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Influence of Human Factors on Integration of ICT in Teaching and Learning in TVET Institutions in Mechanical and Automotive Engineering Departments in Uasin Gishu County

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Abstract

The study focused on integration of ICT in teaching in Technical and Vocational Education and Training (TVET) institutions. Integration of ICT is of great importance as it motivates learners, promotes knowledge retention, and increases collaboration among learners among other benefits. Mechanical and Automotive Engineering departments were selected because of their high student population hence it was more representative and also complexities in their practicals. The Eldoret National Polytechnic and Rift Valley Technical Training Institute were selected in this study because the two institutions have the highest number of trainees in the departments of Mechanical and Automotive Engineering in the County. The objective of this study was to: determine the influence of human factors on integration of ICT in teaching and learning. Rodgers' theory of Diffusion of innovation informed the study while Questionnaires was used to collect data. The target population consisted of trainees and trainers. The sample size for the trainees was 384 which was calculated by fisher's formula and was selected using the simple random sampling whereas trainers were selected using purposive sampling. Data was analyzed by use of descriptive and inferential statistics and Statistical Package for the Social Sciences software. The study findings revealed that few of the trainers had effective basic ICT training. 27.45% affirmed that ICT training at their former training institution has been helpful while the majority 72.55% had a contrary opinion. The study in general concludes that there is limited use of ICT in teaching at the two institutions. The study recommends regular in-service training for trainers and other stakeholders in order to improve their skills as technology is a highly dynamic field, motivate trainers using incentives to use ICTs in the teaching process and use organizations and women charters i.e., WiTED to encourage the female trainers to embrace technology for teaching.

Key Words: ICT, Integration, Pedagogy, Diffusion

Background of the Study

One of the recent changes in the world today is the emergence of Information and Communication Technologies (ICTs) during the second half of the 20th century, in which the computer and the internet are now being highly used to procure, process, store, communicate and apply information/knowledge. With the emergence of this information age, the world has become a global village with global interconnectedness (Adewunmi, 2012). Many societies in the developed as well as in the developing countries are using these devices to build up knowledge as a new weapon for rivalry and growth, for example, fighting against poverty, access to education and health services, transformation and modernization of the economy, the government and the entire society (Hare, 2007). Castells (2001) says that, ICTs act upon all domains of human activity and make it possible for endless connections to be established between different domains, as well as between elements and agents of such activities.

Even though Oliver (2003) asserted that education in particular has not actually felt the impact of ICTs, the situation has changed from then and today, health education, economic education, engineering education, military education, now depend on the new ICTs for research, communication, and application of research results. Ayoo (2009) remarks that ICTs at the same time continue to impact on all aspects of contemporary education, requiring tertiary education institutions and stakeholders to be linked to each other through an advanced network that is connected to the global village. Trainees and teachers, and researchers now interact online without necessarily meeting face-to-face frequently. Some universities today operate as virtual universities or with virtual libraries. The new technologies have led to the development of off-campuses degree programs, new forms of learning in different environments or settings. For instance, today we hear of the use of e-learning, blended learning, and open and distance learning.

ICT Integration in Technical Training

The technical education sector in Africa has suffered from many deficiencies including quality training, contents, infrastructure, environment etc. Several challenges are likely to be encountered when integrating ICT with CBET training. The challenges according to this research includes but not limited to lack of proper policies on the use of ICT in training, inadequate training of lecturers on the use of ICT in training, negative attitude of lecturers towards the use of ICT in training and lack of continuous updating of these ICT skills amongst the lecturers. African TVET institutions cannot participate in the global competency-based education training revolution if the trainers and learners lack ICT skills on

their instructional activities, inappropriate instructional materials to meet the objectives of training and learning, inadequate motivational techniques to increase the interest to learn. Also lack of training of the lecturers on use of ICT in training is a major barrier to improve the quality of the technical and vocational education training.

Government should provide enough budgets to ensure the requirement of ICT tools and machineries for each classroom also formulate proper policy to train up the lecturers for their respective field as well as in ICT. Lecturers' motivation is a critical factor in use of ICT adoption (Songa, 2015).

All these indicate that there is an existing knowledge gap as far as the use of ICTs in teaching in African tertiary education in concerned. This study is sought to contribute to this knowledge gap.

Statement of the Problem

Computers are spreading rapidly in schools not just in developed countries, but increasingly in developing ones as well. However, although schools have had computers for over two decades, ways to use them effectively have evolved slowly. Technological revolution in schools has been beset by theoretical inadequacies that have kept educational technology at the margins of the established educational system. Research findings in Kenya have revealed that there are ICT facilities in the TVET sector such as computers, computer laboratories, internet connections, alongside the traditional methods of telecommunication. Further research has revealed that teachers do not make real use of ICTs at their disposal hence weak integration and usage in classroom activities-teaching and learning. Most TVET institutions in Kenya are in the rural areas and they face a number of challenges including; high levels of poverty, limited rural electrification and frequent power disruptions, inadequate connectivity and network infrastructure. This creates a digital divide between the rural and the urban. Failure to take full advantage of the opportunities offered by technological advances to education for massive expansion represent a drastic lag in skilled innovative manpower narrowing the possibilities for individual activities in areas of business, research,. The study sought to establish the factors that affect the integration of ICT in TVET institutions in Uasin Gishu County.

Objectives of the Study

The main objective of this study was to investigate the human factors that influence integration of ICT in teaching and learning in TVET institutions in Uasin Gishu County. They are professional development, ICT competency, teaching experience and gender.

Research question

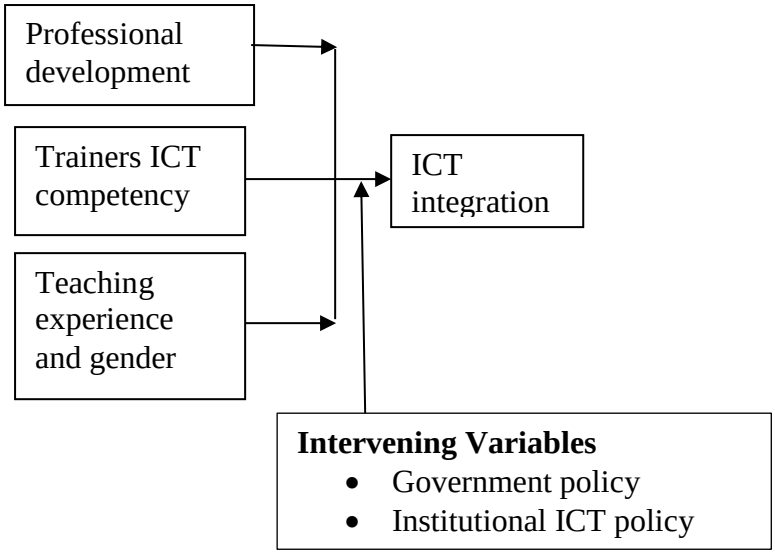
i. How does professional development, ICT competency, teaching experience and gender influence integration of ICT in teaching and learning at TVET institutions in Uasin Gishu County?

Theoretical framework

The study was based on Roger's theory of Diffusion of Innovations**.** The theory seeks to explain how, why, and at what rate new ideas and technology spread through cultures. Diffusion research centers on the conditions which increase or decrease the likelihood that a new idea, product, or practice is adopted by members of a given culture or a social system. This was extended by Rogers (2003) hence at present is commonly known as Roger's theory of diffusion of innovation

Conceptual Framework

Independent Variables **Dependent Variable**



Literature Review

Integration of ICT in TVET in Kenya

The Kenya Vision 2030 is a vehicle for accelerating transformation of our country into a rapidly industrialized middle-income nation by the year 2030. TVET has emerged as one of the most effective human resource development strategies that Kenya need to embrace in order to train and modernize their technical workforce for rapid industrialization and national development. The argument is that in order for technical and vocational education to effectively support industrialization, skills training must be of high quality and competency-based (Wanyeki, 2012).

It is anchored on the following foundations; macroeconomic stability, continuity in governance reforms, enhanced equity and wealth creation opportunities for the poor infrastructure, energy, STI, land reforms, human resource development, security and public sector reforms (Republic of Kenya, 2007). All this is achievable by producing a globally competitive work in TVET. As noted by Wanyeki (2012), Vision 2030 has made it clear that Kenya must be industrialized by the year 2030. Simply put, it is having highly developed tertiary and quaternary sector of industries. It is also important to note that development in a country is also based on human resource development index. This will be done through specialized training at different levels; community polytechnics, and the technical, industrial, vocational and entrepreneurship (Republic of Kenya, 2007)

The government through the ministry of ICT has come up with a National ICT policy that is missioned to facilitate universal access to ICT infrastructure and services all over the country. The policy objectives are as follows; create infrastructure conditions that enable the use of always-on high speed, wireless internet across the country, facilitate the creation of infrastructure and frameworks that support the growth of data centers, pervasive instrumentation, machine learning and local manufacturing while fostering a secure, innovation ecosystem, position the country to take advantage of emerging trends by enhancing our education institutions and skills of our people and gain global recognition for innovation, efficacy and quality in public service delivery.

Factors Influencing Integration of ICT in TVET Institutions

Human Factors

Professional Development

Teachers' professional development is a key factor to successful integration of computers into classroom teaching. Studies have revealed that whether beginner or experienced, ICT related training programs develop teachers' competences in computer use (Bauer & Kenton, 2005). Buabeng-Andoh (2012) mentions that the quality professional training program helps teachers implement technology and transform teaching practices (Brinkerhoff, 2006; Diehl, 2005). Perienen, A. (2020) reported that teachers reiterated the need to be adequately trained in the pedagogical integration of ICT. Li, et. al(2019). Conducted a study and the result shows that six teacher level factors that are important for the ICT integration have been improved over time through professional development activities. This provides supporting evidence to educational practitioners for the implementation of effective professional development programs to promote ICT integration in education.

Trainer's ICT Competency

Research has shown that teachers require expert in technology to show them the way to integrate ICT to facilitate trainees' learning (Plair, 2008). Educators who integrate technology with new teaching practices gained through professional training can transform the performance of the trainees (Lawless & Pellegrino, 2007). Teachers who are committed to professional 12development activities gain knowledge of ICT integration and classroom technology organization (Wepner et al., 2006). Training programs for teachers that embrace educational practices and strategies to address beliefs, skills and knowledge improve teachers' awareness and insights in advance, in relation to transformations in classroom activities (Levin & Wadmany, 2008).

Teaching Experience

In a survey of almost 3000 teachers, Russell et al. (2007) argued that the quality of ICT integration was related to the years of teacher service. Gorder (2008) reported that teacher experience is a crucial factor influencing teachers' adoption and integration of ICT significantly correlated with the actual use of technology. In her study, she revealed that effective use of computer was related to technological comfort levels and the liberty to shape instruction to teacher-perceived student needs. Further, Lau and Sim (2008) conducted a study on the extent of ICT adoption among 250 secondary school teachers in Malaysia. Their findings revealed that older teachers frequently use computer technology in the classrooms more than the younger teachers. Goh & Sigala (2020) also reported that teachers with fewer years of teaching experience might be more likely to integrate technology into their teaching endeavor.

Gender

Markauskaite (2006) investigated gender differences in self-reported ICT experience and ICT literacy among first year graduate trainee teachers. Males' scores were higher. Similarly, in research conducted by Kay (2006), he found that male teachers had relatively higher levels of computer attitude and ability before computer implementation, but there was no difference between males and females regarding computer attitude and ability after the implementation of the technology. Palomares-Ruiz et. al(2020) in a study, reported that girls have more difficulties than boys in managing ICTs expertly. Another survey conducted at Najran University, Saudi Arabia obtained results indicating female teachers reported less use of ICT in their instruction than male teachers, Mahdi & Al-Dera (2013). Pozas & Letzel (2023) also

report that male pre-service teachers hold more positive attitudes towards ICT use than their female counterparts.

Research Methodology

Non-experimental descriptive survey design was used. The target population consisted of trainees and trainers at The Eldoret National Polytechnic and Rift Valley Technical Institute. 384 trainees were sampled while all of the trainers were used as the sample because of their small numbers. The sample size for the trainees was calculated using the Fisher's formula (2004) as cited by Mugenda and Mugenda (2003) also both stratified random and purposive sampling were used. Data was collected using questionnaires. Validity was established expert judgment of other experienced researchers. A pilot study was conducted to test reliability and a reliability index of 0.89 was obtained, the scores were checked against a 0.5 level of significance and therefore found to be reliable few corrections were made on the questions that were unclear.

Findings and Discussion

Professional Development

Table 2 Trainers perception on professional development

Statement		Yes	No
Do you have Certificate Proficiency packages in ICT?	F (%)	39 76.47	12 23.53
Can you say you ICT training at your former training institution has been helpful	F (%)	14 27.45	37 72.55
Have you attended any ICT in service training recently?	F (%)	8 15.69	43 84.31
Was it institutionally organized	F (%)	0 0	8 100

According to Table 2 above, the respondents were asked whether they have Certificate Proficiency packages in ICT and 76.47% had it while 23.53% didn't have it. This indicates that most the trainers had basic ICT training. They were also asked if ICT training at their former training institution has been helpful and 27.45% affirmed while 72.55% rejected it.

This implies that most of the trainers gained little knowledge on ICT from their former training institutions. Concerning in service training, 15.69% were trained while 84.31% had no in service training. All the trainers who had in service training had facilitated themselves. This indicates that none of the institution had facilitated ICT in service training for their trainers.

These findings agree with the works of Junejo *et al* (2018) that was conducted in Indonesia whose objective among others was to establish the perception of teachers on in-service training also, with that conducted by Ahmad & Razali (2009) which established the relationship between in-service training with students' achievements at TVET institutions in Malaysia.

Trainers' ICT competency

Table 3 Trainers use of ICT Applications

Statement	**Frequency**	**Yes**	**No**
Use of learning applications for simulations and research	F (%)	13 25.49	38 74.51
Use of collaborative tools	F (%)	6 11.76	45 88.24
Create podcasts and videocasts for learners to access	F (%)	2 3.92	49 96.08
Use of remote communication application	F (%)	22 43.13	29 56.86
Use of presentation packages	F (%)	49 96.08	2 3.92
Creating softcopy learning materials	F (%)	51 100	0 0

From Table 3, it can be deduced that 25.49% of trainers could use of learning applications for simulations and research while 74.51% were unable to use it. 11.76% could make use of collaborative tools while 88.24% were unable to use it. 3.92% could create podcasts and videocasts for learners to access while 96.08% were unable to do it. 43.13% could make use of remote communication application while 56.86% could not use it. 96.08% of the trainers could use of presentation packages while 3.92% were not conversant with it.

These findings indicate that the trainer's ICT competency is wanting as they are mostly competent in the most basic skills. This is a contributing factor to the low usage of ICT in teaching and learning in TVET institutes.

The findings of this study agree with research conducted by Cuckle et al.(2000) which found teachers to be most competent in word processing compared to other applications.

4.3.3 Teaching Experience and Gender

Table 4 Trainers' Perception

Demographic Information			Yes	No
Gender	Male	F	13	26
		%	32.50	65.00
	Female	F	2	9
		%	18.18	81.81
Working experience				
	<5 years	F	14	2
		%	87.50	12.50
	6-12 years	F	7	12
		%	36.84	63.16
	Above 12 Years	F	1	14
		%	6.67	93.33

The findings in Table 4. concerning teaching experience reveal that 87.50% of trainers with a working experience of less than 5 years embraced use of ICT in teaching while 12.5% didn't use ICT in teaching. 36.84% of trainers with a working experience of between six and twelve years embraced use of ICT while 63.16% did not technology to teach. 6.67% the most experienced trainers use ICT to teach while 93.33% while did not use technology in teaching. This indicates that younger trainers embraced use of ICT more than the experienced trainers. Kushnir et. al (2014) agrees with this finding. It reveals that 'School teachers of the future are coming from a new generation. This generation is fluent and even unseparated from digital devices

Concerning gender, the findings reveal that 32.50% of the male trainers use ICT teaching while 65% don't make use of it. 18.18% of female trainers while 81.81% don't make use of ICT. This implies more male trainers use ICT as compared to their female counterparts this is in agreement with Burnett et.al., (2006) conducted a study on teachers' integration of ICT in schools in Queensland State. Results from 929 teachers indicated that female teachers were integrating technology into their teaching less than the male teachers.

Conclusions

The findings reveal that trainers have basic ICT training, they hardly benefited from ICT training in their former institutions of training and they have hardly participated in in-service training in the ICT field. Further, trainer's ICT competency level is wanting as they are mostly competent in the most basic skills such as word processing. The study also revealed that younger trainers embraced use of ICT more than the experienced trainers more so male trainers use ICT as compared to their female counterparts.

Recommendations

Based on the research findings and the discussion, the study formulated recommendations; TVET institutions and the government under the public service commission should provide regular in-service training for trainers and other stakeholders in order to improve their skills as technology is a highly dynamic field, motivate trainers using incentives to use ICTs in the teaching process and use organizations and women charters i.e. WiTED to encourage the female trainers to embrace technology for teaching.

Suggestions for Further Research

Further research should be carried out to find out other factors that affect ICT integration, assess the impact of ICT integration for instruction on TVET education and to ascertain the positive influence of the use of ICTs in the teaching and learning process.

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