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Assessment of the perception of TVET Tutors in Rwanda on their level of Technological, Pedagogical and Content Knowledge (TPACK): a Case of Integrated Polytechnic Regional Colleges (IPRCs)

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Abstract: This study entitled "**Assessment of the perception of TVET Tutors in Rwanda on their level of Technological, Pedagogical and Content** Knowledge (TPACK): a Case of Integrated Polytechnic Regional Colleges (IPRCs)", was conducted to assess the perception of TVET Tutors in Rwanda on their level of Technological, Pedagogical and Content Knowledge. The output of this study will be helpful in contributing towards Rwanda current educational goals assessment and implementation review for their achievements since it demonstrates the level of TVET tutors in relation to Technological Pedagogical and Content Knowledge. It also suggests possible solutions that among them TPACK training will facilitate to achieve its goals.The methodology that was used in data collection is descriptive survey. Purposive and stratified random were used as sampling techniques. Questionnaires were used as data collection instruments. The sample size was determined by Slovin's Formula as the population size is definite. 218 teaching staff were selected to answer to research questions. 192of them responded and returned questionnaires. The data collected was analyzed using SPSS software, to determine the tutors' perception on their level of TPACK. The study came up with the following findings: The results from the respondent showed that , the mean number of those who strongly agreed with the statements assessing their level of TPACK is 39.4 (20.6%), those who agreed are 33.8 (17.7%), neutral are 12.4 (6.5%), those who disagreed are 34.4 (18.2%) while 70.6 (36.8%) strongly disagreed. The rate is very high and varied from Neutral to strongly disagreeing respondents (between 6.5 and 36.8%). The negative attitude scale is high on a rate counting between 16.1 and 41.7% of all respondents. The mean range is between 6.5.0 and 36.8%. The above findings confirm that most of TVET tutors in Rwanda have a low level of Technological, Pedagogical and Content Knowledge (TPACK). It has been recommended that the government of Rwanda should establish a pre-service institute dedicated to training trainers who would teach in technical and vocational schools at all Rwanda Qualification Framework. Those in-service teaching staff 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 sector in Rwanda should invest in establishing training and consultancy companies that would upgrade the tutors' level of TPACK.

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I. INTRODUCTION

I.1 Background of the study

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 Rwanda. It also indicates the organs involved in the research and their role in the training. It refers much on the reports and Statistics related to Rwanda TVET as well as other published research studies on TPACK.

Rwanda is an independent country since 1962. It is a landlocked country surrounded by the United Republic of Tanzania in east, the Democratic Republic of Congo in west, the Republic of Burundi in south, and the Republic of Uganda in north of this country. After the 2012 population and housing census conducted in the whole country, the total population is ten million, five hundred and fifteen thousand, nine hundred and seventy three (National Instirute of Statistics of Rwanda, 2012).

Currently, the formal education in Rwanda is being regarded as the main pillar of the country development and the welfare of its people. In its article 2, paragraph number 8, the Organic Law organizing education in Rwanda states that amongst the mission of education in Rwanda, to train a Rwandan to be hard

working, perform properly the work, to save time, to be committed to work and to promote competence (Office of the Prime Minister, 2011). The same article, paragraph number 9 states that education also aims at organizing for the country, the necessary and sufficient human resources at each level of employment in accordance with the country's development level. The said human resources will be gained from the trainings conducted at different levels and types of education, including Technical Vocational and Education and Training (TVET).

For the effective implementation of the national policy guidelines for improving the practical skills of Rwandan residents for their employability and competitiveness on the labour market through an appropriate technical and vocational education and training system, the Workforce Development Authority (WDA) was established in 2009 (Office of the Prime Minister, 2009). It was established to implement the TVET Policy and regulate TVET providers.

Before 2009, the Technical Vocational Educational Training was conducted but there was no law reinforcing its implementation and its National Qualification Framework was not yet established. With the establishment of WDA, this field of training has taken a direction and it is now conducted basing on the Rwanda TVET Qualification Framework (RTQF) which is in place since June 2012. This will enable students to be efficient and competitive at the labour market. This efficiency is a result of the quality of the training which also depends on the teacher's capacity in delivering the courses through the integration of technology into pedagogy and content knowledge.

Referring to the Rwanda Ministry of Education, (MINEDUC), TVET history is not well documented. It is quite hard to know much about this development engine before the 1994 genocide against Tutsis. But there had been some types like: "Foyer for women established to train women in Culinary art & housekeeping, CERAR (Centre d'Enseignement Rural et Artisanal au Rwanda) that was in charge of training rural residents in different handcraft production services later replaced by CERAI (Centre d'ensegnement Rural et Artisanal Integré) in 1979 (Rwanda Ministry of Education, 2017). They also argue that CERAR and CERAI were a 3 years program for primary school leavers & failure. ETOs (Ecoles Techniques Officielles) were also established in 1979 for Technical secondary Education. At the moment there was no policy related to TVET that was available.

After the 1994 Genocide, the government established the CFJ and CFP for vocational training and ETOs were maintained for Technical Secondary Education. In this period, TVET was captured in the Rwanda National Policy and there were neither implementation guidelines nor the regulating entity. The Education Sector policy has been over changing due to some gaps in its implementation and other policies have been elaborated, as discussed earlier.

From 2008, the government adopted the TVET Policy and reforms of TVET in Rwanda started. Vocational Training Centres were introduced primary leavers to attend a 3 months to 3 years program in vocational training. Technical Secondary Schools were established for Technical secondary Education and Integrated Polytechnic Regional Centres (IPRC) /Polytechnics or TVET Higher Technical Education and Training Institutions. After the recent TVET restructuring, the Integrated Polytechnic Regional Centres and other polytechnics have changed their name and are now known as Integrated Polytechnic Regional Colleges. But the abbreviation is still the same (IPRCs).

Currently, Rwanda has 8 Integrated Polytechnic Regional Colleges around the country, 7,411 trainees and 724 trainers. In the 2003 Education Sector Policy, in its part 5, there are specific policy statements and associated implementation strategies stipulating that the Ministry of Education would offer pedagogical training/teaching methodology to students in technical and vocational tertiary education, so that these students upon graduation can teach at secondary level. On the other hand, in the 2017 Ministry of Education TVET skills development report, among the challenges facing TVET Sector, there is "Insufficient human capacity within the TVET system especially the **Training workforce**."

On top of 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 o 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.

As we discussed it earlier, WDA was established to monitor the teaching methods and train the concerned staff members who are mainly the teachers. Some staff members got in-service training, others went for Post Graduates Studies, but others have not yet received any training. Therefore, there is a skills gap in courses delivered by the teachers who have not yet gone for the trainings. Therefore, the students will be vulnerable of the poor performance of teaching staff.

Technology in Rwanda has evolved in most working sector. 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 the 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). This research will prove the extent to which Technological Pedagogical and Content Knowledge is being used to facilitate learning and acquisition of new behaviour in learners.

I.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 Rwanda, the Technical Vocational Education and Training is a field that has many trainers who are qualified in their respective domains but who have never acquired any technological and pedagogical knowledge to use while teaching since they are mainly not trained to teach. This is because in this country, there is 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 teachers, 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.

There are policies concerning Technical Education in Rwanda, Technical Teacher Training and other facilitations needed to conduct quality technical education and training, but the policy implementation is still a challenge. In its vision 2020, Rwanda has put emphasis on vocational and technical training in the field of technology, engineering and management (Republic of Rwanda, 2012). On the other hand, the Economic Development and Poverty Reduction Strategy II (EDPRS II) spelt out that the current approach to Capacity Building (CB) is holistic and focuses on capacity creation, capacity utilisation and capacity retention (MINECOFIN, 2013). This means that the government is concerned by the capacity of its servants. The skills they have must be complemented by other training related to their service. The teaching staffs in Integrated Polytechnic Regional Centres (IPRCs) are also concerned. They need to acquire the technological and pedagogical skills such that they deliver their courses appropriately. Though the other factors, apart from technological and pedagogical knowledge, contribute to the students' academic performance, this research intends to assess the impact of training on technological integration in the pedagogical knowledge and content mastery upon TVET tutors' performance in Rwanda.

In the study conducted to enlighten the teacher's perceptions upon the integration of ICT in teaching in Rwanda, it was advised to help teachers acquire different Technological Pedagogical Content Knowledge (TPACK) 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). Therefore, this study seeks to evaluate the impact of training on TPACK upon the tutors' performance in classroom. It is better to evaluate the perception, but it is best to evaluate the implementation of a particular idea.

I.3 The purpose of the study

The purpose of this research project was to investigate the level of Technological Pedagogical and Content Knowledge of the teaching staff in the Rwanda Integrated Polytechnic Regional Colleges.

I.4 Objective of the study

To assess the perception of TVET Tutors in Rwanda on their level of Technological, Pedagogical and Content Knowledge

I.5 Research hypothesis

Most of TVET tutors in Rwanda have a low level of Technological, Pedagogical and Content Knowledge.

I.6 Significance of the study

Rwanda Education Sector Strategic Plan spells out the mission, goals and objectives of education sector. They depict that the overall goal of education is "access to quality, equitable and effective education for all Rwandans". This study will be a baseline towards educational goals assessment and implementation review for their achievements since it demonstrates the level of TVET tutors in relation to Technological Pedagogical and Content Knowledge. It also suggests possible solutions that among them TPACK training will facilitate to achieve its goals.

II. LITERATURE REVIEW

II.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 & Koehrer, 2006).

II.2.Teachers level of Technology integration into Pedagogical and Content knowledge

Teaching is a multifaceted profession, which requires the integration of different knowledge domains. To enhance the quality of the integration of technology into our teaching, a broader conceptualisation of the use of the 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)

The currently available results of the survey that were conducted by Denise A. Schmidt et al, intend to have assessed the teachers' level of integration technology in pedagogy. They were focusing on self-assessment of the extent to which they use technology. They said that: "Teachers must have an intuitive understanding f the complex interplay between the three basic components of knowledge (CK, PK, TK) by teaching content using appropriate pedagogical methods and technologies (Denise, Evrim, Ann, Punya, Matthew, & Tae, 2009).

In their research, they results found upon the instrument they had designed to measure the preservice teachers' level of technology integration indicate that this is a promising instrument for measuring their self-

assessment of the TPACK knowledge domains. They only designed the survey instrument for preservise teachers but also inservice teachers should be evaluated using a similar or different instrument.

In a survey conducted on the level of TPACK of English Language instructors, by Naran Kayacan Köse, the findings stated that the participants were much competent in Content Knowledge (CK) since their highest mean about understanding the texts written in English. On the other hand, the lowest mean score was in Technological Pedagogical and Content Knowledge (TPACK) whereby participants didn't think that they were highly competent in integrating technology into their content teaching with sound pedagogy. These results demonstrated that teaching teachers master their subject content but it is quite hard for them to deliver it using technology (Naran, 2016).

The study conducted by Frank Bate and Dorit Maor proved that Pedagogical Knowledge (PK) takes precedence over other knowledge domains. Technological knowledge did not seem to be interesting and useful to early career teachers. They "hold a wide variation of beliefs, knowledge, perceptions of what ICT is, and how these can be harnessed in the classroom" (Frank & Dorit, 2010).

Even though it has been proved by the above findings, "Training the in-service teachers, teacher educators, and pre-service teachers is of foremost importance for the right use of technology which can go with the content and pedagogy. Training a teacher in using ICT is more crucial than acquiring a large number of computers. Teachers have to be trained to facilitate the learning process which is real, achievable, exciting, and nonthreatening" (Manchikanti, 2017). It is in this regard this research seeks first to assess the level of TPACK of tutors in Rwanda, second, train them and finally evaluate the impact of this training.

II.3. 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).

II.4. Technological Pedagogical and Content knowledge in Rwanda

Rwanda is country which is fast growing in terms of economy through different sectors. Education has become a key to the country development. Different efforts have been deployed to enhance the quality of education in Rwanda. Technology is at the heart of most of instructional policies implementation. Technical education is emerging since 2009. Even though all these efforts are being made, it quite hard to find available research related to TPACK in general, and no single baseline for researchers who want to conduct studies on TPACK in Technical vocational Education (TVET) in this country. It is in this regard that the researcher reviewed the few available articles on integration of ICT in teaching.

A study conducted to correlate Information Communication Technology with public primary schools' efficiency in Rwanda, a survey carried out in Nyagatare District, came out with results showing that ICT in primary schools is poorly used. It has also proved that there is a significant relationship between the use of ICT and primary schools efficiency in Nyagatare District (Munyengabe, He, & Zhao, 2018). The results showed that Information Communication Technology (ICT) integration in teaching and learning is important Rwandan primary schools.

Basing on the above research findings, researchers recommended that effective use of ICT tools in teaching and learning processes in primary schools is needed, promotion of the One Laptop Per Child Programme in all primary schools would help learners become familiar with ICT use and finally, teachers need to advance their technological knowledge of computers and other technological tools related to teaching and learning processes. They also argued the government of Rwanda to allocate ICT equipment equally in all schools and generate funds specifically for promoting the ICT use at the primary schools' level.

On the other hand, a survey was conducted on teachers' perceptions on ICT integration for enhancing Teaching and Learning through the Implementation of One Laptop Per Child Program in Primary Schools of Rwanda. The findings showed that "Teachers' perceptions on ICT show their interest to integrate ICT into teaching and learning processes…. Teachers also are aware that ICT will help learners to do their self-coaching and that teachers can use technology to illustrate and demonstrate new content" (Munyengabe, Zhao, He, & Hitimana, 2017). Due to lack of adequate skills to use ICT in teaching and learning process, lack of adequate technological equipment, infrastructure, teachers' motivation, teachers are facing challenges hindering them to effectively and efficiently deliver their subjects.

The studies conducted in Rwanda, African countries as well as globally proved that technology is a key factor to schools internal and external efficiencies. As depicted in the above literature review, TPACK has been proved important to effectiveness in teaching. Some studies showed that there were positive changes in their performance after attending training on TPACK. In Rwanda, it seems there is no enough research studies conducted to find out the relevance of TPACK domains towards the tutors' performance in general, TVET tutors, particularly.

It is in this regard, the research seeks to assess the perception of TVET Tutors in Rwanda on their level of Technological, Pedagogical and Content Knowledge.

III. RESEARCH METHODOLOGY

III.1. Research design

The research used the descriptive survey. The descriptive survey was used to collect and analyse data from a few sample considered to be representative of the TVET tutors in Rwanda. The purpose is just to assess the perception of TVET Tutors in Rwanda on their level of Technological, Pedagogical and Content Knowledge.

III.2. Target population

The research was conducted in Rwanda, and the target population was the Technical Vocational Education and Training Institutions. The accessible population will be 481 teaching staff members from four (4) different Integrated Polytechnic Regional Colleges (IPRCs).

III.3. Sample size

The sample size is determined by Slovin's Formula as the population size is definite. That formula is given and explained as follows:

$$n = \frac{N}{1+Na2}$$

Where:

a= level of significance or reliability level (equals to 0.05)

N: Population size

n: sample size.

The students sample size was: $\frac{481}{1+481*(0.05)2} = 218$

Thus, the sample size drawn from the target population of 481 is 218 teaching staff members. Note that only 192 responded and returned the questionnaires.

III.4. Sampling techniques

In Rwanda, There are 8 Integrated Polytechnic Regional Colleges (IPRCs). We used the non-probability sampling technique whereby we used the purposive sampling. Purposive sampling refers to the selection of sample on the basis of informed judgment that the group is likely to be representative. Four (4) IPRCs were selected as a sample of Technical Vocational Education and Training Institutions. This is because these institutions offer technical training at all levels of Rwanda TVET Qualification Framework. This sample represents the TVET institutions around the country- Rwanda.

The purposive sampling technique used the following inclusion criteria to qualify them in this: for the teacher/trainer-respondents (1) teaching any level of TVET in any subject; (2) from the selected institutions under the study; (3) not having received any previous training related to one of TPACK. The teacher/trainer-respondents were chosen in simple random sampling from the teaching staff.

III.5. Data collection Instruments

The study was conducted using questionnaires. The questionnaires were containing close-ended questions to allow the respondents not to deviate from the research objectives, to determine their attitude about their level of Technological, Pedagogical and Content Knowledge. Attitude scale method was used. This is a method called Likert Method of summated ratings. It consists of collecting a number of statements about a subject, and assigning a five-scale value to each of the responses.

IV. FINDINGS

The findings of this study are presented based on the research objective which was to assess the perception of TVET Tutors in Rwanda on their level of Technological, Pedagogical and Content Knowledge (TPACK).

The researcher used six questions to test the concerned respondents. The summary of respondents' views is presented in the following table. The question has been answered by all 192 respondents who returned the questionnaires.

TABLE N°1: Rwanda TVET tutors' level of Technological Pedagogical and Content Knowledge

Level of TVET Tutors' TPACK	SA (%)	A (%)	N(%)	D (%)	SDA(%)
I can help my students to understand the content knowledge of the subject I deliver through various ways.	54 (28.1)	27 (14.1)	9 (4.7)	33 (17.2)	69 (35.9)
I can use strategies that combine content, technologies and teaching approaches that I learned about in my coursework in my classroom.	37 19.3)	36 (18.8)	14 (7.3)	35 (18.2)	70 (36.5)
I can select technologies to use in my classroom that enhance what I teach, how I teach and what students learn	36 (18.8)	39 (20.3)	11(5.7)	39 (20.3)	67 (34.9)
I can teach lessons that appropriately	38 (19.8)	38 (19.8)	13 (6.8)	36 (18.8)	67 (34.9)

combine the course content, technologies and the teaching approaches					
I can provide leadership in helping others to coordinate the use of content, technologies, and teaching approaches at my school and elsewhere in the country.	37 (19.3)	29 (15.1)	15 (7.8)	31(16.1)	80 (41.7)
MEAN	**39.4 (20.6)**	**33.8(17.7)**	**12.4(6.5)**	**34.8(18.2)**	**70.6(36.8)**

Source: *primary data from respondents (developed 2019)*

As shown in table No1, the results from the respondents, the mean number of those who strongly agreed with the statements assessing their level of TPACK is 39.4 (20.6%), those who agreed are 33.8 (17.7%), neutral are 12.4 (6.5%), those who disagreed are 34.4 (18.2%) while 70.6 (36.8%) strongly disagreed. The rate is very high and varied for Neutral to strongly disagreeing respondents (between 6.5 and 36.8%). The negative attitude scale is also high on a rate counting between 16.1 and 41.7% of all respondents. The mean range is between 6.5.0 and 36.8%.

V. DISCUSSION OF THE RESULTS

This section deals with the major findings of the study and its significance to the area of knowledge in the light of previous studies that either support our findings or differ from them. To discuss results in a logical and clear way, the research objectives are referred to.

As stated in the literature review, research studies found out that tutors are equipped with content knowledge but have little knowledge related to Technology and Pedagogy. In a survey conducted on the level of TPACK of English Language instructors, by Naran Kayacan Köse, the findings stated that the participants were much competent in Content Knowledge (CK) since their highest mean about understanding the texts written in English. On the other hand, the lowest mean score was in Technological Pedagogical and Content Knowledge (TPACK) whereby participants didn't think that they were highly competent in integrating technology into their content teaching with sound pedagogy. These results demonstrated that teaching teachers master their subject content but it is quite hard for them to deliver it using technology (Naran, 2016).

TVET tutors in Rwanda are technicians and have full knowledge of the subjects they teach but they are not equipped with Technology integrated to pedagogy. Their Pedagogical Knowledge level is low. As it has been found out in the survey results shown in Table N°1, the majority of the respondents disagreed and strongly disagreed ((18.2+36.8)&) on most of the questions that were asked by the researcher to test their attitude about the TPACK knowledge. There is also a big number of respondents who were uncertain of their knowledge (6.5%). Those respondents couldn't know whether they can integrate technology in their teaching approaches in their content knowledge. Therefore the results confirm that most of TVET tutors in Rwanda have a low level of Technological, Pedagogical and Content Knowledge (TPACK).

Basing on the above results, there is a gap of knowledge and this may result into poor performance of both tutors and students. This can be proven by the study cited in this paper literature review where researchers correlated Information Communication Technology with public primary schools' efficiency in Rwanda, a survey carried out in Nyagatare District, and came out with results showing that ICT in primary schools is poorly used. It has also proved that there is a significant relationship between the use of ICT and primary schools efficiency in Nyagatare District (Munyengabe, He, & Zhao, 2018). The results showed that Information Communication Technology (ICT) integration in teaching and learning is important Rwandan primary schools. These results are cross cutting since, not only primary school teachers need ICT integration, but also other teaching staff at all educational level.

VI. CONCLUSION AND RECOMMENDATIONS

The purpose of this research project was to investigate the level of Technological Pedagogical and Content Knowledge of the teaching staff in Rwanda. . It was conducted in Integrated Polytechnic Regional Colleges (IPRCs). Amongst 218 selected respondents sampled from the target population of 481 teaching staff members, 192 responded and returned the questionnaires (88%). All the respondents were above 18 years old. Among them, there were 82.3% of male and 17.7% of female staff. Through the primary data from respondents, the results showed that most of TVET tutors in Rwanda have a low level of Technological, Pedagogical and Content Knowledge (TPACK). The research confirmed the hypothesis and it filled in the gap from the previous surveys and it is a baseline for further studies since it needs to demonstrate future tutors' performance and attitude after TPACK training.

Basing on the outcomes of the research, the researcher recommends the following that aim at further improvement tutors' performance in Rwanda. The government should establish a pre-service institute dedicated

to training trainers who would teach in technical and vocational schools at all Rwanda Qualification Framework. Those in-service teaching staff 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 sector in Rwanda should invest in establishing training and consultancy companies that would upgrade the tutors' level of TPACK.

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