging	<i>Be aware of the importance of creating and managing effective learning environments in the educative processes</i>	<i>Review various approaches that help to create and manage effective learning environments</i>	<i>Develop interest in creating and managing effective learning environments</i>
Applying	<i>Recognize and describe the approaches and techniques to create and manage effective learning environments using ICTs</i>	<i>Use available approaches that are claimed by the authors for creating and managing effective learning environments using ICTs in the specified subject areas</i> <i>Evaluate the appropriateness of the approaches for their target learners</i>	<i>Demonstrate positive attitudes in using approaches developed by others and that assist in creating and managing effective learning environments in their subjects using ICTs</i>
Infusing	<i>Explain and criticize the pros and cons of the various approaches used for 1) creating effective learning environments and 2) managing effective learning environments in terms of classroom management theories, appropriateness of ICT tools, content requirements within a subject area and contextual factors</i>	<i>Produce approaches that create and manage effective learning environments using ICTs for their subject areas and target groups</i> <i>Use one's produced learning environment approaches for the target group</i> <i>Evaluate the effectiveness and efficiency of one's produced approaches</i>	<i>Appreciate the care and rigor needed in creating and managing effective learning environments for target learners using available ICT tools</i>
Transforming	<i>Master the approaches and techniques that create and manage effective learning environments within and across grade levels of a given subject as well as across the institute's/school's curricula using ICTs</i>	<i>Demonstrate creativity in creating and managing effective learning environments using ICTs in their institutions/schools and beyond</i>	<i>Demonstrate motivation, dedication and sensitivity to creating and managing effective learning environments to various target groups using ICTs</i>

Table 5: Competences/Indicators for Standard 4

4. Engage in assessment and communication of student learning			
Competencies/Indicators			
Stage	Knowledge	Skills	Attitudes
Emerging	<i>Be aware of the importance of assessing and communicating student learning in the educative processes</i>	<i>Review various approaches that help to assess and communicate student learning</i>	<i>Develop interest in assessing and communicating student learning to the stakeholders</i>
Applying	<i>Recognize and describe the approaches to assess and communicate student learning using ICTs</i>	<i>Use available approaches that are claimed by the authors for assessing and communicating student learning using ICTs in the specified subject areas</i> <i>Evaluate the appropriateness of the approaches for their target learners</i>	<i>Demonstrate positive attitudes in using approaches developed by others and that assist in assessing and communicating student learning in their subjects using ICTs</i>
Infusing	<i>Explain and criticize the pros and cons of the various approaches used for 1) assessing student learning and 2) communicating student learning in terms of assessment and communication theories, appropriateness of ICT tools, content requirements within a subject area and contextual factors</i>	<i>Produce approaches that help to assess and communicate student learning using ICTs for their subject areas and target groups</i> <i>Use one's produced assessment communication of student learning approaches for the target group</i> <i>Evaluate the effectiveness and efficiency of one's produced approaches</i>	<i>Appreciate the care and rigor needed in assessing and communicating student learning for target learners using available ICT tools</i>
Transforming	<i>Master the approaches and techniques that assess and communicate student learning within and across grade levels of a given subject as well as across the institute's/school's curricula using ICTs</i>	<i>Demonstrate creativity in assessing and communicating student learning using ICTs in their institutions/schools and beyond</i>	<i>Demonstrate motivation, dedication and sensitivity to assessing and communicating student learning to various target groups using ICTs</i>

Table 6: Competences/Indicators for Standard 5

5. Engage in professional development and model ethical responsibilities			
Competencies/Indicators			
Stage	Knowledge	Skills	Attitudes
Emerging	<i>Be aware of the importance of engaging in one's professional development activities and in modeling ethical responsibilities in the educative processes</i>	<i>Review various approaches that help to engage in professional development and to model ethical responsibilities</i>	<i>Develop interest in engaging oneself in professional development activities and in modeling ethical responsibilities in the educative processes</i>
Applying	<i>Recognize and describe the approaches to engaging in professional development activities and to modeling ethical responsibilities using ICTs</i>	<i>Use available approaches that are claimed by the authors for engaging in professional development activities and for modeling ethical responsibilities using ICTs in the specified subject areas</i> <i>Evaluate the appropriateness of the approaches for their target learners</i>	<i>Demonstrate positive attitudes in using approaches developed by others and that assist in engaging in professional development and modeling ethical responsibilities in their subjects using ICTs</i>
Infusing	<i>Explain and criticize the pros and cons of the various approaches used for 1) engaging in professional development and 2) modeling ethical responsibilities in terms of theories of professional development and ethics, appropriateness of ICT tools, content requirements within a subject area and contextual factors</i>	<i>Produce approaches that help to engage in professional development and to model ethical responsibilities using ICTs for their subject areas and target groups</i> <i>Use one's produced professional development and ethical responsibilities approaches for the target group</i> <i>Evaluate the effectiveness and efficiency of one's produced approaches</i>	<i>Appreciate the care and rigor needed in engaging in professional development and in modeling ethical responsibilities for target learners using available ICT tools</i>
Transforming	<i>Master the approaches and techniques that engage in professional development activities and model ethical responsibilities within and across grade levels of a given subject as well as across the institute's/school's curricula using ICTs</i>	<i>Demonstrate creativity in professional development activities and in modeling ethical responsibilities using ICTs in their institutions/schools and beyond</i>	<i>Demonstrate motivation, dedication and sensitivity to engaging in professional development activities and to modeling ethical responsibilities to various target groups using ICTs</i>

Table 7: Competences/Indicators for Standard 6

6. Understand subject matter for use in teaching			
Competencies/Indicators			
Stage	Knowledge	Skills	Attitudes
Emerging	<i>Be aware of the importance of understanding subject matter for use in teaching in the educative processes</i>	<i>Review various approaches that help to understand subject matter for use in teaching</i>	<i>Develop interest in understanding subject matter for use in teaching in the educative processes</i>
	<i>Recognize and describe the approaches to understanding subject matter for use in teaching using ICTs</i>	<i>Use available approaches that are claimed by the authors for understanding subject matter for use in teaching using ICTs in the specified subject areas</i> <i>Evaluate the appropriateness of the approaches for their target learners</i>	<i>Demonstrate positive attitudes in using approaches developed by others and that assist in understanding subject matter for use in teaching in their subjects using ICTs</i>
Applying	<i>Explain and criticize the pros and cons of the various approaches used for understanding subject matter for use in teaching in terms of content theories in the specific subject area, appropriateness of ICT tools, pedagogical approaches within a subject area and contextual factors</i>	<i>Produce approaches that help to understand subject matter for use in teaching using ICTs for their subject areas and target groups</i> <i>Use one's produced understanding subject matter for use in teaching approaches for the target group</i> <i>Evaluate the effectiveness and efficiency of one's produced approaches</i>	<i>Appreciate the care and rigor needed in understanding subject matter for use in teaching for target learners using available ICT tools</i>
	<i>Master the approaches and techniques that engage in understanding subject matter for use in teaching within and across grade levels of a given subject as well as across the institute's/school's curricula using ICTs</i>	<i>Demonstrate creativity in understanding subject matter for teaching using ICTs in their institutions/schools and beyond</i>	<i>Demonstrate motivation, dedication and sensitivity to understanding subject matter for use in teaching to various target groups using ICTs</i>
Transforming			

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Appendices

I. Summary of Broad Standards Developed by RECs' Groups

Stage	Broad standards	Component	Source
Emerging	Teachers using basic ICT tools for lesson preparation, planning, teaching, record keeping, reporting, research Exploring and documenting the possibilities of integrating ICT in materials development Exploring the possibilities of integrating ICT in assessment of learning	Teaching & research Materials development Assessment	SADC_I
	Raising awareness on ICT use to learners, administrators, and individuals outside the school	Consulting others	SADC_II
	Attaining adequate technical skills through training in ICT tools and equipment	Technical skills	
	Facilitating student learning Assessing and reporting students' learning Engaging in professional development Mastery of ETP, curriculum and different educational issues	Student learning Assessment & reporting Professional development Policy, curriculum & educational issues	ECCAS_IGAD_I
	Forming partnership with school community	Partnership	
	ICT-related organization culture Class management	Orientation to technology Management	ECCAS_IGAD_II
	Enhance teaching and facilitate learning Develop curriculum resources and learning materials	Teaching-learning Materials development	ECCAS_IGAD_III
	Educational and didactic training Education, learning and syllabuses Teachers' evaluation Operations and technology concept	Pedagogy Curriculum Assessment Technical skills	ECOWAS_I
	Drafting a training plan Developing ICT competencies Managing teaching situations using ICT Learning assessment Taking advantage of ICT in communication and collaboration situations	Planning Technical skills Teaching environment Assessment Communication and collaboration	ECOWAS_II
	Technology operations and concepts Planning and designing learning environments and experiences Enhancing teaching, learning processes and outcomes Assessment and Evaluation Productivity and professional Ethics Social, ethics, legal and human issues in the use of ICTs	Technical skills Planning & designing Teaching-learning Assessment Ethical issues Ethical issues	ECOWAS_III

Applying

<p>Teaching using a range of ICT tools such as computers, radio, camera, phone, etc</p> <p>Integrating ICT tools in developing teaching and learning support materials</p> <p>Integrating ICTs to enhance assessment of teaching and learning</p>	<p>Use of a range of tools</p> <p>Materials development</p> <p>Assessment</p>	<p>SADC_I</p>
<p>Integrating ICT in the development of teacher support materials to improve classroom practices</p> <p>Enhancing teaching methods using productivity tools</p> <p>Integrating ICT in evaluating learning outcomes</p>	<p>Materials development</p> <p>Use of productivity tools</p> <p>Assessment</p>	<p>SADC_II</p>
<p>Facilitating student learning</p> <p>Assessing and reporting students' learning</p> <p>Engaging in professional development</p> <p>Mastery of ETP, curriculum and different educational issues</p> <p>Forming partnership with school community</p>	<p>Student learning</p> <p>Assessment and reporting</p> <p>Professional development</p> <p>Policy, curriculum & educational issues</p> <p>Partnership</p>	<p>ECCAS_IGAD_I</p>
<p>Involvement of teachers in the use of ICT</p>	<p>Technical skills</p>	<p>ECCAS_IGAD_II</p>
<p>Enhance teaching and facilitate learning</p> <p>Develop curriculum resources and learning materials</p>	<p>Teaching-Learning</p> <p>Materials development</p>	<p>ECCAS_IGAD_III</p>
<p>Educational and didactic training</p> <p>Education, learning and syllabuses</p> <p>Teachers' evaluation</p> <p>Operations and technology concept</p> <p>Social, ethic, legal and human aspects</p>	<p>Pedagogy</p> <p>Curriculum</p> <p>Assessment</p> <p>Technical skills</p> <p>Ethical issues</p>	<p>ECOWAS_I</p>
<p>Drafting a training plan</p> <p>Developing ICT competencies</p> <p>Managing teaching situations using ICT</p> <p>Learning assessment</p> <p>Taking advantage of ICT in communication and collaboration situations</p>	<p>Planning</p> <p>Technical skills</p> <p>Teaching environment</p> <p>Assessment</p> <p>Communication and collaboration</p>	<p>ECOWAS_II</p>
<p>Technology operations and concepts</p> <p>Planning and designing learning environments and experiences</p> <p>Enhancing teaching, learning processes and outcomes</p> <p>Assessment and Evaluation</p> <p>Productivity and professional Ethics</p> <p>Social, ethics, legal and human issues in the use of ICTs</p>	<p>Technical skills</p> <p>Planning & designing</p> <p>Teaching-learning</p> <p>Assessment</p> <p>Ethical issues</p> <p>Ethical issues</p>	<p>ECOWAS_III</p>

Infusing

<p>Integrating ICT enhanced learner centered approach in teaching and learning</p> <p>Processing teaching and learning materials to include a wide range of learner centered ICT tools</p> <p>Integrating ICT enhanced learner driven modes of assessment</p>	<p>Learner-centered methods</p> <p>Materials development</p> <p>Assessment</p>	<p>SADC_I</p>
<p>Integrating ICT in the development of curriculum content</p> <p>Improving learner-centered access to pedagogical material using ICT</p> <p>Enhancing teacher professional development using productivity tools</p> <p>Integrating ICT in evaluating learning outcomes</p>	<p>Curriculum content</p> <p>Access to materials</p> <p>Professional development</p> <p>Assessment</p>	<p>SADC_II</p>
<p>Facilitating student learning</p> <p>Assessing and reporting students' learning</p> <p>Engaging in professional development</p> <p>Mastery of ETP, curriculum and different educational issues</p> <p>Forming partnership with school community</p>	<p>Student learning</p> <p>Assessment and reporting</p> <p>Professional development</p> <p>Policy, curriculum & educational issues</p> <p>Partnership</p>	<p>ECCAS_IGAD_I</p>
<p>Implementation of ICT in teaching/learning</p>	<p>Experience</p>	<p>ECCAS_IGAD_II</p>
<p>Enhance teaching and facilitate learning</p> <p>Develop curriculum resources and learning materials</p> <p>Improve the learning assessment quality</p>	<p>Teaching-learning</p> <p>Materials development</p> <p>Assessment</p>	<p>ECCAS_IGAD_III</p>
<p>Educational and didactic training</p> <p>Education, learning and syllabuses</p> <p>Teachers' evaluation</p> <p>Operations and technology concept</p> <p>Social, ethic, legal and human aspects</p>	<p>Pedagogy</p> <p>Curriculum</p> <p>Assessment</p> <p>Technical skills</p> <p>Ethical issues</p>	<p>ECOWAS_I</p>
<p>Drafting a training plan</p> <p>Developing ICT competencies</p> <p>Managing teaching situations using ICT</p> <p>Learning assessment</p> <p>Taking advantage of ICT in communication and collaboration situations</p>	<p>Planning</p> <p>Technical skills</p> <p>Teaching environment</p> <p>Assessment</p> <p>Communication and collaboration</p>	<p>ECOWAS_II</p>
<p>Technology operations and concepts</p> <p>Planning and designing learning environments and experiences</p> <p>Enhancing teaching, learning processes and outcomes</p> <p>Assessment and Evaluation</p> <p>Productivity and professional Ethics</p> <p>Social, ethics, legal and human issues in the use of ICTs</p>	<p>Technical skills</p> <p>Planning & designing</p> <p>Teaching-learning</p> <p>Assessment</p> <p>Ethical issues</p> <p>Ethical issues</p>	<p>ECOWAS_III</p>

Transforming

<p>Integrating ICT in the overall teaching and learning development plan Integrating contemporary and up to date learning materials Enhancing network based-continuous assessment</p>	<p>Planning & designing Up-to-date materials Assessment</p>	<p>SADC_I</p>
<p>Institute is a center of specialization promoting ICT integrated pedagogical learning environment</p>	<p>Center of excellence</p>	<p>SADC_II</p>
<p>Facilitating student learning Assessing and reporting students' learning Engaging in professional development Mastery of ETP, curriculum and different educational issues Forming partnership with school community</p>	<p>Student learning Assessment and reporting Professional development Policy, curriculum & educational issues Partnership</p>	<p>ECCAS_IGAD_I</p>
<p>Approval of ICT expertise by teachers Assessment of learning with ICT</p>	<p>Specialization Assessment</p>	<p>ECCAS_IGAD_II</p>
<p>Enhance teaching and facilitate learning Develop curriculum resources and learning materials</p>	<p>Teaching-learning Materials development</p>	<p>ECCAS_IGAD_III</p>
<p>Educational and didactic training Education, learning and syllabuses Teachers' evaluation Operations and technology concept Social, ethic, legal and human aspects</p>	<p>Pedagogy Curriculum Assessment Technical skills Ethical issues</p>	<p>ECOWAS_I</p>
<p>Drafting a training plan Developing ICT competencies Managing teaching situations using ICT Learning assessment Taking advantage of ICT in communication and collaboration situations</p>	<p>Planning Technical skills Teaching environment Assessment Communication and collaboration</p>	<p>ECOWAS_II</p>
<p>Technology operations and concepts Planning and designing learning environments and experiences Enhancing teaching, learning processes and outcomes Assessment and Evaluation Productivity and professional Ethics Social, ethics, legal and human issues in the use of ICTs</p>	<p>Technical skills Planning & designing Teaching-learning Assessment Ethical issues Ethical issues</p>	<p>ECOWAS_III</p>

II. Standards and Competences Developed by RECs' Groups

ECOWAS I

Stage	Broad standards	Characteristics of the stage	Competencies/Indicators		
			Knowledge	Skills	Attitudes
Emerging	1. Educational and didactic training	Encouraging and promoting initiatives	Informal learning - Lack of computer skills		Individual and private initiatives
	2. Education, learning and syllabuses	Acquisition of equipment, material and financial resources		Search for a working station, software - Purchase of computer tools	
	3. Teachers' evaluation	Learning and pedagogy	Acquisition of computer and Internet basics	Use of word processing software	Compliance with maintenance and safety instructions
	4. Operations and technology concept				
Applying	1. Educational and didactic training	Drafting of projects integrating ICT		Planning (need, cost assessment, mobilization of resources)	
	2. Education, learning and syllabuses			Acquisition of appropriate computer rooms - Acquisition of computer tools and presentation software, calculation software, ICT software, Connection to Internet	
	3. Teachers' evaluation	Learning and pedagogy	Illustration of courses through multimedia materials	Use of multimedia materials in courses	Management of the computer room and the equipment
	4. Operations and technology concept	Community involvement		Search for donations and contributions from Associations, NGO, Projets,... Information/ Awareness raising/ request of action from educational communities and partners	
	5. Social, ethic, legal and human aspects	Professional development	Acquisition of Knowledge through ICT training		

Infusing	1. Educational and didactic training	Commitment of the school administration and the communities supporting the use of ICT	Ownership of the new forms of teaching/ learning based on ICT	Implementation of a new form of teaching	Adaptation of new skills as with regards to ICT
	2. Education, learning and syllabuses	Acquisition of equipment, material and financial resources			
	3. Teachers' evaluation	Curriculum review taking into account ICT in the setting up of training			
	4. Operations and technology concept	Community involvement Professional development			
	5. Social, ethic, legal and human aspects	Development plan and policy Evaluation	Drafting and setting up of action plans including ICT		
Transforming	1. Educational and didactic training	Vision / Perception			
	2. Education, learning and syllabuses	Acquisition of equipment, material and financial resources			
	3. Teachers' evaluation	Learning and pedagogy			
	4. Operations and technology concept	Community involvement			
	5. Social, ethic, legal and human aspects	Professional development Development plan and policy evaluation			

ECOWAS II

Stage	Broad standards	Characteristics of the stage	Competencies/indicators		
			knowledge	Skills	Attitudes
Emerging	Drafting a training plan	<ul style="list-style-type: none"> - lack of equipment - lack of teacher training in ICT - lack of policy 	<ul style="list-style-type: none"> - identify teachers' needs, constraints, characteristics and skills regarding ICT 	<ul style="list-style-type: none"> - planning 	<ul style="list-style-type: none"> - readiness to change
	Developing ICT competencies	<ul style="list-style-type: none"> - lack of equipment - lack teacher training in ICT - lack of policy 	<ul style="list-style-type: none"> - Acquire a computer working environment 	<ul style="list-style-type: none"> - determine the ICT used in he designing process - develop, produce, process, use data 	II
	Managing teaching situations using ICT	<ul style="list-style-type: none"> - lack of equipment - lack teacher training in ICT - lack of policy 	<ul style="list-style-type: none"> - identification of computer resources 	<ul style="list-style-type: none"> - implement teaching – learning situations 	<ul style="list-style-type: none"> - adaptation capacity and sense of initiative
	Learning assessment	<ul style="list-style-type: none"> - lack of equipment - lack teacher training in ICT - lack of policy - lack of a framework 	<ul style="list-style-type: none"> - identification of assessment fields 	<ul style="list-style-type: none"> - development of assessment instruments in one's learning 	II
	Taking advantage of ICT in communication and collaboration situations	<ul style="list-style-type: none"> - lack of equipment - lack teacher training in ICT - lack of policy - lack of a framework 	<ul style="list-style-type: none"> - identify communication and collaboration situations in order enhance the learning and support motivation 	<ul style="list-style-type: none"> - Determine the psycho-pedagogical and teaching opportunities - integrate communication tools in one's pedagogical strategies - urge and organize participation - take action in order to help establishing an adequate socio-affective environment 	II

Applying	Drafting a training plan	<ul style="list-style-type: none"> - Defined policy - Establishment of computer infrastructures and equipment - ICT use in administration - training on ICT applications 	<ul style="list-style-type: none"> - analyze teachers' needs, constraints, characteristics and skills regarding ICT 	<ul style="list-style-type: none"> - develop ICT-related resources and equipment - use adapted software 	II
	Developing ICT competencies	<ul style="list-style-type: none"> - defined policy - establishment of computer infrastructures and equipment - ICT use in administration - training on ICT applications 	<ul style="list-style-type: none"> - Develop ownership of computer applications 	<ul style="list-style-type: none"> - use applications in one's teaching 	II
	Managing teaching situations using ICT	<ul style="list-style-type: none"> - defined policy - setting up of computer infrastructures and equipment - ICT use in administration - training on ICT applications 	<ul style="list-style-type: none"> - Develop ownership of computer applications 	<ul style="list-style-type: none"> - Implement the learning framework and disseminate resources 	II
	Learning assessment	<ul style="list-style-type: none"> - defined policy - setting up of computer infrastructures and equipment - ICT use in administration - training on ICT applications 	<ul style="list-style-type: none"> - Develop ownership of teaching assessment applications 	<ul style="list-style-type: none"> - Use assessment tools through ICT 	II
	Taking advantage of ICT in communication and collaboration situations	<ul style="list-style-type: none"> - defined policy - setting up of computer infrastructures and equipment - ICT use in administration - training on ICT applications 	<ul style="list-style-type: none"> - Design communication and collaboration situations in order to enhance the learning and support motivation 	<ul style="list-style-type: none"> - choose appropriate tools for one's teaching objectives 	II

Infusing	Drafting a training plan	<ul style="list-style-type: none"> - defined orientation - setting up of computer infrastructures and equipment - ICT use in administration - required qualifications for ICT applications 		<ul style="list-style-type: none"> - integrate ICT resources in a teaching framework 	II
	Developing ICT competencies	<ul style="list-style-type: none"> - defined orientation - setting up of computer infrastructures and equipment - ICT use in administration - required qualifications for ICT applications 	<ul style="list-style-type: none"> - Develop ownership of ICT didactics 	Integrate ICT in teaching - learning	II
	Managing teaching situations using ICT	<ul style="list-style-type: none"> - defined policy - setting up of computer infrastructures and equipment - ICT use in administration - training on ICT applications 		<ul style="list-style-type: none"> - apply ICT didactics - integration of ICT in teaching syllabuses 	II
	Learning assessment	<ul style="list-style-type: none"> - defined orientation - setting up of computer infrastructures and equipment - ICT use in administration - required qualifications for ICT applications 			II
	Taking advantage of ICT in communication and collaboration situations	<ul style="list-style-type: none"> - defined orientation - setting up of computer infrastructures and equipment - ICT use in administration - required qualifications for ICT applications 			II
Transforming	Drafting a training plan	<ul style="list-style-type: none"> - ICT are part of the overall development program of training institutions - a learning community 			
	Developing ICT competencies	<ul style="list-style-type: none"> - ICT are part of the overall development program of training institutions - a learning community 	<ul style="list-style-type: none"> - Designing of teaching – learning situations 	<ul style="list-style-type: none"> - develop applications 	
	Managing teaching situations using ICT	<ul style="list-style-type: none"> - ICT are part of the overall development program of training institutions - a learning community 			
	Learning assessment	<ul style="list-style-type: none"> - ICT are part of the overall development program of training institutions - a learning community 			
	Taking advantage of ICT in communication and collaboration situations	<ul style="list-style-type: none"> - ICT are part of the overall development program of training institutions - a learning community 			

ECOWAS III

Stage	Broad standards	Characteristics of the stage	Competencies/indicators		
			knowledge	Skills	Attitudes
Emerging	1. Technology Operations and concepts	Presentation and discussion of issues using technology as a medium.	Technology can present abstract concepts in a vivid manner	Switching on of radio, television , phone and computer	Respect for & Tolerance of others views , Teamwork
	2. Planning and designing Learning environments and experiences	Technologies are not an end in themselves but a means to end. Technology assists in planning and designing for efficient teaching and learning.	Recognition of the significance for Planning. Appreciation of learning needs	Planning skills. Basic computing skills-word processing, spreadsheet etc	Dedication , sensitivity and caring for different learning needs
	3. Enhancing Teaching, Learning processes and outcomes	Identify, plan and locate ICT resources. Guiding students to access and use simple digital resources. Eg slides, video, films	Content of syllabus, Knowledge of current technologies to facilitate teaching and learning	Manipulation of assistive technologies. Preparation of digital resources. Planning skills for instructional delivery.	Support for students achievement. Appreciation of membership of professional body
	4. Assessment and Evaluation	Value of self, peer and instructor assessment.	Use of technology to design assessment instruments	Use of ICTs for designing of assessment instruments and portfolios. Analysis of data (using spreadsheets) to improve learning.	Appreciation of scope of performance
	5. Productivity and Professional Ethics	Scholarly productivity and research are subject to dramatic change in the advent and dynamics of technology.	Concept that knowledge grows. Use of technology increases knowledge base Awareness that knowledge get outdated with time. Acknowledge ideas of others that are quoted.	Use of technologies to improve efficiency as well as time and cost savings.	Respect for divergent views. Humility
	6. Social, Ethics, Legal and Human Issues in the use of ICTs	Access to common knowledge sources leading to cybercrime, piracy, health risks etc. Access to common knowledge sources leading to cybercrime, piracy, health risks etc.	Knowledge about Cybercrime, software piracy & security, viruses, health risks.	Use of anti-viruses, passwords, Determination of Ergonomically suitable furniture. (<i>Comfortable seating arrangements</i>)	Enthusiasm and willingness to take risks in the application of technology. Respect acknowledgement of others' ideas.

Applying

1. Technology Operations and concepts	Taking pictures using cameras and recording sounds to illustrate concepts. Transmission of ICT skills and technical knowledge. Taking pictures using cameras and recording sounds to illustrate concepts. Transmission of ICT skills and technical knowledge.	Technology can present abstract concepts in a lively and vivid manner	Keyboarding, basic word processing, analysis with spreadsheet and presentation skills	Teamwork , appreciation of individual skills
2. Planning and designing Learning environments and experiences	Development of ICT policies and operational and deployment plans Centralisation of the use of ICT resources	Recognition of the significance for planning. Learning needs of students	Policy development Basic Networking & Planning skills. Basic computing skills-word processing, spreadsheet etc	Sensitivity and caring for different learning needs
3. Enhancing Teaching, Learning processes and outcomes	Identify, plan and locate ICT resources. Instruction supplemented with electronic slide presentations and word processed handouts A few ICT tools made available to students.	Content of syllabus, Knowledge of current technologies to facilitate teaching and learning.	Use of appropriate technologies to support instruction Use of CD-ROM based digital educational and research resources Planning skills for instructional delivery	Motivation of students to use ICT resources.
4. Assessment and Evaluation	Student Assessment records shared and moderated by staff using ICT tools.	Use of technology to design and administer assessment instruments.	Assessing data on network. Collaboration. Analysis of data for evaluation of learning. Designing assessment instruments and portfolios using ICTs	Inner satisfaction with performance level.
5. Productivity and Professional Ethics	Scholarly productivity and research are subject to dramatic change in the advent of technology. Focus is on development and transmission of ICT skills and knowledge.	Knowledge gets outdated with time. Use of technology increases knowledge base. Basic knowledge on Plagiarism & Intellectual Property laws.	Use of technologies for enhancement of management efficiency as well as time and cost savings.	Sharing with others Respect for divergent views and Humility
6. Social, Ethics, Legal and Human Issues in the use of ICTs	Access to common knowledge sources leading to cybercrime, piracy, health risks etc. Support of community members with ICT background sought to address curriculum issues arising.	Dangers about Cybercrime software piracy & security, viruses, Ergonomics & health risks. Basic knowledge on Plagiarism & Intellectual Property laws.	Scanning with anti-viruses, Use of firewalls and passwords,	Respect & acknowledgement of ideas and culture of others. Enthusiasm and willingness to take risks in the application of technology.

Infusing

1. Technology Operations and concepts	Deliver presentations with still or moving pictures and build and analyse data from a database.	Technology can bring home abstract and distant resources for better comprehension	Enhanced manipulative skills if the use of diverse ICT tools,	Respect for expertise of others. High degree of tolerance for views of others, Teamwork,
2. Planning and designing Learning environments and experiences	Development of digital content. Well designed teaching & learning environment using ICTs.	Planning to promote equitable access to educational facilities. Learning needs differ	Planning skills. Computing skills- word processing including web authoring, spreadsheet, presentation etc	Dedication, sensitivity and caring for different learning needs
3. Enhancing Teaching, Learning processes and outcomes	Teachers develop digital content for instruction in different subjects. New ways explored to impact positively on personal teacher productivity and professional practice	Content of syllabus and other learning experiences. Knowledge of current technologies to facilitate teaching and learning.	Manipulation of assistive technologies. Preparation of digital resources using web authoring, animations etc. Planning & Research skills for instructional delivery including use of search engines and analysis tools.	Motivation of students engaged in collaborative learning and projects.
4. Assessment and Evaluation	Using ICT facilities to build work portfolios for assessment	Use of technology to evaluate student, staff and management performance	Use of ICT-based assessment instruments and portfolios. Assessing data on network. Collaboration. Analysis of data for evaluation of learning.	Sharing of results of assessment and evaluation.
5. Productivity and Professional Ethics	Scholarly productivity and research are subject to dramatic change in the advent of technology. Innovative ways explored to enhance productivity and professional practice using ICT.	Knowledge is dynamic. Basic knowledge on Plagiarism & Intellectual Property laws.	Application and Analytical skills	Sharing of research findings. Respect Humility.
6. Social, Ethics, Legal and Human Issues in the use of ICTs	Access to common knowledge sources leading to cybercrime, piracy, health risks etc. Support of community members with ICT background sought to address curriculum issues arising.	Dangers about Cybercrime software piracy & security, viruses, Ergonomics & health risks. Basic knowledge on Plagiarism & Intellectual Property laws.	Scanning with anti-viruses, Use of firewalls and passwords	Willingness to take risks in the application of technology. Readiness to address social challenges with research findings.

Transforming

1. Technology Operations and concepts	Modelling tools, expert system, semantic networking and web-tools identified . Communicate ideas in full multimedia format and operating ICT tools with relative ease.	Technology can bring home abstract and distant resources for better comprehension	Enhanced manipulative skills if the use of diverse ICT tools,	Respect for expertise of others . High degree of tolerance for views of others , Teamwork ,
2. Planning and designing Learning environments and experiences	ICT enabled services applied to support teaching and learning and enhance management efficiency. ICT in Education policy effectively implemented at the institutional level. Opportunities created for staff and students to use ICTs for individual and collaborative work.	Planning to promote equitable access to educational facilities. Learning needs differ.	Planning skills. Computing skills-word processing including web authoring, spreadsheet , presentation etc	Dedication , sensitivity and caring for different learning needs
3. Enhancing Teaching, Learning processes and outcomes	Easy access to ICT tools. Well enhanced teacher mastery of special software/ Learning Management Systems and innovative transformation of teaching and learning. Full integration of ICT in teaching and learning.	Content of syllabus and other learning experiences. Knowledge of current technologies to facilitate teaching and learning.	Manipulation of assistive technologies. Preparation of digital resources using web authoring, animations etc. Planning & Research skills for instructional delivery including use of search engines and analysis tools.	Motivation of students engaged in collaborative learning and projects .
4. Assessment and Evaluation	Moderated Peer/Teacher assessment of student work portfolio is maintained on a network. Effective use of School Management Software	Use of technology to evaluate student , staff and management performance.	Use of ICT-based assessment instruments and portfolios . Assessing data on network. Collaboration. Analysis of data for evaluation of learning.	Sharing of results of assessment and evaluation.
5. Productivity and Professional Ethics	Scholarly productivity and research are subject to dramatic change in the advent of technology. Teachers accept role as co-learners with students and committed to professional development as a life-long and critically reflective process.	Knowledge is dynamic. Basic knowledge on Plagiarism, Intellectual Property & Patent laws.	Skills for Analysis, Synthesis and Evaluation. Development of digital resources for learning and management.	Zeal for new knowledge Sharing of research findings. Respect & Humility.
6. Social, Ethics, Legal and Human Issues in the use of ICTs	Access to common knowledge sources leading to cybercrime, piracy, health risks etc. Support of community members with ICT background sought to address curriculum issues arising. Community is part of institution and vice versa in the use of ICTs.	Dangers about Cybercrime software piracy & security, viruses, Ergonomics & health risks. Basic knowledge on Plagiarism & Intellectual Property laws. Innovativeness and creativity.	Back-up & encryption skills. Scanning with anti-viruses, Use of firewalls and passwords	Willingness to take risks in the application of technology. Readiness to address social challenges with research findings. Self-reliant

SADC I

Stage	Broad standards	Characteristics of the stage	Competencies/indicators		
			knowledge	Skills	Attitudes
Emerging	1. Teachers using basic ICT tools for lesson preparation, planning, teaching, record keeping, reporting, research <i>Note: With electronic lesson plan, the teacher is able to adapt or modify according to new needs / able to store the information for future use and so saves time and improves efficiency</i>	1. Displaying basic competencies for lesson preparation, planning, teaching, record keeping, reporting, research in use of ICT tools eg computers, radio, camera, phone 2. Teacher has confidence to handle computers, radio, camera, phone {as appropriate} to enhance teaching and learning practices	1. Identifying the tools, parts and their functions 2. Differentiating between hardware and software	1. Ability to boot and shut down properly 2. Ability to access and use the right software for a specified teaching and learning task	1. Having interest in using ICT tools 2. Frequent use of ICT tools, 3. Showing curiosity, being inquisitive
	1. Exploring and documenting the possibilities of integrating ICT in materials development	1. ICT tools available and accessible for materials development	1. Identify and explain the different software and hardware	Differentiation of software and hardware	Having interest in using ICT tools for developing materials i.e. prioritizing in budgets
	3. Exploring the possibilities of integrating ICT in assessment of learning	Recognition of ICT enhanced assessment tools	Assessing what they know on ICT tools	1. What capabilities they have on ICT 2. Are they economical budgeting and purchasing	Assessing individual interest, curiosity in ICT
Applying	1. Teaching using a range of ICT tools such as computers, radio, camera, phone, etc	1. Teachers applying appropriate software within discreet subjects e.g., power point 2. ICT application training for subject teachers by ICT specialist	Teacher prepares lessons using appropriate software and mobilizes appropriate tools efficiently	ICT specialist exists who teaches ICT as a separate, specialist subject	Appreciation and valuing the role of ICT enhanced teaching and learning
	2. Integrating ICT tools in developing teaching and learning support materials	ICT enhanced development of teaching and learning support materials	Teachers identifying appropriate ICTs in developing teaching and learning materials	Demonstrable ability to create teaching and learning materials using ICTs	Showing appreciation of integrating ICTs in materials preparation
	3. Integrating ICTs to enhance assessment of teaching and learning	Teaching and learning assessment methods that are ICT compliant	Teacher selects and uses appropriate software to assess teaching and learning	Teachers show ability to choose and apply appropriate ICT tools in assessment of teaching and learning	1. Showing willingness and interest to use ICT tools in assessment 2. Showing innovation to integrate ICT tools in assessment

Infusing	1. Integrating ICT enhanced learner centered approach in teaching and learning	Availability of a wide range of appropriate ICT tools to choose from	Teacher facilitates identification and use of appropriate ICT tools by learners to enhance learning	Teacher displays ability to incorporate ICT enhanced learner centered approaches eg web quest for students	1. Open minded in terms of contributions from learners on ICT enhanced activities, responsiveness 2. Teacher's interest to use web quest / internet to carry out research on a computer
	2. Processing teaching and learning materials to include a wide range of learner centered ICT tools	Use of specific content rich software programmes and on-line learning tools	Teacher identify multimedia technology relevant for teaching and learning materials	Teacher demonstrates ability in developing multimodal rich resources to stimulate learner senses	Valuing creativity through innovations
	3. Integrating ICT enhanced learner driven modes of assessment	Varied cross curricular assessment methods to include students' self assessment portfolios, journals, {multidisciplinary / transdisciplinary}	Teacher Identifies, plans, negotiates and locates ICT based assessment tools that are learner centered to other assessment methods	Capability to design and adapt relevant ICT enhanced learner centered assessment tools	Teacher values and respects ICT enhanced learner driven assessment modes
Transforming	1. Integrating ICT in the overall teaching and learning development plan	ICT enhanced teaching and learning is accepted by the entire learning networked-centered community	Teacher facilitates ICT enhanced teaching and learning throughout the entire community	1. Teacher guides learners to think critically about ICT enhanced learning processes and activities 2. Teacher facilitates sharing of expertise within the community of learning	Teacher values sharing of ICT enhanced learning expertise within the community of practice
	2. Integrating contemporary and up to date learning materials	contemporary or latest technology is a core aspect of teaching learning materials development	Awareness and ability to identify and describe the latest technologies	Teacher shows ability to collaborate with learners in designing and using contemporary technologies	Teacher shows interest and willingness to work with learners and the community in designing and using of contemporary technologies
	3. Enhancing network based-continuous assessment	1. ICT is integrated in learner centered continuous assessment 2. Peers and the community actively involved in assessment	Exchange of electronic portfolios or non electronic ones to facilitate reflection as a way of peer assessment	Demonstrating competence in ICT enhanced peer assessment	Valuing learner centered ICT enhanced peer assessment

For all these things to happen, there is need to have a budget for capitalization and maintenance and personnel

SADC II

Stage	Broad standards	Characteristics of the stage	Competencies/indicators		
			knowledge	Skills	Attitudes
Emerging	1. Raising awareness on ICT use to learners, administrators, and individuals outside the school	<ol style="list-style-type: none"> 1. Developing an institutional ICT training plan focusing on technical skills training 2. Demonstrate benefits of ICT in education 3. Self initiative in learning and accessing ICT equipment and tools 	<ol style="list-style-type: none"> 1. Lesson plans, reports, requests / proposals reflect awareness of ICT importance 2. Understanding social , legal, ethical implications 	1. Basic appreciation and operation of ICT	1. Embracing change to technology
	2. Attaining adequate technical skills through training in ICT tools and equipment	1. Assessment of training outcomes	1. Increased knowledge in the use of ICT	1. Ability to use ICT in lessons preparation	1. Positive response to change arising from use of ICTs
Applying	1. Integrating ICT in the development of teacher support materials to improve classroom practices.	<ol style="list-style-type: none"> 1. Teachers are able to use ICT in delivery of their subjects 2. Teachers are able to use video clips, television sets, radios in classroom presentation; 	1. Demonstrable understanding of effective application of diverse ICT tools in preparing pedagogical materials	Expertise in using diverse ICT tools in preparation of classroom materials	1. positive attitude in utilising ICT resources for preparing classroom materials visible
	2. Enhancing teaching methods using productivity tools.	<ol style="list-style-type: none"> 1. Teachers giving exercises to learners that utilize ICTs e.g. using word-processing to prepare notes and PowerPoint for presentation and giving hand-outs to learners; 2. Using video material to elicit classroom discussion 	Demonstrable understanding of the functions of office automated software in teaching methods	<ol style="list-style-type: none"> 1. Expertise in using diverse ICT tools in delivery of pedagogical content; 2. ability to use ICT in designing tasks based on pedagogical principles 	1. positive attitude in utilising ICT resources for pedagogical delivery
	3. Integrating ICT in evaluating learning outcomes	<ol style="list-style-type: none"> 1 Preparing assessment material using software such as word processing and spreadsheets 2. capturing assessment scores and other related scholastic records using database and spreadsheet software 	<ol style="list-style-type: none"> 1. Demonstrable understanding in preparing assessment material using office automated software 2. Demonstrable understanding of keeping scholastic records using office automated software 	<ol style="list-style-type: none"> 1. Expertise in using office automated software in preparing assessment material; 2. Ability to use ICT in keeping scholastic records 	1. positive attitude in utilising ICT resources for student record keeping

Infusing	1. Integrating ICT in the development of curriculum content	<ol style="list-style-type: none"> 1. Institution provides ICT resources and infrastructure to enhance content production from multiple sources; 2. Networking with external institutions having ICT based resources to enhance classroom practices and content development 3. The available software is constantly appraise to ensure consistency with curriculum requirements 4. Teachers integrate ICT in development of teaching materials to improve classroom practices. 5. Curriculum guides and instructional materials reflect that ICT 6. Institutional development plan, policies and budget Integrate ICT 	<p>Teachers understand the function and operation of the available ICT facilities and resources in preparing, delivering and assessing learners performance;</p> <p>Libraries contain both paper and web based pedagogical materials;</p>	<p>Ability to use ICT to review curriculum,</p> <p>Ability to Network with external institutions</p> <p>Ability to appraise software regularly to be consistent with curriculum requirements</p> <p>Ability to infuse ICT in development of teaching materials</p> <p>Ability to use Curriculum guides and instructional materials that reflect ICT</p>	Willingness to use
	2. Improving learner-centered access to pedagogical material using ICT	<p>Learners access pedagogical content from both institute based and external sources (online , libraries other institutions' websites) and teachers,</p> <p>Learners undertake projects utilizing ICT skill in addressing real life situations</p>			
	3. Enhancing teacher professional development using productivity tools.	institute based ICT program for teachers continuous professional development that supports cross curricula collaborative subject synergy is in place			
	4. Integrating ICT in evaluating learning outcomes	<ol style="list-style-type: none"> 1. Teachers and students take responsibility in management of scholastic assessment using ICT; 2. Learners use ICT to for self assessment and evaluation 			
Transforming	Institute is a center of specialization promoting ICT integrated pedagogical learning environment	<ol style="list-style-type: none"> 1. Evolution of teachers and learner ICT competences ; 2. Learner centered Curriculum integrating real world challenges in subject areas; 3.Learners and teachers are creative in developing simulation models to address local community challenges; 4. Promote institutional research as well as solving community issues 5. Institution acts as a learning hub with well resourced ICT tools and infrastructure; 6.Institutional development plan, policies and budget Integrate ICT 		<ol style="list-style-type: none"> 1. Ability to practice acquired knowledge and skills in ICT in solving real life problems 	Readiness of political will to support ICT in education

ECCAS-IGAD I

Stage	Broad standards	Characteristics of the stage	Competencies/Indicators		
			Knowledge	Skills	Attitudes
Emerging	1. Facilitating Student learning		<ul style="list-style-type: none"> • Knowledge of the subject matter. • Knowledge of pedagogy. • Understanding of ICT materials to deliver the subject. • Document students' learning needs. • Knowledge of ICT based Planning of student learning. 	<ul style="list-style-type: none"> • Identify multi media learning. • Planning and design learner center instruction. 	<ul style="list-style-type: none"> • Appreciate ICT based learner center methodology.
	2. Assessing and reporting students' learning		<ul style="list-style-type: none"> • Understanding of different assessment tools. • Understanding of use of ICT for assessment. 	<ul style="list-style-type: none"> • Identify assessment tools. • Identifying ICT based continuous assessment tools. (e.g tests and exams) 	<ul style="list-style-type: none"> • Appreciate ICT based assessment tools
	3. Engaging in professional development.		<ul style="list-style-type: none"> • Sensitized on the importance of CPD. 	<ul style="list-style-type: none"> • Using iCT to understand and implement educational reforms 	<ul style="list-style-type: none"> • Appreciate the importance of CPD.
	4. Mastery of ETP, curriculum and different educational issues.		<ul style="list-style-type: none"> • Understanding of the educational policies. • Understand of the curriculum. • Understanding of pedagogy. 	<ul style="list-style-type: none"> • Identifying ICT materials to enhance curriculum development. 	<ul style="list-style-type: none"> • Appreciate Education & training policy and curriculum
	5. Forming partnership with school community		<ul style="list-style-type: none"> • Understand of the involvement of parents and communities in the education. 	<ul style="list-style-type: none"> • Communities apply the best design of ICT programs which facilitate learning. 	<ul style="list-style-type: none"> • Parents and communities appreciate ICT based learning

Applying

1. Facilitating Student learning		<ul style="list-style-type: none"> • Coverage of curriculum content. • Planning of ICT based student learning. 	<ul style="list-style-type: none"> • Improving the teaching learning process using ICT (word process, PPT, etc.) • Preparing instructional materials & using appropriate media. 	<ul style="list-style-type: none"> • Accept to implement ICT based curriculum
2. Assessing and reporting students' learning		<ul style="list-style-type: none"> • Use ICT resources to collect, analyze, interpret and communicate findings. 	<ul style="list-style-type: none"> • Applying ICT to facilitate a Variety of assessment and evaluation strategies. • Using ICT materials to report students' learning. 	<ul style="list-style-type: none"> • Stimulate learners to use ICT materials.
3. Engaging in professional development.			<ul style="list-style-type: none"> • To address educational issues using ICT. • Prepare ICT focused training Materials. 	<ul style="list-style-type: none"> • High regular attendance in CPD program. • Active participation in CPD.
4. Mastery of ETP, curriculum and different educational issues.		<ul style="list-style-type: none"> • Use of ICT materials for school based curriculum development 	<ul style="list-style-type: none"> • Interpretation of curriculum for implementation 	
5. Forming partnership with school community		<ul style="list-style-type: none"> • Involve parents and communities in a problem solving using ICT tools. 	<ul style="list-style-type: none"> • Parents and communities actively participation in ICT based learning. • Analyze and apply the best media for children. • The government has given due attention to ICT based learning. • The government applies good ICT tools. 	<ul style="list-style-type: none"> • Parents Stimulates their children to choose appropriate ICT materials for their learning.

Infusing	1. Facilitating Student learning		<ul style="list-style-type: none"> Understanding how and when to use ICT to facilitate student's learning. 	<ul style="list-style-type: none"> Using ICT in all aspects of teaching & learning process. Integrating ICT across various subjects in the curriculum Using a range of teaching styles. 	<ul style="list-style-type: none"> Being active and creative in stimulating and managing the learning process
	2. Assessing and reporting students' learning		<ul style="list-style-type: none"> Knowing what is to be assessed. When to assess using ICT. 	<ul style="list-style-type: none"> Assessing students' learning using ICT becomes day to day life of a teacher. 	<ul style="list-style-type: none"> Report on time students' learning using ICT.
	3. Engaging in professional development.			<ul style="list-style-type: none"> To address educational issues using ICT 	
	4. Mastery of ETP, curriculum and different educational issues.		<ul style="list-style-type: none"> Understanding how and when to use ICT to facilitate school based curriculum 	<ul style="list-style-type: none"> Developing soft ware & ICT tools to master curriculum 	
	5. Forming partnership with school community				
Transforming	1. Facilitating Student learning			<ul style="list-style-type: none"> Using ICT in day to day activity of teaching and learning process. 	<ul style="list-style-type: none"> Applying ICT as day to day life/ activities.
	2. Assessing and reporting students' learning			<ul style="list-style-type: none"> Extend ICT service to communities for better life. 	<ul style="list-style-type: none"> Positive attitude to extend ICT service to communities for better life. Community problem solving
	3. Engaging in professional development.			<ul style="list-style-type: none"> Specializing the use of ICT tools to create an innovative learning environment Using ICT to evaluate self performance. Using ICT to develop school based curriculum materials 	
	4. Mastery of ETP, curriculum and different educational issues.				
	5. Forming partnership with school community				

ECCAS-IGAD II

Stage	Broad standards	Characteristics of the stage	Competencies/indicators		
			Knowledge	Skills	Attitudes
Emerging	ICT-related organization culture	Use of ICT by a greater number of teachers	Awareness of teachers on ICT use	Capacity in identifying ICT-based tools	Enthusiasm toward ICT usage-based activities
	Class management	<ul style="list-style-type: none"> - Multi-grade classes - Large classes - Double flow (Shift classes) 	<ul style="list-style-type: none"> - Grasp the teaching process, progress, curricula - Grasp the management methods for large groups - Rationally manage the learning time 	Capacity in handling ICT basic tools such as VCD, tape-recorder, etc.)	Motivation, hearing, patience, resistance, enthusiasm, leadership in teaching
Applying	Involvement of teachers in the use of ICT	Interest in ICT training and in other ICT tools required for the teaching/learning	Knowledge of ICT basic materials and of other ICT tools required for the teaching/ learning	Use of ICT basic tools and other ICT tools required for the teaching/ learning	<ul style="list-style-type: none"> - Adaptation to the training environment - Network-based communication - Enthusiasm - Leadership
Infusing	Implementation of ICT in teaching/ learning	<ul style="list-style-type: none"> - Designing of ICT-related teaching tools - Collaboration of teachers with ICT professional 	<ul style="list-style-type: none"> - Grasp the designing techniques for ICT tools 	<ul style="list-style-type: none"> - Production of teaching resources adapted to the environment - Adaptation of training contents to different contexts using ICT 	<ul style="list-style-type: none"> - Creativeness - Relationship Leadership
Transforming	<p>Approval of ICT expertise by teachers</p> <p>Assessment of learning with ICT</p>	<ul style="list-style-type: none"> - Training environment conducive for ICT practice. - Use of assessment tools compliant with ICT 	<ul style="list-style-type: none"> - Grasp ICT - Adapt training with ICT - Grasp the techniques for the designing of ICT tools 	<ul style="list-style-type: none"> - Development of new ICT-related teaching applications - Capacity in handling assessment tools and instruments 	<ul style="list-style-type: none"> - Motivation of teachers and learners - Learners' success - Open-minded, and creativeness spirit, tact.

ECCAS-IGAD III

Stage	Broad standards	Characteristics of the stage	Competencies/indicators		
			Knowledge	Skills	Attitudes
Emerging	1. Enhance the teaching and facilitate the learning	Teachers are sensitized and motivated on the use of ICT	Knowledge of ICT tools Knowledge of basic software (Word, Excel, PPT)	Be able to use basic functions	Demonstrate interest in the use of ICT Demonstrate intellectual honesty
	2. Develop curriculum resources and learning materials				
Applying	1. Enhance the teaching and facilitate the learning	Teachers use ICT in the teaching/ learning process	Knowledge of ICT tools Knowledge of basic software (Word, Excel, PPT)	Be able to use basic functions	Demonstrate interest in the use of ICT Demonstrate professional ethics
	2. Develop curriculum resources and learning materials	Teachers develop materials using ICT Teachers use ICT to improve the learning	Techniques for designing teaching materials using ICT	Good knowledge of the techniques for designing teaching and learning materials	Demonstrate professional ethics
Infusing	1. Enhance the teaching and facilitate the learning	Teachers integrate the use of ICT in their professional practice	Main software used in ICT Internet and its use for educational purposes	Be able to use the software in order to enhance the teaching and facilitate the learning	Demonstrate interest in the use of ICT and the Internet Demonstrate intellectual honesty
	2. Develop curriculum resources and learning materials	Teachers carry out research in order to develop resources Teachers exchange with others through an educational platform	Internet research and web surfing	Be able to use Internet in order to develop resources	Demonstrate interest in the use of ICT and the Internet
	3. Improve the learning assessment quality	Teachers design assessment tools using ICT	Various assessment tools using ICT	Be able to use software in order to improve the quality of the learning assessment	Demonstrate interest in the use of ICT and the Internet Respect of appraisal ethics rules

Transforming	1. Enhance the teaching and facilitate the learning	<p>Teachers integrate the use of ICT in their professional practice</p> <p>Teachers use ICT to transform their professional environment</p> <p>Move from teacher-centered approaches to student-centered approaches</p>	Learners' characteristics and needs	Adaptation to the new ICT-related environment	Work made easy by the use of ICT
	2. Develop curriculum resources and learning materials	<p>Move from teacher-centered approaches to student-centered approaches</p> <p>Teachers access technologies in a broader and non-restrictive way</p>	Teaching methods and ICT		Broader and non-restrictive access to technologies

III. The Training Manuals

Part I: Conceptual Framework

Development of ICT-enhanced Teacher Standards for Africa (ICTeTSA)

By Temechegn Engida (PhD)

1. Background Information

One of UNESCO's overriding aims is to ensure that all countries, both developed and developing, have access to the best educational facilities necessary to prepare young people to play full roles in modern society and to contribute to a knowledge nation. Maintaining a capacity to advise national governments on the use of technology in schools and, in particular, on the optimal balance, given local circumstances, between ICTs and traditional educational technologies and assisting countries in developing educational software and materials that reflect their own national and regional cultures are key components of the Organization's strategy to achieve the **Education for All** goals.

In line with UNESCO's commitment, the International Institute of Capacity Building for Africa (IICBA) puts the *development of ICTs and Distance Education* in teacher training institutions as its key strategic priorities for the coming four years. With the advent of ICTs and the development of a knowledge-based society, IICBA firmly believes that teacher's role needs to be redefined. To this end, IICBA looks beyond professional teacher development programmes that merely focus on training teachers in the operation of computers and ICT literacy per se but plans to work actively towards enabling African teachers to master ICT as an effective tool to improve teaching and learning and actually integrate their skills in day-to-day classroom instruction.

Back in 1996, UNESCO labelled the situation of teachers around the world a "silent emergency." A decade on, things have not improved much (Gable and Burns, 2005). This is primarily true in Sub-Saharan Africa where there is a serious shortage of qualified teachers and quite a considerable number of children lack access to basic education. There is thus a general consensus that such challenges can not be met without increasing both the supply and quality of teachers through expanding the breadth and depth of pre-service and in-service teacher professional development by using Information and Communication Technologies (ICTs).

The rapid and inexorable movement towards a knowledge society places new demands on the knowledge, skills and competencies of teachers. At the same time, technology development gives rise to newer opportunities and advantages. It should, however, be clear from the outset that the opportunities for ICTs to create new paradigms of teaching and learning will depend largely on leadership and a shared vision, and on appropriate and needs-based continuing professional development.

A survey study (Farrel and Isaacs, 2007) on ICTs and education in 53 African countries in 2007 revealed that there is a great deal of variance in ICT policies for education among the African countries, with the largest group being made up of those countries that are in transition from a sustained period of conflict and economic instability. All of these countries are in Sub-Saharan Africa (SSA) and are among the neediest in terms of development assistance. These SSA countries are looking to ICT applications to help them meet a myriad of challenges – particularly the development of their human resource capacity. Although these countries have developed or are in the process of developing some sort of ICT in education plans/policies, the implementation of these plans remains very dependent on the support of partners from the donor community and the private sector. The survey further indicates the general lack of human resource capacity to provide ICT training and equipment servicing, and also the gap between the availability of ICT infrastructure and the ability of agrarian societies to integrate it to benefit national development. It is also learnt that the capacity of African universities, let alone teacher education institutions, to lead the process of integrating ICTs in education is, to say the least, inadequate. More specifically, most of the teacher training programmes in Africa involve the development of basic ICT skills, sometimes as an end in itself, through one-off, topic-led, short-term training programs that aim to develop specific computer skills of teachers, but which do not necessarily improve teachers professional standards in light of recommended competency frameworks.

One cannot reach the pursuit of distinguishing competent teachers from incompetent ones merely by stipulating that any particular set of standards is the answer. There is a need to identify and develop contextualized teacher and teaching competencies and standards. Professional associations, countries, states, or universities often collaborate within their larger educational community to establish ICT supported teacher standards and guidelines that describe the knowledge, skills, and dispositions teacher candidates are expected to demonstrate upon completion of their teacher education programs. According to the UNESCO's (2002a) planning guide on ICTs in teacher education, these accepted standards not only provide guidance to universities and colleges when developing plans for infusion of technology into their teacher education programs, but also establish a measure of consistency among teacher education programs within a region. Many regions and countries in Europe, the USA, Asia, and Australia have adopted a set of ICT standards for pre-service and in-service teacher education.

Based on the above premises, UNESCO-IICBA (2008) conducted a needs assessment study on ICT standards for African teachers (I-SAT). This study was commissioned by IICBA on behalf of the UN Economic Commission for Africa (UNECA) in the context of ECA's e-Policy Resource Network for Africa.

Target African Countries of ISAT

It was based on 18 representative countries covering the East African, Southern Africa and West African regions. In each region, six representative countries were selected by the steering committee of the project. The countries in the East African region were Ethiopia, Kenya, Mauritius, Sudan, Tanzania, and Uganda. In the West and Central African sub-region the representative countries were Ghana, Ivory Coast, Senegal, Congo, Cameroon, and Benin. In the South African region, the six countries included in the study were Zimbabwe, South Africa, Lesotho, Angola, Malawi, and Mozambique. A lead researcher was assigned to each region but a common research framework and questionnaire was developed to guide each of the researchers.

Assessment Model of ISAT

The study defined a layered model for assessing the type and nature of ICT standards. The **ICT infrastructure standards** are foundational and would be necessary in countries with limited national ICT infrastructure and human capacity. The **ICT curriculum standards** address the quality issues of the ICT courses taught in TTIs and secondary schools. These standards could be the basis for a framework of national or regional ICT certification for ICT teachers. These standards would be especially important because secondary teachers are being trained in universities that develop curricula in an autonomous fashion, and yet there is a need for minimum standards. The **ICT pedagogy** standards will be critical instead for the transformation of teaching and learning using ICT in African countries. The standards would be relevant for teachers of other subjects.

Overall Findings of ISAT

The study found that most of the universities and teacher training institutions (TTIs) in the 18 African countries had started to address the ICT infrastructure issues and had also introduced ICT curriculum standards. However, **few had addressed ICT pedagogy issues** or were even aware of UNESCO work in this area. Teacher standards that integrate ICT are either non-existent or poorly developed to meet the needs and contexts of African countries. It is also found out that African countries within and among the regional communities are at various levels of ICT use in education.

Relevant Recommendations from the I-SAT

1. Use a consultative and participatory method in developing and promoting ICT standards. This would increase awareness and chances of adoption of the standards.
2. Articulate the role of TTIs in the implementation of national ICT policies and strategies at the highest level in the political leadership (e.g., Ministers for Education and Ministers-in-charge of ICT).
3. Involve faculties of education in universities in the development of ICT standards for subjects and for pedagogy. This is because of the increasing role of universities in secondary teacher training in African countries.

4. Develop ICT infrastructure standards for all TTIs and secondary schools. This would ensure that any school or TTI using ICT or teaching ICT has adequate infrastructure.
5. Develop ICT subject standards for TTIs in African countries.
6. Develop ICT pedagogy standards. In addition, introduce ICT pedagogy courses for lecturers or tutors of TTIs, particularly the university-based TTIs in each country.
7. UNESCO-IICBA has to coordinate detailed e-readiness assessment of all TTIs, starting with secondary school TTIs, in all the countries. This would determine the capacity of all the TTIs to implement the ICT curriculum and pedagogy standards.

2. Competency Standards

In recent years, there is an increasing tendency of governments moving from an input mode of financing education to emphasize throughput or process, output and outcomes approaches. More specifically, teacher qualifications and competencies are increasingly being examined and measured as part of the throughput or process. Minimal threshold levels of standards are being established and teachers are increasingly being expected to demonstrate these levels.

Majumdar (2005) conceptualizes competency as a set of attributes covering knowledge, skills and attitudes for enabling one to effectively perform the activities of a given occupation or function to the standards expected in employment. Within the context of ICT in education, competence is broader than the technical skills needed to use ICT. To take a technical view of competence is to deny the plethora of skills needed by teachers to create meaningful and productive learning contexts for learners.

The UNESCO Bangkok document (Majumdar, 2005) describes the type of ICT competence needed by teachers as a collection of knowledge, skills and attitudes that are inextricably bound up with the context and pedagogy. Competence needs to be embedded in teacher practices.

Standards do not imply a prescribed course of study for all teachers across subject areas, nations, and regions. Generally, standards present a set of competencies that each local group of educators can interpret and translate into classroom practice based on their local context, the particular subject being taught, and their vision of ICT in education. While educators throughout Africa share many common goals and beliefs about education, they come from different cultures. These cultures dictate that calls for fuller integration of ICT into education are sensitive to these cultural differences. Change will not occur in the same manner in each nation or within different locations in any one nation. Competency standards, therefore, are often closely tied to local standards for students, so that expected student outcome in a particular field of study implies a set of competencies with ICT that their teachers should possess.

3. Models of ICT Integration in Teacher Education

According to Mehlinger and Powers (2002), there is a need for a model that brings together technology standards, teaching standards, and the teacher education program. It is also necessary that each graduate at all levels of teacher education must meet all requirements of the integration model.

There are several models of integration of ICT in teacher education. Some among these are discussed below.

3.1. Hope College's Technology Integration Model

According to Cherup and Synder (2002), the most important factors in bringing technology integration to fruition in Hope College was that faculty members were encouraged to integrate technology into their current course content rather than attempt to add technology and change the design of the course. This concept of ownership became the Technology Integration Model's biggest selling point. They also recommended that teacher educators should be convinced that they have the power to decide how to integrate the technology standards into their coursework because teacher educators perception that technology will add another requirement to a course already filled with too many requirements will pose a great challenge to the integration process.

Pre-service teacher education programs usually involve three components: content, pedagogy and clinical/teaching practice. The clinical experiences or teaching practices (student teaching) by pre-service teachers should also be designed in such a way that they integrate theory, practice, and technology in meaningful ways.

Based on the above premises, Hope College utilized the following standards to be applied in all components of its teacher education program (Cherup and Synder, 2002):

Standard I: Technology Operations and Concepts

For instance, pre-service teachers can formulate their reasons for choosing a career in teaching in introductory pedagogy courses. Through oral presentations, using a multimedia format, they share their career choices. These presentations challenge them to demonstrate a sound understanding of technology operations and thoughtfully and effectively communicate their ideas. Pre-service teachers can also build on their technology skills as they present projects and deliver presentations using technology in content area courses. These skills are put into practice in the teaching/clinical practice setting (student teaching).

Standard II: Planning and Designing Learning Environments and Experiences

Pre-service teachers, for example, can learn about legislation that requires assistive technology to be considered for students with disabilities. They learn that technology must be used if it allows students with disabilities to do something they could not otherwise accomplish. Pre-service

teachers recognize that assistive technology devices are not stand-alone guarantees of student success but rather are to be used in combination with good pedagogy, a solid knowledge base, and dedicated, caring teaching. They understand the role technology plays in helping students with disabilities learn and they incorporate technology into lesson planning as appropriate. Rapid changes in the school curriculum, as well as the importance of content standards, are fully understood by pre-service teachers.

Standard III: Teaching, Learning and the Curriculum

Teacher educators strive to remain abreast of current technologies and model technology use in a variety of ways, such as Discussion Board, multimedia presentations, Internet resources, digital cameras and digital video cameras, SMART Board, and electronic gradebooks. All faculty members use at least one of these technologies in each class that they teach. For example, course instructors demonstrate electronic gradebooks. Pre-service teachers then are required to use these same technologies, and others, in class assignments and field placement settings. By using these technologies pre-service teachers learn how to streamline their workload. It is expected that these pre-service teachers will be comfortable with, and prepared to use, these technologies in their student teaching placements and later in classrooms of their own.

Standard IV: Assessment and Evaluation

Pre-service teachers learn to value the role of self, peer, and instructor assessment. This process can be facilitated by the use of technology to design assessment instruments and gather and analyze data to improve learning. For instance, electronic portfolios can be used to monitor pre-service teachers' progress as they move through all components of the teacher education program.

Standard V: Productivity and Professional Practice

In developed and most emerging economies, scholarly research changed dramatically with the advent of technology. Current pre-service teachers would find it cumbersome, frustrating, and almost impossible to complete the requirements for teacher certification without using technology. Research no longer consists of going to the library to sign out a book but rather accessing the library online. This has allowed pre-service teachers to access information from around the world and become scholarly educators. Reading professional journals and gathering information for group and individual presentations as well as research papers, begins the process and continues throughout the period of the teacher education program.

Standard VI: Social, Ethical, Legal, and Human Issues

It is important to discuss ethical issues, crime, software piracy, viruses, security, and health risks in using computers. Teacher educators plan for and incorporate these issues into class discussions.

In summary, Cherup and Synder (2002) indicated the essential conditions that were necessary for the model to be functional and effective. Administrative support, access to current hardware and software, a willing education faculty, and professional and technical assistance all came together

to support the creation of the Technology Integration Model. Perhaps the most important aspect of the integration process was the pre-service teachers who were always eager to learn. Without their energy, enthusiasm, and willingness to take risks, the Technology Integration Model would not have succeeded.

3.2. UNESCO's Model of ICT Development in Education

It is to be recalled that UNESCO-IICBA's (2008) needs assessment study on I-SAT found that most of the universities and teacher training institutions (TTIs) in the 18 African countries had started to address the ICT infrastructure issues and had also introduced ICT curriculum standards. However, few had addressed ICT pedagogy issues or were even aware of UNESCO's work in this area. More specifically, IICBA has learnt that teacher standards that integrate ICT are either non-existent or poorly developed to meet the needs and contexts of African countries. It is also found out that African countries within and among the regional communities are at various levels of ICT use in education.

Under such circumstances, Majumdar (2005) argues, it is useful to have a model for ICT development for developing competency standards for teacher development. Such a model can be:

- a representation of the essential characteristics of ICT development to provide a scaffold or a framework
- useful to show the inter-relationship of various components within a system and thus, help to locate its position in the whole framework

For instance, the UNESCO's (2002a) framework for the integration of pedagogy and ICT in teacher education programs, discussed below, can show the major parts and the inter-relationship of these parts.

3.2.1. A Framework for ICTs in Teacher Education

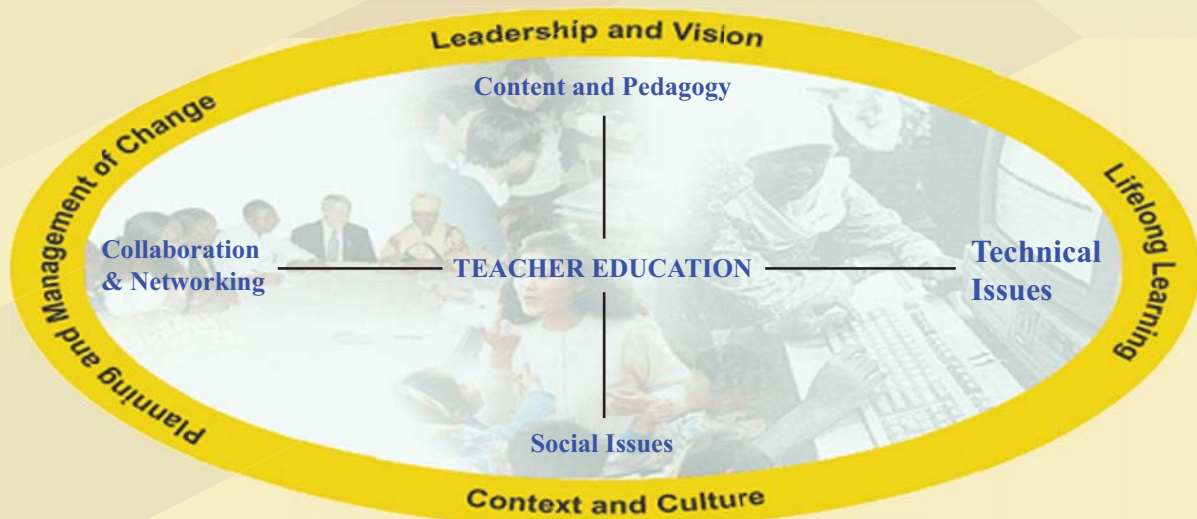


Fig. 1: A Framework for ICTs in Teacher Education

The encompassing oval underscores that the framework should be interpreted as a whole. The framework:

- is comprised of four clusters of competencies encircled by four supportive themes
- suggests that each teacher is allowed to interpret the framework within his or her context and personal approach to pedagogy, which is always related to the subject discipline or content area, rather than to the technology itself

As described in UNESCO (2002a), the four themes of the framework are:

Theme 1: Context and Culture (CC)

CC identifies the culture and other contextual factors that must be considered in infusing technology into teacher education curriculum. It includes the use of technology in culturally appropriate ways and the development of respect for multiple cultures and contexts, which need to be taught and modeled by teachers.

Theme 2: Leadership and Vision (LV)

LV is essential for the successful planning and implementation of technology into teacher education and requires both leadership and support from the administration of the teacher education institution.

Theme 3: Lifelong Learning (LL)

LL acknowledges that learning does not stop after school. In common with the other themes, it is important that teachers and teacher preparation faculty model lifelong learning as a key part of implementation, and as an ongoing commitment to ICTs in teacher education.

Theme 4: Planning and Management of Change (PMC)

PMC is born of today's context and accelerated by technology itself. It signifies the importance of careful planning and effective management of the change process.

Similarly, UNESCO (2002a) describes the four competencies as follows:

Competency 1: Pedagogy (P)

P is focused on teachers' instructional practices and knowledge of the curriculum and requires that they develop applications within their disciplines that make effective use of ICTs to support and extend teaching and learning.

Competency 2: Collaboration and Networking (CN)

CN acknowledges that the communicative potential of ICTs to extend learning beyond the classroom walls and the implications for teachers development of new knowledge and skills.

Competency 3: Social Issues (SI)

SI refers to those aspects of technology that bring with it new rights and responsibilities, including equitable access to technology resources, care for individual health, and respect for intellectual property.

Competency 4: Technical Issues (TI)

TI is an aspect of the LL theme through which teachers update skills with hardware and software as new generations of technology emerge.

A modified version of the framework for ICTs in teacher education, shown in Figure 2, depicts teacher competencies of pedagogy and technology operating within an environment (the context) that is characterized by change and the need to continue learning throughout life (Majumdar, 2005).

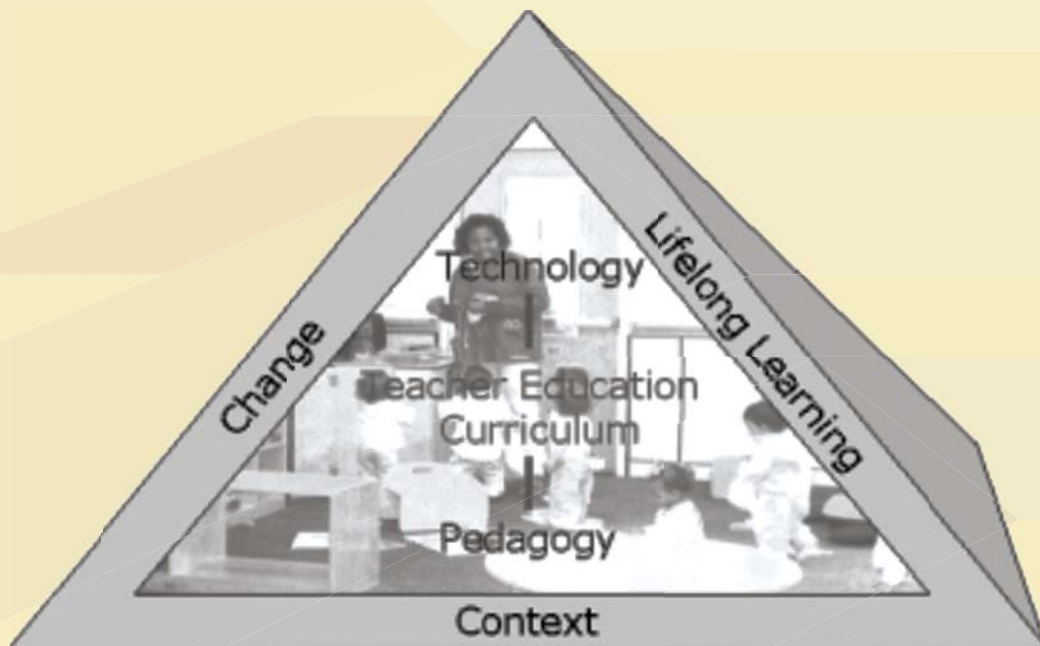


Fig.2: A curriculum framework for integrating ICT and pedagogy in professional teacher education programs

Figure 2 presents both pedagogy and technology as core competencies for teachers, acknowledging that integrating ICT in education for teaching and learning is far broader than simply acquiring technical skills to use ICT. Majumdar (2005) further argues that placing pedagogical competencies at the base of the pyramid in the figure above reinforces the key place of pedagogy in ICT integration. This means that:

- learning activities involving ICT have to be embedded in a real-world context, and that students engage in such activities not only because they are required, but also because they are intrinsically interesting
- an infusion of ICT, like any other learning activity, has to have clear and specific goals, and encourage learners to collaborate with one another

Integrating ICT with pedagogy and at the same time ensuring authentic learning requires an understanding of the complexity of learning. In other words, adoption of ICT for varying instructional approaches with respect to complexity and authenticity of learning poses a complex inter-relationship. The North Central Regional Educational Laboratory (NCREL) attempted to construct a three dimensional (or 3-D) representation of this complex inter-relationship between various instructional approaches, as can be seen in Figure 3 (Majumdar, 2005).

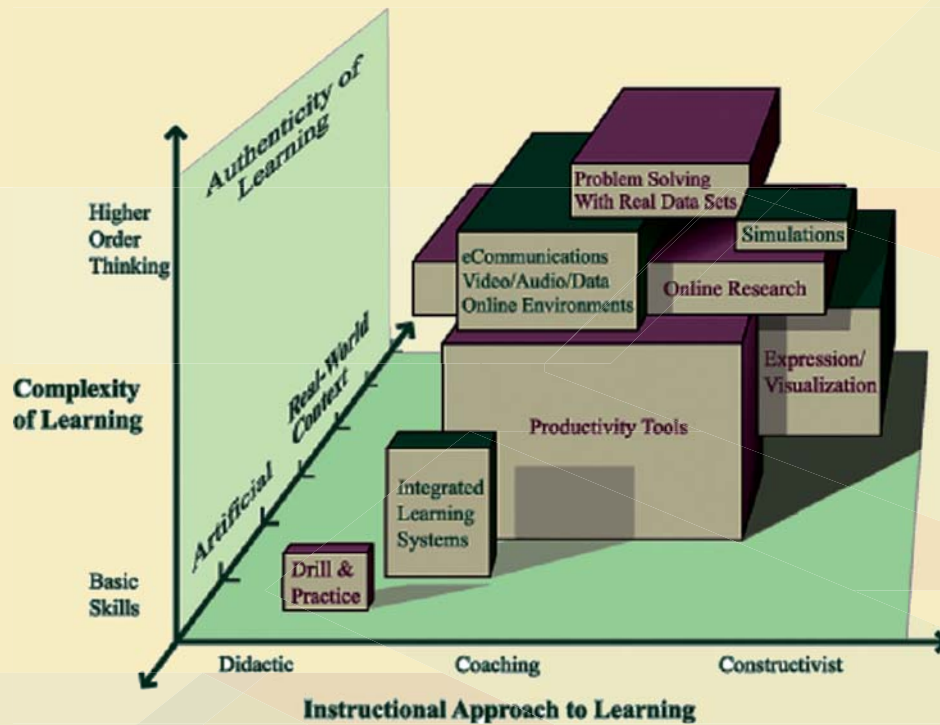


Fig. 3: A 3-D representation for gauging which instructional approach with ICT (X-axis) might support students' thinking (Z-axis) in authentic learning situations (Y-axis)

Figure 3 shows one of the ways of understanding the range and diversity of the model discussed above with regard to instructional approaches to complexity and authenticity of learning from emerging to transformation stages. Such a representation is useful in defining ICT usage that might extend the learning potential of learners. The three axes shown therein may be used to answer three important questions, as discussed below.

- X What instructional approaches work most effectively with various ICT applications? The X-axis represents *Instructional Approach to Learning*, ranging from didactic to constructivist.
- Y Which ICT applications can be a springboard for student learning in a real-world context? The Y-axis represents *Authenticity of Learning*, ranging from artificial to real-world problem solving.
- Z What types of ICT uses support thinking and learning? The Z-axis represents *Complexity of Learning*, ranging from simple (basic skills) to complex (higher order thinking).

3.2.2. The ICT for Teacher Education Development (ICT4TED) Model

Most studies of ICT development in both developed and developing countries identify at least four broad approaches through which educational systems and individual institutions typically proceed in their adoption and use of ICTs (UNESCO, 2002b; Majumdar, 2005). Although the number of ICT development stages varies depending on the context, there is a general consensus that the introduction and use of ICTs in education proceeds in broad stages that may be conceived as a continuum or series of steps, namely: *Emerging, Applying, Infusing, and Transforming*. Figure 4 depicts that each of the successive stages in the continuum (i.e., from Emerging through to Transforming) gets richer in both technology and pedagogy in terms of quality and complexity.

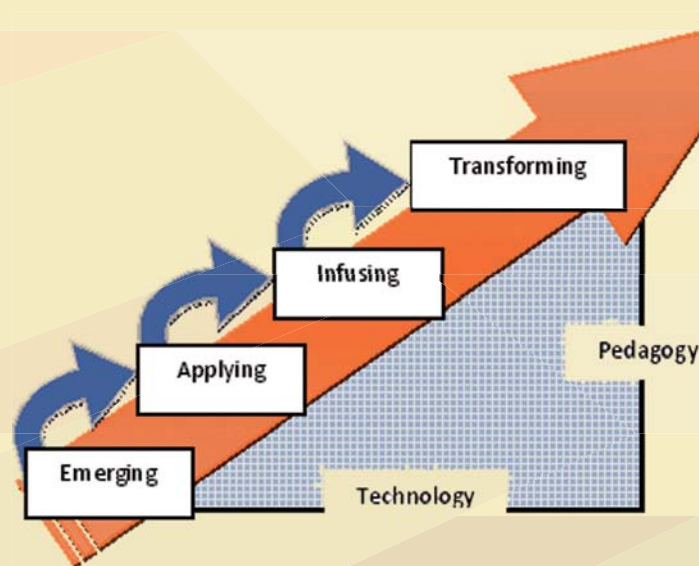


Fig. 4: Stages of ICT for Teacher Education Development (ICT4TED)

The **Emerging Stage** is characterized by educational establishments just beginning to explore the possibilities and consequences of using ICT for institutional management and adding ICT to the curriculum. Pedagogically speaking, institutions at this stage are still firmly grounded in traditional, teacher-centered practice.

At the **Applying Stage**, administrators and teachers use ICT for tasks already carried out in institutional management and in the curriculum. More specifically, teachers at this stage involve themselves in integrating ICT to acquire specific subject skills and knowledge, beginning to change their teaching methodology in the classroom, and using ICT to support their training and professional development.

The **Infusing Stage** is characterized by educational institutions involved in integrating or embedding ICT across the curriculum, and in employing a range of computer-based technologies in laboratories, classrooms, and administrative offices. The curriculum of institutions at this third stage also begins to merge subject areas to reflect real-world applications. The teachers in this stage use ICT to manage not only the learning of their students but also their own learning.

At the **Transforming Stage** teachers and other staff members regard ICT as a natural part of the everyday life of the institutions and begin to look at the process of teaching and learning in new ways. The emphasis changes from teacher-centered to learner-centered. Institutions at this stage of ICT4TED development have become centers of learning for their communities.

The specific objectives of the ICT4TED Model are to enable teacher educators to:

- Become aware of ICT and support work performance
- Learn how to use ICT and enhance traditional teaching
- Understand how and when to use ICT and facilitate learning
- Specialize in the use of ICT and create innovative learning environments

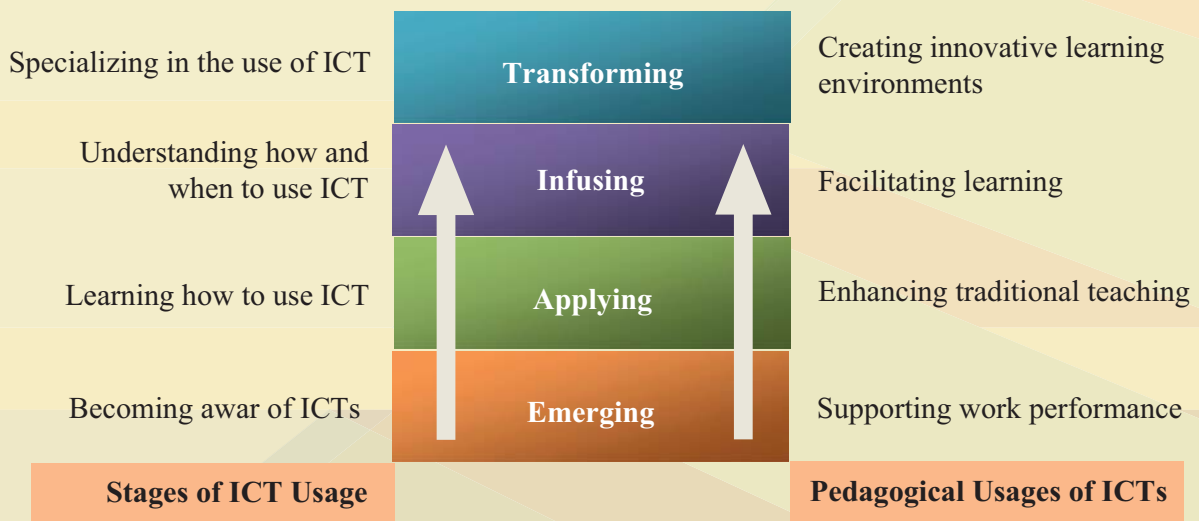


Fig. 5. Mapping the ICT4TED Model

The inclusion of both pedagogy and technology as core competencies for teachers acknowledges that integrating ICT in education for teaching and learning is far broader than the simple acquisition of these two sets of competencies. Competencies of integration are neither competencies of technology alone nor are they competencies of pedagogy. Rather competencies of integration are about the appropriate selection, use, mix, fusion and integration of many sets of competencies. Each stage of the ICT4TED model characterizes the expertise the teacher is required to possess in pedagogy clusters, technology clusters and integration strategies.

There is an important relationship between continuum models, curriculum frameworks and competency standards in ICT. When agreement is reached within a country or region for a curriculum framework for integrating ICT into learning, the development of competency standards for students and their teachers can follow. Furthermore, once a clear statement about ICT competency standards is arrived at, it is then possible to adapt or develop training modules for teachers.

It is expected that there will be a big variation among African countries and, within a country, among teacher education institutions (TEIs) in the degree of ICT use in teacher education. Even within a given TEI, various departments/units may be at different stages and use different approaches. The institutions could fall in any of the four stages of the ICT4TED model. On the other hand, it is believed that each country/TEI should do its best to promote the teacher educators to the highest level successively. In order to do that, countries/TEIs need to know, develop and implement the standards and competences expected of each level. This project is therefore trying to fill this gap for African countries and their TEIs.

4. Basic Questions to be Addressed in the Development of ICTeTSA

This project is about the development of ICT-enhanced teacher standards for Africa (ICTeTSA). The specific objectives of the project are:

- To identify pedagogy-based ICT teacher competencies applicable in the context of the regional economic communities (RECs) of Africa
- To develop a framework of ICT-enhanced teacher standards for Africa
- To validate the developed framework at regional level

In the development of the ICTeTSA, it is necessary for participants to consider the following key questions:

- What are the meaning and scope of standards in general and ICTeTSA in particular?
- Which level of the teacher education system the ICTeTSA targeting at?
- What should be the nature and type of the model to be used in the development of ICTeTSA for the Regional Economic Community (REC) under consideration?
- Which aspects of the 'ICT use in teacher education' implementation challenges will the ICTeTSA address?
- What are the indicators for effective implementation of each of the standards?
- Who will be the custodian and implementers of the developed ICTeTSA?

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Part II: Stages of ICT4TED

Development of ICT-enhanced Teacher Standards for Africa (ICTeTSA)

By Temechegn Engida (PhD)

Advances in technology and the way technology is incorporated into a system constitute a dynamic process (Majumdar, 2005; UNESCO, 2002b)). Each institution has to work within the context of its own system to fit choices to what best suits its unique situation and culture. The adoption of technology into the curriculum generally proceeds in stages as depicted in the ICT4TED model in Part I of this paper. The stages can be considered as hierarchical with the emerging stage as a starting point, and the transforming stage as a goal, which many perceive as the future of education. The following sections are synthesized from Majumdar, 2005 and UNESCO, 2002b.

1. The Emerging Stage

The emerging stage is linked with institutions at the beginning stages of ICT development. Such institutions begin to purchase computer equipment and software or perhaps have had some donated. In this initial phase, administrators and teachers are just starting to explore the possibilities and consequences of adding ICT for school management and the curriculum. The institution is still firmly grounded in traditional, teacher-centered practice. For example, teachers tend to lecture and provide content while students listen, take notes, and are assessed on the prescribed content. Institution organization provides discrete time periods for each subject. Learners' access to technology is through individual teachers. A curriculum that focuses on basic skills and an awareness of the uses of ICT assists movement to the next approach.

The focus in the emerging stage is on the basic technical functions and uses of ICT. This stage involves teachers' competencies in word processing, spreadsheet, database, presentation software and uses of Internet and e-mail. Besides the kinds of ICT competencies relating to concepts and operations, there are many social, legal and ethical issues associated with the use of ICT about which teachers need to know. The facilities required to access information easily from remote sources, the ability to download it to a personal computer, and the utilization of the information in a classroom assignment, brings with it a host of social, legal, and ethical issues relating to copyright, evaluation of information sources, and appropriate forms of acknowledging electronic information.

Institutions at the emerging stage can be identified by judging the extent of indicators of performance against eight characteristics of institutions, as presented in Table 1 below (UNESCO, 2002b).

Table 1: Indicators to Determine an Institution's Implementation of ICT at the Emerging Stage

Characteristics	Indicators
1. Vision	Dominated by individual interest. Limited. Pragmatic.
2. Learning and pedagogy	Teacher-centered. Didactic.
3. Development plan and policies	Non-existent. Accidental. Restrictive policies. No planned funding.
4. Facilities & resources	Stand-alone workstations for administration. Individual classrooms. Computers and printers. Word processing, spreadsheets, databases, presentation software. Institution administration software. Games.
5. Understanding of curriculum	ICT literacy. Awareness of software. Responsibility of individual teachers.
6. Professional development for institution staff	Individual interest.
7. Community	Discreet donations. Problem-driven. Accidental.
8. Assessment	Equipment-based. Budget-oriented. Discrete subjects. Didactic. Paper and pencil. Controlling. Closed tasks. Responsibility of individual teacher.

One can deduce from Table 1 that the school's vision of learning and ICT at the emerging stage is beginning to develop. The use of ICT is focused on computers under the responsibility of an enthusiastic individual or a small group with very specific uses for teaching or administration, based on their own knowledge and expertise. The vision is a pragmatic response with access to resources and expertise available.

The individual teacher is responsible for discrete lessons concentrating on the development of ICT skills and the transmission of subject knowledge. The pedagogy of the enthusiastic individual or small group of teachers is restricted by the institute organization and fixed timetable lesson periods.

The development of ICT in the institution is separate from the overall institutional development plan and policies regarding curriculum, personnel, professional development, finance, community, teaching, learning and assessment. Teachers and students discover for themselves opportunities to use computers and software.

The ICT facilities and resources consist of a few isolated, stand-alone computers and printers in the institute office and a few classrooms. The content available is very limited consisting of generic office type applications and institution management software, with a few games providing reward to some students. Content will be determined by the needs of a few teachers and their teaching.

ICT teaching is to ensure students are ICT literate. The curriculum is structured to teach students a sound basic understanding of available software applications. The curriculum is planned and delivered by individual teachers.

Learning and ICT training will emphasize the need to learn to operate a limited range of software for teaching and administration. Individual members of staff will identify their training needs, which is generally restricted to technical training. The ICT development plan will identify training separately from other institute training and professional development. ICT training and development is partly funded by the institute and teachers.

Community involvement in the institute is a welcome, although often an un-planned activity. There may be contribution by community members to institute activities and the institute becomes a focus of the community.

Assessment strategies emphasize the limiting nature of equipment and budget on levels of attainment. Paper and pencil testing is widely used due to the limited ICT resources. Assessment allows the teacher to control the pace of learning. Assessment tasks and moderation of levels of attainment is the responsibility of the individual teacher. ICT assessment is independent of other student and institute assessments.

2. The Applying Stage

In the applying stage, teachers use ICT for professional purposes, focusing on improving the teaching of subjects so as to enrich how to teach with a range of ICT tools. The applying stage is linked with institutions in which a new understanding of the contribution of ICT to learning has developed. In this phase, administrators and teachers use ICT for tasks already carried out in institution management and in the curriculum. Teachers still largely dominate the learning environment. For example, instruction may be supplemented with ICT such as electronic slide presentations and word-processed handouts. Students receive instruction and add notes to teacher prepared handouts. They use ICT tools to complete required lessons and are assessed on prescribed content. Institute organization provides discrete time periods for each subject with some flexibility to combine subjects and time periods. Learner access to technology is through one or two classroom computers and computer labs. Until now, ICT has been taught as a separate subject area. To move to the next phase, the institute chooses to implement an ICT-based curriculum that increases ICT across various subject areas with the use of specific tools and software.

Institutions at the applying stage can be identified by judging the extent of indicators of performance against eight characteristics of institutions, as presented in Table 2 below (UNESCO, 2002b).

Table 2: Indicators to Determine an Institution's Implementation of ICT at the Applying Stage

Characteristics	Indicators
1. Vision	Driven by ICT specialists.
2. Learning and pedagogy	Factual knowledge-based learning. Teacher-centered. Didactic. ICT a separate subject.
3. Development plan and policies	Limited. ICT development led by specialist. Centralized policies. Hardware and software funding. Automating existing practices.
4. Facilities & resources	Computer lab or individual classrooms for ICT specific outcomes. Computers, printers and limited peripherals. Word processing, spreadsheets, databases, presentation software. ICT software. Internet access.
5. Understanding of curriculum	Applying software within discrete subjects. Use of artificial and isolated contexts.
6. Professional development for institution staff	ICT applications training. Unplanned. Personal ICT skills.
7. Community	Seeking donations and grants. Parental and community involvement in ICT.
8. Assessment	Skills-based. Teacher-centered. Subject focused. Reporting levels. Moderated within subject areas.

Table 2 depicts that the institute's ICT specialist is responsible for any statement about a vision of learning and ICT in the school. There is an emphasis on learning about ICT and developing the institute's facilities and resources.

A teacher-centered didactic approach focuses on development and transmission of ICT skills and factual knowledge. The pedagogy of the institute ICT specialist drives the teaching and use of ICT as a separate, specialist subject.

Responsibility for development of an ICT plan and policies is delegated to the ICT specialist in the institute. Emphasis is placed on acquiring computer equipment and resources but plans and policies centralize the use and access to ICT resources, tightly managing access opportunities. Funding is provided for the acquisition of hardware and software in support for a defined part of the institute's curriculum and pedagogy. The institute plan seeks to increase teaching and administration efficiency and effectiveness.

The institute ICT specialist manages all available ICT resources, such as any computer laboratories in the institute and stand-alone computers in classrooms, together with access to these. There is a limited range of computer peripherals such as printers with usage specific to the ICT curriculum. Internet access is available for some of the computers in the institute. Software is available to teach the ICT curriculum. The applications are used within teaching contexts created by individual teachers to provide clear and predictable results for students, ensuring success. The Internet and the World Wide Web are used in a customized way with planned access to selected sites to ensure predictable outcomes to lessons.

ICT teaching will provide opportunities for students to apply their ICT literacy skills using teacher-created examples within specified contexts. The curriculum is structured to provide students with opportunities to apply their ICT literacy in other subject areas to acquire specific skills and knowledge.

Skills training will be provided to support teachers of the ICT curriculum. The training will support the use of individual software applications and learning resources. Training will concentrate on the management of ICT, emphasizing personal ICT skill development. Training will tend to be “just-in-time” for a specific teaching topic or to coincide with the arrival of a new piece of software. Internet-based training will emphasize the identification of information, with direct support for the existing curriculum in a range of subjects.

The institute ICT specialist will seek donations and grants to develop the ICT resources and facilities within the institute. ICT skills of parents and community members will be sought in support of the specified curriculum.

Assessment allows teachers to report students’ level of ICT literacy and their ability to apply what they have learned in ICT and other subjects. Individual teachers share assessments of students’ attainment with other teachers within their subject area to moderate their reporting of standards of attainment. The assessments provide the opportunity for teachers to amend their curriculum. Assessment strategies are the responsibility of individual subject areas.

3. The Infusing Stage

In the infusing stage, teachers infuse ICT in all aspects of professional life to improve student learning and the management of learning processes. ICT enables teachers to become active and creative in stimulating and managing the learning process, by infusing a range of preferred learning styles and uses of ICT in achieving educational goals. Teachers are required to master authoring tools, animation tools and multimedia tools to develop instructional software in different subjects.

The infusing stage is linked with institutes that now have a range of computer-based technologies in laboratories, classrooms, and administrative areas. Teachers explore new ways in which ICT changes their personal productivity and professional practice. The curriculum begins to merge subject areas to reflect real-world applications. For example, content is provided from multiple sources, including community and global resources through the World Wide Web. Students’ access to technology enables them to choose projects and ICT tools that stimulate learning and demonstrate their knowledge across subject areas. Institute organization provides the flexibility to combine subjects and time periods. Learners have more choices with regard to learning styles and pathways. They take more responsibility for their own learning and assessment. ICT is taught to selected students as a subject area at the professional level. To advance to the next phase, institutions choose an ICT curriculum that allows a project-based, ICT-enhanced approach. These schools begin to involve the community more in the learning environment and as resource providers.

Institutions at the infusing stage can be identified by judging the extent of indicators of performance against eight characteristics of institutions, as presented in Table 3 below (UNESCO, 2002b).

Table 3: Indicators to Determine an Institution's Implementation of ICT at the Infusing Stage

Characteristics	Indicators
1. Vision	Driven by subject specialists. Discrete areas.
2. Learning and pedagogy	Learner-centered learning. Collaborative.
3. Development plan and policies	Individual subject plans include ICT. Permissive policies. Broadly-based funding, including teacher professional development.
4. Facilities & resources	Computer lab and/or classroom computers. Networked classrooms. Intranet and Internet. Resource-rich learning centers. Range of devices, including digital cameras, scanners, video and audio recorders, graphical calculators, portable computers, remote sensing devices. Video-conferencing. Word processing, spreadsheets databases, presentation software. Range of subject-oriented content. Multimedia authoring, video/ audio production. Range of subject specific software.
5. Understanding of curriculum	Infusion with non-ICT content. Integrated learning systems. Authentic contexts. Problem solving project methodology. Resources-based learning
6. Professional development for institution staff	Subject specific. Professional skills. Integrating subject areas using ICT. Evolving.
7. Community	Subject-based learning community providing discrete, occasional assistance, by request. Global and local networked communities.
8. Assessment	Integrated. Portfolios. Subject-oriented. Learner-centered. Student responsibility Multiple media to demonstrate attainment. Moderated across subject areas. Social and ethical as well as technical.

It is evident from Table 3 that the institute's learning and vision for ICT is developed and shared by subject specialists who seek to increase student levels of attainment in their subjects, exploring new ways of learning and the management of learning. The vision belongs to all staff and to the institute's local and global learning communities, as well as to students.

A learner-centered approach, supporting students' choice of preferred learning styles and learning environments, tends to dominate. Students are able to collaborate with other learners, infusing learning across subjects, and utilizing a wide range of resources found by students. The use of ICT to investigate and explore new approaches to learning is accepted.

The individual subject areas infuse ICT into their plans and policies within the total institution development plan and policies. The institution's planning processes encourage collaborative approaches to learning and the management of learning by staff and students. Funding of ICT is broadly-based and integral to the annual budgetary cycle. The provision of funding covers all aspects of ICT, including professional development of institute staff.

The whole institute is networked to ensure access to multimedia and learning-rich resources via the institute's Intranet and the Internet wherever students and teachers are, in or out of institute. The computer labs and classroom computers are sufficient in number to allow ready access by students and staff in most subjects across the institution. Software content is critically appraised to ensure it matches the requirements of the curriculum supporting a wide range of multi-sensory learning styles. All staff help identify the software and learning resources required. A wide range of peripheral and remote working devices, including video-conferencing, is provided and integrated into the curriculum. Large and small group presentation facilities are readily available.

The curriculum provides the opportunity for students to utilize their ICT literacy skills in real problem solving by means of project work that offers new ways for students to demonstrate their learning. The curriculum seeks to use real contexts for learning, using institute-based and externally available resources. ICT is used as a tutor to support specific learning goals. Teachers regularly review the curriculum for opportunities to incorporate the use of ICT.

Emphasis is placed on the professional development of teachers' subject skills and their capabilities to apply ICT in a range of contexts. The provision of institute-based, in-service training to support the shared development of collaborative, cross-curriculum uses of ICT complements any external professional development provision. The institution's program of professional development has evolved to meet changing needs and new opportunities.

Staff and students make ready use of their local and emerging global learning communities to provide specific assistance for additional opportunities offered through ICT, especially the Internet and video-conferencing. The institute has a regular program to attract donations and grants to further develop ICT resources and curriculum within the institution.

Students' assessments are not limited to specific subjects, with reports on attainment informing all teachers in planning teaching and learning programs of study. Students are responsible for maintaining personal portfolios of their work, demonstrating their attainment, over one or more years, using ICT facilities and resources to complement paper-based records. The assessments inform whole institute curriculum planning and resource allocations.

4. The Transforming Stage

The transforming stage is linked with institutions that have used ICT creatively to rethink and renew institute organization. ICT becomes an integral part of daily personal productivity and professional practice. The focus of the curriculum is now much more learner-centered and integrates subject areas in real-world applications, both in real and virtual environments. For example, students may work with community leaders to solve local problems by accessing, analyzing, reporting, and presenting information with ICT tools. Learners' access to technology is broad and unrestricted. They take even more responsibility for their own learning and assessment. ICT is taught as a subject area at an applied level and is incorporated into all vocational areas. The institution has become a centre of learning for the community.

Teachers need to master special software, learning management system simulation and modeling tools, expert system, semantic networking and various web tools, in order to innovatively transform the teaching and learning system.

Institutions at the transforming stage can be identified by judging the extent of indicators of performance against eight characteristics of institutions, as presented in Table 4 below (UNESCO, 2002b).

Table 4: Indicators to Determine an Institution's Implementation of ICT at the Transforming Stage

Characteristics	Indicators
1. Vision	Leadership. Acceptance by entire learning community. Network-centered community.
2. Learning and pedagogy	Critical thinking and informed decision-making. Whole learner, multi-sensory, preferred learning styles. Collaborative. Experiential.
3. Development plan and policies	ICT is integral to overall school development plan. All students and all teachers involved. Inclusive policies. All aspects of ICT funding integral to overall school budget. Integral professional development.
4. Facilities & resources	Whole school learning with ICT with access to technology resources and a wide range of current devices. Emphasis on a diverse set of learning environments. The whole range of devices in the column to the left and web-based learning spaces. Brainstorming. Conferencing and collaboration. Distance education. Web courseware. Student self-management software.
5. Understanding of curriculum	Virtual and real-time contexts, new world modeling. ICT is accepted as a pedagogical agent itself. The curriculum is delivered via the Web and staff in an integrated way.
6. Professional development for institution staff	Focus on learning and management of learning. Self-managed, personal vision and plan, school supported. Innovative and creative. Integrated learning community with students and teachers as co-learners.
7. Community	Broad-based learning community actively involved parents and families, business, industry, religious organizations, universities, vocational schools, voluntary organizations. Global and local, real and virtual. Institute is a learning resource for the community – physically and virtually.
8. Assessment	Continuous. Holistic – the whole learner. Peer-mediated. Learner-centered. Learning community involvement. Open-ended. Project-based.

From Table 4 we can realize that the institution provides leadership to its learning community, providing innovative and creative access and opportunities to learning and the management of learning, maximizing the contribution of ICT to realize the school of tomorrow, today. The institute sees itself as network-centered, providing a physical place to learn, as well as web-based learning spaces, accessible any time, anywhere, by students and staff.

Emphasis is upon the whole learner in all aspects of their learning, with a focus on critical thinking skills and well-founded decision-making. Every student is responsible for his or her own learning. Learning is experiential, with learning pathways and learning styles continuously changing to meet learner requirements. The use of ICT to investigate and explore new approaches to learning is expected.

The institute and learning community use ICT to rethink creatively and to renew the learning environment of students and staff, including the development planning and policy-making processes. The plans for the institution seek to support continuous change and renewal, striving to provide truly differentiated and individualized curriculum for all students, and seeking to maximize student achievement. ICT funding is seen as essential as funding for basic utilities like water and power. Effective, accessible, and inclusive ICT ensures that learning environments are mission-critical to all staff, students and learning communities.

A whole school learning and ICT infrastructure provides ready access to innovative learning environments and contexts. Institution facilities and resources are designed and enabled to support continuous change and development of approaches to learning, the management of learning, and technology.

The curriculum is enabled by an understanding of the learning needs of every student, informed on a continuous basis by management of learning systems. Students' ICT literacy skills are assumed to enable learning readily within a personalized curriculum. The curriculum uses as a matter of course virtual and real world, real-time contexts, and modeling. Students are involved in solving real problems.

Focus is placed on learning and the management of learning, with specific ICT training provided when it is required. Teachers' development is self-managed, and informed by a well-founded personal vision and plan, that supports the school's overall vision and the needs of the learners. Teachers accept their role as co-learners, learning together with their students. Teachers are committed to professional development as a continuous, critically reflective process.

The community is a natural partner with the institute, actively involved in all aspects of the staff and students' learning processes, and providing real-world contexts through which learning takes place. In turn, the institute is a learning resource for the whole community, offering access to local and global learning environments with physical visits as well as virtual visits through the Internet. The institution is as much a part of the community as the community is a part of the institute: the boundaries are indistinct to the observer.

Students are responsible for their own continuous assessment to inform and plan a personal curriculum that is matched to their preferred learning styles. The assessments are moderated between students as well as between teachers, providing a holistic view of the whole learner across the curriculum. Students maintain a portfolio of all their work on the network. Students' attainments and preferred learning styles determine the institute's curriculum and policies. Staff and student assessments determine the management of learning.

5. Summary

The four stages of the ICT4TED model are described above as a continuum. Although the approaches above are not a necessary hierarchical, they are intended to illustrate the steps towards growing ICT confidence and competence that many teachers go through, before beginning to transform teaching practice and the learning of their students. Bearing in mind the contextual factors of change and lifelong learning, teachers are required to be competent in using new hardware and software. Technological competencies also have an attitudinal dimension. A positive attitude towards ICT and a clear understanding of the potential of ICT in education are critical for the success of institutions using the model (Majumdar, 2005).

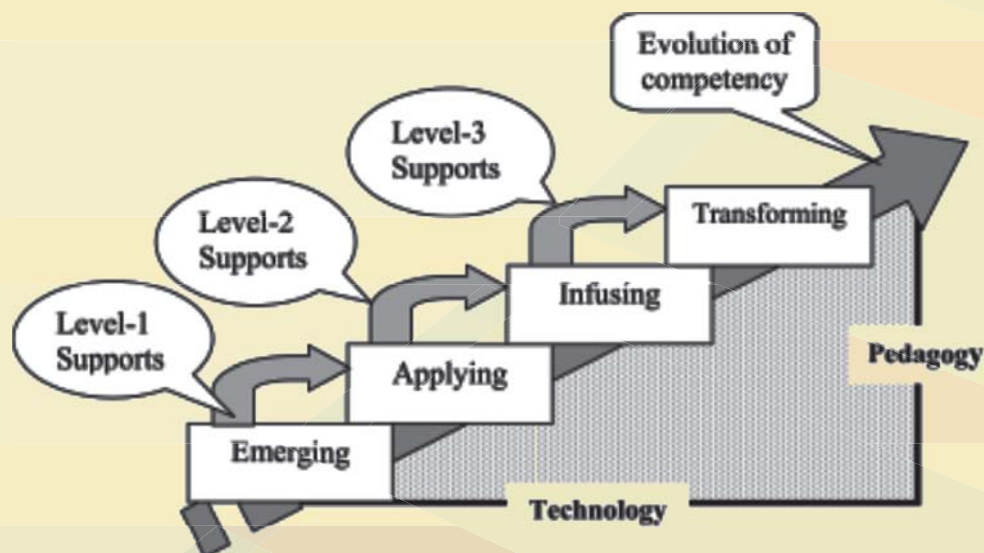


Fig. 1: Points of support provided by teacher education to promote movement through the stages of ICT development

As can be seen from Figure 1, a program of teacher development can help individual teachers move through the four stages in ICT4TED. The ICT activities that a development program provides are likely to deepen in complexity as a teacher's understanding and skills improve. The activities, therefore, have to be carefully designed to promote a teacher's movement into the next stage. Level-1 supports promote movement from stage 1 to stage 2, level-2 supports promote movement from stage 2 to stage 3, and level-3 supports promote movement from stage 3 to stage 4. Each stage of the ICT development model characterizes the expertise the teacher is required to possess in pedagogy clusters, technology clusters and integration strategies.

For example, teachers who are in the *emerging stage* are first becoming aware of the potential to use ICT in teaching and learning. The development program might provide basic support through guidance by a mentor who helps these teachers to use ICT within their subject areas in simple but important ways. This will encourage the movement of these teachers into the *applying stage*, in order to be engaged in more complex activities that promote deeper understanding. Here, the development program might provide support through opportunities for discussion with colleagues doing similar work, or by providing collections of effective ICT infusions on a resource website. This encourages further growth into the *infusing stage*, when these teachers begin to apply knowledge

and skills from other subjects into project based curricula. In the *transforming stage*, teachers specialize in the use of ICT tools to create an innovative learning environment. This is a completely new way of approaching teaching and learning using ICT. In this stage, various software like experts systems, semantic networking, modeling and simulation etc., can be utilized to support innovative pedagogical approach.

Teachers just beginning to develop pedagogical skills are to be measured by standards represented by the emerging level of pedagogy. They progress through the standards as they further develop their skills. It is important to note that some teachers who have strong pedagogical skills and understanding may have limited skills with technology; for this, such teachers would be evaluated by the infusing standards in pedagogy, and the emerging standards in technology skills and integration strategies. Again, the standards for integration strategies at all levels have to reflect infusions of technology that support meaningful learning. With this approach, teachers are stimulated to develop through a natural progression implied by the standards, gaining both competence and confidence as they do so.

Why are such careful support strategies required? According to Majumdar (2005) this is because teachers resist ICT innovations that do not match the context in which they work, but tend to integrate technology when it addresses real classroom problems, situations and learning goals. Teachers adapt to change when it is possible to set the goals, to have opportunities to acquire the needed skills, and to reflect on learning. It is the desire of teachers to infuse ICT directly into students' academic lives so that student activities are authentic and meaningful from the earliest stages. A similar approach towards teacher training needs to be adopted. Teachers are required to develop the simplest ICT skills in the midst of authentic teaching and learning activities that are seen as viable ways to solve existing professional and pedagogical problems.

Teacher development is to be carefully planned, which is appropriate to a teacher's understanding and skills. This means that teachers learn to use ICT always within their zone of proximal development, so that activities are simple enough that teachers can place new ideas within the context of previous understanding, but are challenging enough to give their work meaning and purpose. **Standards can play a key role in facilitating this kind of support.**

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