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# TECHNOLOGICAL, PEDAGOGICAL AND CONTENT KNOWLEDGE (TPACK) FRAMEWORK; A PATH TO TVET TRAINING SKILLS ENHANCEMENT IN AFRICA

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## KeyWords

TPACK, TVET, Training of Trainers.

## ABSTRACT

A good number of research studies have been conducted on the framework of teacher/trainer knowledge commonly known as TPACK (Technological Pedagogical and Content Knowledge). Findings in Africa showed that teachers in TVET are fully equipped with Technological and content knowledge and a few of them are equipped with pedagogical knowledge. In some countries, governments have established the training centers for pre and in-service TVET trainers and results showed that the performance for those who were trained is greater than the one of those who are not yet trained. In our country, Rwanda TVET Trainer Institute (RTTI) has been established to absorb those challenges of staff who are partly qualified. We recommend that the partnerships should not only remain in teaching facilities but also in training of the trainers in this framework which is very important for module deliverers to provide adequate skills. Governments in Africa should establish pre-service institutes dedicated to training of trainers who would teach in technical and vocational schools at all levels of their qualification frameworks. Those in-service teaching staff who are not yet trained should be offered Technological and Pedagogical Training to enhance their teaching activities preparation and implementation. This would stop hiring employees who would not provide ineffective and inefficient output in the institutions' graduates production. Private sectors across Africa should invest in establishing training and consultancy companies that would upgrade the TVET tutors' level of TPACK.

## 1. INTRODUCTION

### 1.1. Background

This chapter focuses on how a basic package in Technological pedagogical and Content Knowledge Commonly known as TPACK influences teaching performance in the field of Technical Vocational Education and Training (TVET) in Africa. It also indicates the organs involved in the research and their role in the training.

In some African countries, it has been found that the teaching personnel are recruited basing on the individual qualification matching with the subject to be taught. There are no specific guidelines or minimum standards, apart from the degree one may have been awarded, to be a TVET tutor. Some institutions may require a number of years of the teaching experience or experience in the related field but other do not consider this criteria. This results into poor performance of the tutors who may be having knowledge but are not familiar with how learning takes place and how they should integrate technology in their teaching.

Technology has evolved in most working sectors in Africa. It shouldn't be left behind in educational system. To enhance the quality of the integration of technology into our teaching, a broader conceptualisation of the use of technology is needed and, in particular, to enable an authentic context for teachers and students to learn about educational technology (Dorit & Pauline, 2014). "Technological Pedagogical Content Knowledge (TPACK) is a conceptual framework for teachers to teach effectively using technology. This framework originates from the opinion that use of technology in educational context would be effective only if content, pedagogy and technology are aligned carefully" (Manchikanti, 2017).

### 1.2. Statement of the problem

The pedagogical knowledge has been identified amongst factors that influence the tutor's performance. "It is an unaccepted fact that teachers are usually born but made.... one of the prerequisite to be (a) good teacher is to understand the teaching learning process in more depth." (Sequeira, 2012). Other academics have remarked that: "It is unfortunate, but true, that some academics teach students without having much formal knowledge on how students learn." (Heather, Steve, & Marshall, 2009). There are clearly many knowledge systems that are fundamental to teaching, including knowledge of student thinking and learning, and knowledge of subject matter (Mishra & Koehrer, 2006).

It is quite important to master the course content, but also to understand how students learn and the kind of technology to be integrated in the teaching session. This leads to understanding the methods to use in teaching. This is where pedagogy and the technology to use are thought about. An effective teacher will integrate technology in his instructional planning. Technologies have come to the forefront of educational discourse primarily because of the availability of a range of new, primarily digital, technologies and requirements for learning how to apply them to teaching. These new technologies incorporate hardware and software such as: computers, educational games, and the Internet and the myriad applications supported by it (Mishra & Koehrer, 2006).

In Africa, the Technical Vocational Education and Training (TVET) is a field that has many trainers who are qualified in their respective domains but who have never acquired pedagogical knowledge to use while teaching since they are mainly not trained to teach. This is because in countries of this continent, there are no training institution dedicated to training future Technical school tutors. Research studies have indicated that "knowledge and skills in how to teach is also a must. Effective teachers understand and are able to apply strategies to help students increase achievement" (Maivaji, 2014). Mastering the subjects to be taught is not enough, but trainers, to be effective, should understand how learning takes place and be able to use different methods to teach and technologies to us such that students perform well as individuals.

In the study conducted to enlighten the teacher's perceptions upon the integration of ICT in teaching, it was advised to help teachers acquire the Technological Pedagogical Content Knowledge (TPACK) package and to provide adequate ICT facilities and Skills required for integrating ICT into teaching and learning processes as proposed by TPACK model (Munyengabe, He, & Zhao, 2018).

TPACK integration in teaching requires provision of equipments and training. How would partnerships amongst Technical Universities and Polytechnics in Africa enhance the required TVET Trainers skills for efficient and effective courses delivery?

### 1.3. The purpose of this paper

The purpose of this paper is to discuss about how building partnerships for the promotion of TVET training would focus on TPACK framework for effective training in Africa.

### 1.4. Objective of the paper

1. To investigate TPACK gap in TVET trainers at the continent of Africa.
2. To find out how TPACK framework for teachers would enhance TVET training in Africa.
3. To identify the role of partnerships for the promotion of TVET TPACK framework enhancement in Africa.

### 1.5. Significance of the paper

The African Union Agenda 2063, in its call to action, article 72, the African Heads of States committed to speed-up actions to: c) *“Catalyze education and skills revolution and actively promote science, technology, research and innovation, to build knowledge, human capital, capabilities and skills to drive innovations and for the African century”*: by Strengthening technical and vocational education and training through scaled up investments, establishment of a pool of high-quality TVET centres across Africa, foster greater links with industry and alignment to labour markets, with a view to improve the skills profile, employability and entrepreneurship of especially youth and women, and closing the skills gap across the continent. (African Union Commission, 2015) This study will be a baseline towards The Agenda 2063 adoptions assessment and implementation review for their achievements since it will demonstrate the role of African TVET partners in its quality enhancement. It will also suggest some possible solutions to identified challenges being encountered by the current implementation of Africa TVET training.

## 2. LITERATURE REVIEW

### 2.1. Technological Pedagogical and Content Knowledge (TPACK) Theory

TPACK, which in full stands for Technological Pedagogical Content Knowledge, is a theory that was developed to explain the set of knowledge that teachers need to teach their students a subject, teach effectively, and use technology. The seminal piece on the TPACK model was written in 2006 by Punya Mishra and Matthew J. Koehler in “Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge.” They explain that their theory comes after five years of studying teachers at all different grade levels with design experiments to see how their classrooms operated (Mc Graw Hill Education, 2017).

This theory is an extension of Shulman’s (1986) theory known as PCK which stands for Pedagogical Content Knowledge. PCK represents the blending of content and pedagogy into an understanding of how particular aspects of subject matter are organized, adapted, and represented for instruction. He didn’t discuss about technology and its relationship to pedagogy and content. This is because when he introduced this theory, technology was not as complex issue as it is today.

Shulman’s approach still holds true, what has changed since the 1980s is that technologies have come to the forefront of educational discourse primarily because of the availability of a range of new, primarily digital, technologies and requirements for learning how to apply them to teaching. These new technologies incorporate hardware and software such as computers, educational games, and the Internet and the myriad applications supported by it (Mishra & Koehrer, 2006).

Twenty years later, Mishra and Koehler saw that the biggest change happening in education is the use of technology in the classroom. They noticed that technological knowledge was treated as a set of knowledge outside of and unconnected to PCK. After five years of research, Mishra and Koehler created a new framework, TPACK, which adds technology to pedagogical content knowledge and emphasizes the connections, interactions, and constraints that teachers work with in all three of these knowledge areas (Mc Graw Hill Education, 2017).

Teachers will have to do more than simply learn to use currently available tools; they also will have to learn new techniques and skills as current technologies become obsolete. This is a very different context from earlier conceptualizations of teacher knowledge, in which technologies were standardized and relatively stable. The use of technology for

pedagogy of specific subject matter could be expected to remain relatively static over time. Thus, teachers could focus on the variables related to content and pedagogy and be assured that technological contexts would not change too dramatically over their career as a teacher (Mishra & Koehler, 2006).

## 2.2. Technological Pedagogical and Content knowledge in African countries

In African countries, as in other countries, TPACK model is being adopted in instructional planning and implementation to catch up with developed countries whereby this model can easily be in use due to availability of resources. Below is some research papers published on this theory.

In a the research conducted in South Africa by Verona Leendertz Verona Leendertz and others, on South African Mathematics teachers' dataset of the Second Information Technology in Education Study, the results proved that 39% of the research participants were not aware that they had skills to incorporate ICT in their usual teaching methods, whereas 61% reported that they didn't know the situation in which and when they would incorporate ICT and new teaching methods.

It has also been proved that "an ideal teacher is able to integrate knowledge of technology, mathematics, content and pedagogy...., knows in which teaching and learning situations ICT use is suitable and has a positive effect on their learners' knowledge and skills" (Verona, A. Seugnet, Hercules, Christo, & Suria, 2013). Above 70% of teachers with TPACK agreed that they observed impact on their students' knowledge, skills and attitude. Only 19% of them reported that there was no impact. On the other hand, less than 10% indicated that there was a decrease in their students' knowledge, skills and affect. In the South Africa International Conference on Education, held in South Africa from 19 to 21 September 2016, at Manhattan Hotel Pretoria, it was argued that TPACK framework should adopted to enhance the ICT use by teachers (Marjorie & Fred, 2016).

Classroom management is one of the factors influencing effective teaching and students' performance. The findings of the research conducted by Department of Educational Technology, University of Botswana on the Effective Classroom Management and the Use of TPACK proved that: "The use of instructional materials make learners to appreciate the topic and the learners can apply the lesson taught to real life situation....., effective classroom management can best be achieved through the use of instructional media" (Olatoye, Nleya, & Batane, 2013). This study also proved that the teachers who do not use instructional media make the learners passive to participate in classroom activities.

The investigation carried out by Wilson Osafo Apeanti found out that among the Contributing Factors to Pre-service Mathematics Teachers' e-readiness for ICT Integration in Ghana; Technological Pedagogical Content Knowledge (TPACK) had a considerably high positive weight. "The findings ... revealed that Technological Pedagogical Content Knowledge is the most important factor for determining the e-readiness of pre-service mathematics teachers and it contributes 42.1% to the total variance in pre-service mathematics teachers' perceived readiness. These finding confirms Koehler and Mishra (2006, 2009) theory of Technological Pedagogical Content Knowledge (TPACK) which indicates that TPACK is the basis of effective teaching with technology..." (Wilson, 2016).

In the survey conducted to investigate the extent to which teachers' learning of Technological Pedagogical Content Knowledge (TPACK) has an impact on their classroom practices in Tanzania, researchers evaluated the difference between pre and post intervention results and found out that there was a teachers' perceived ability of using technology in teaching, improved as a result of the intervention. Classroom observation conducted also confirmed teachers' perceived impact of technology in their teaching as a result of TPACK development (Ayoub, Petra, & Joke, 2012). After having attended six lessons, students at Kibasila secondary school were given the opportunity to share their experiences with the technology-enhanced lessons through a questionnaire and most of them perceived "computer as interesting and useful in the learning of difficult science concepts. They also reported that through the use of technology, they were more involved in the learning process than when they learned without the use of technology". Therefore, the use of technology encouraged shifting from teacher-centred approach to learner-centred approach.

In another study conducted to assess the effect of support on the teachers' collaboration in design teams to develop Technological Pedagogical Content Knowledge (TPACK) in Chang'ombe and Jitegemee secondary schools, Tanzania, teachers were given four support options during their professional development program: collaboration guidelines, online learning materials, exemplary lessons and human support (an expert). When asked about the impact of each support on their collaboration and learning of technology integration, the majority of the participants from both schools indicated high level of agreement towards the expert. "However the

two schools differed on the second best support; while Chang'ombe showed that exemplary lessons were the second best, Jitegemee showed that online learning materials were the best next to the expert. In the second design, teachers from Chang'ombe indicated high level of agreement with exemplary lessons, while teachers from Jitegemee showed high level of agreement towards the expert" (Ayoub, Petra, & Joke, 2013).

### 3. CONCLUSION AND RECOMMENDATIONS

We recommend that the partnerships should not only remain in teaching facilities but also in training of the trainers in this framework which is very important for module deliverers to provide adequate skills. Governments in Africa should establish pre-service institutes dedicated to training of trainers who would teach in technical and vocational schools at all levels of their qualification frameworks. Those in-service teaching staff who are not yet trained should be offered Technological and Pedagogical Training to enhance their teaching activities preparation and implementation. This would stop hiring employees who would not provide ineffective and inefficient output in the institutions' graduates production. Private sectors across Africa should invest in establishing training and consultancy companies that would upgrade the TVET tutors' level of TPACK.

Working hand in hand amongst TVET institutions will build strong partnerships towards meeting the Technical Universities and Polytechnics we want in Africa; effective and efficient, equipped with creative and innovative projects output, promoting Entrepreneurship and Youth empowerment and Employment.

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