

Trainers' Preparedness on the Integration of Information Communication Technology in the Instructional Process of Engineering Courses in National Polytechnics in Kenya

Mutai Cheruiyot Daniel, and Ongeti Khaemba

ABSTRACT

Educational institutions are under increasing pressure to integrate Information Communication Technology (ICT) in the instructional process as they prepare trainees for the job market in the 21st Century and trainers significantly contribute to this as the implementers. This paper reports a study that aimed at investigating trainers' preparedness on the integration of Information Communication Technology (ICT) in the instructional process of engineering courses in national polytechnics in Kenya. The research objectives were to find out the perception of trainers on ICT integration; and the level of ICT knowledge and skills of trainers. The study was guided by the mixed method research methodology and the descriptive survey research design. Stratified and simple random sampling methods were used to select forty eight trainers from three national polytechnics in Kenya from Mechanical, Electrical, Building and Automotive departments. Purposive sampling was used to select the three principals and three heads of the departments. Data was collected using questionnaires and interview schedules and analyzed using descriptive statistics and thematic analysis techniques respectively. The findings revealed that the trainers were willing to participate actively in integrating ICT in the instructional process and thus had positive perceptions. In addition, over 80 % of trainers were practically competent in the general use of ICT but minimally integrated ICT in the instructional process. The study recommended that national polytechnics should take advantage of the positive perception by trainers and formulate a policy on ICT integration in the instructional process in line with the existing government policies. Another recommendation was that national polytechnics should undertake capacity building for trainers on ICT integration in the instructional process. The findings of this study will be significant in policy formulation on ICT integration in education in Kenya and elsewhere.

Keywords: ICT integration in education, trainers' perceptions; trainers' knowledge and skills

Published Online: January 30, 2021

ISSN: 2736-4534

DOI: 10.24018/ejedu.2021.2.1.38

Mutai Cheruiyot Daniel*

Moi University & Principal - Rift Valley Institute of Science and Technology, Kenya

(e-mail: danmutai74@yahoo.com)

Ongeti Khaemba

Moi University, Kenya

(e-mail: Khaembaongeti@yahoo.com)

*Corresponding Author

I. INTRODUCTION

Kenya like other developing countries is still in the initial stages of integrating Information Communication Technology (ICT) in the instructional process. Though it is facing a number of barriers, there are many factors influencing the use of ICT to make teaching and learning effective in technical institutions in Kenya. ICT is used as an electronic medium of capturing, processing, storing, communicating information. The use of ICT in the classroom teaching and learning is very essential for it provides opportunities for trainers and trainees to operate, store, manipulate, and retrieve information, encourage independent and active learning, and self-responsibility for learning such as distance learning, motivate teachers and students to continue using learning outside school hours, plan and prepare lessons and design materials such as course content

delivery and facilitate sharing of resources, expertise and advice. This versatile instrument has the capability not only of engaging trainees in instructional activities to increase their skills, but of helping them to solve complex problems to enhance their cognitive skills notes Jonassen & Reeves (1996).

According to Pernia (2008), ICT is seen as technologies used to communicate in order to create, manage and distribute information. In a broad sense, ICTs includes computers, the internet, telephone, television, radio and audio-visual equipment. Furthermore, ICT is any device and application used to access, manage, integrate, evaluate, create and communicate information and knowledge. Review of Literature by Tedla (2012) reveal that the successful integration of ICT in the teaching and learning largely depends on teacher perceptions, teacher knowledge and skills, availability of ICT infrastructure and teachers' adoption and embrace of ICT in education.

Trainers play a key role in ensuring effective integration ICT in the instructional process as they are the key implementers of the school curriculum. Trainers' preparedness on ICT integration in the instructional process therefore, calls for further investigation as ICT integration in education is an innovation with significant benefits observes Akbaba-Altun (2005). According to Gülbahar (2007); Kim and Hannafin (2011) using technology in educational settings greatly benefits the students. There is great need for ICT integration in Technical Vocational Education and Training (TVET) as the world of work according to Rojewski (2009) 'requires knowledgeable workers skilled in information technologies'. According to Zarini et al (2009) ICT facilitates the development and the strengthening of TVET around the world by enhancing networking and knowledge sharing opportunities. In light of these facts, TVET institutions need to set up and strengthen their commitment towards training and produce ICT operation compliance graduates or products that will match up with industry trends in the modern workplace.

According to findings by Zimmerman (1989), the perception of trainers on the use of ICT is a major barrier. Similarly, Cassim and Obono (2011) found that the correlation of teachers' belief and the use of ICT are high. The integration of ICT in teaching and learning is greatly influenced by trainers' attitude and acceptance of the usefulness of the technology as observed by Akbaba (2005). In addition, in order to integrate ICT in classroom, trainers must be knowledgeable and skilful in ICT. According to Cavas et al (2009), there are significant positive relationship between trainers' ICT skills and the frequency of the Technology use in instruction rooms. It is confirmed by Agyei and Voogt (2011) that ICT skills are exclusively important for effective application of the technology and is the strongest predictor of ICT integration in the classroom or instruction rooms. This study therefore sought to examine trainers' preparedness on the integration of Information Communication Technology (ICT) in the instructional process of engineering courses in national polytechnics in Kenya.

A. Research Purpose and Objectives

The research purpose for the study was to investigate trainers' preparedness on the integration of Information Communication Technology (ICT) in the instructional process of engineering courses in national polytechnics in Kenya. The research objectives were to find out:

1. The perception of trainers on ICT integration in the instructional process of engineering courses in national polytechnics.
2. The level of ICT knowledge and skills of trainers with respect to in the instructional process of engineering courses in national polytechnics.

II. METHODS AND MATERIALS

This study used a mixed method research approach which is an integration of quantitative and qualitative research. This is a method that involves broader or wider aspects of data collection. The goal of mixed methods research is to draw on the strengths and minimize the weaknesses of both types of research approaches states Connelly (2009). Stratified and simple random sampling methods were used to select forty eight trainers from three national polytechnics in Kenya from Mechanical, Electrical, Building and Automotive departments. Purposive sampling was used to select the three principals and three heads of the departments. The three national polytechnic selected were from Nairobi County, Kisumu County and Uasin Gishu County in Kenya. Data was collected using questionnaires and interview schedules and analyzed using descriptive statistics and thematic analysis techniques respectively.

III. RESULTS AND DISCUSSIONS

This section presents the results and discussions for the study.

A. Findings on the Perception of Trainers on ICT Integration in the Instructional Process of Engineering Courses in National Polytechnics

The first research objective was to find out the perception of trainers on ICT integration in the instructional process of engineering courses in national polytechnics. The trainers' perception on ICT integration in ICT was measured through a likert scale and the results are presented in Table I.

TABLE I. DESCRIPTIVE RESULTS FOR LEVEL OF TRAINERS' PERCEPTION

Statements	Strongly Agree		Agree		Disagree		Strongly Disagree	
	N	%	N	%	N	%	N	%
1. I continuously use ICT to teach Engineering	11	26	10	24	18	43	3	7
2. I can use ICT effectively to teach Engineering, however demotivated by the trainees	8	19	14	33	17	41	3	7
3. I have the readiness to use ICT in teaching Engineering lesson	21	50	17	40	3	7	1	2
4. I have the skills to teach engineering using ICT, however lack time to prepare	10	24	17	40	11	26	4	10
5. I feel I am able to motivate students to use ICT in learning Engineering	17	40	21	50	4	10	0	0
6. I am willing to learn new ICT related stuff	26	62	13	31	3	7	0	0
7. Heel traditional method is more effective than the integrated method	3	7	3	7	22	52	14	33
8. I feel technology related teaching is more effective than the traditional method	15	36	14	33	8	19	5	12
9. I feel combining technology and traditional methods is more effective	20	48	18	43	3	7	1	2

The results presented in Table 1 show that 90% of the respondents stated that they felt ready to use ICT in teaching an engineering lesson. However, only 50% of trainers continuously used ICT in teaching engineering courses. In addition, 64% of the respondents felt that they had skills to teach engineering courses using ICT, but lacked time to prepare. 52% of the respondents agreed with the statement that they could use ICT effectively to teach engineering courses, however demotivated by the trainees.

It is worth noting that 93% of respondents were willing to learn new ICT related materials. In addition, 90% of trainers stated that they had the ability to motivate their students to use ICT in learning engineering courses. This willingness of trainers to embrace new skills in ICT ideas, and to motivate their trainees to use ICT in learning, is a clear pointer that trainers had a positive attitude.

There was a general consensus among trainers that an integrated teaching method is more effective than traditional method. Furthermore, 91% of the respondents felt that combining technology and traditional methods is more effective. This perceived notion – that technology has a positive impact compared to traditional teaching – is another good indication that trainers had positive attitudes towards technology use in teaching.

Interviews with administrators of the various engineering departments revealed that of the 10 administrators interviewed, eight reported that trainers in their departments used ICT to prepare and maintain their teaching records. In the discussion, it was noted that a small percentage of the trainers used ICT tools during the lesson delivery. Those trainers who used ICT consistently stated that it had made their work easier, especially

teaching abstract content in their area of specialization. Learning concepts that were delivered through ICT were well received and well understood.

This confirms the study of Lemke et al (2009), who found that technology is more likely to be adopted by trainers and institution if it champions the existing practices. The study findings concurred with research findings by Zhao and Frank (2003) which averred that trainers were willing to develop their skills in the use of technology to increase their confidence in integrating the ICTs in their lessons.

B. Findings on the Level of ICT Knowledge and Skills of Trainers with Respect to in the Instructional Process of Engineering Courses in National Polytechnics

The second research objective was an investigation of the level of ICT knowledge and skills of trainers with respect to in the instructional process of engineering courses in national polytechnics.

The level of trainers' proficiency was sought and findings presented in Figure 1.

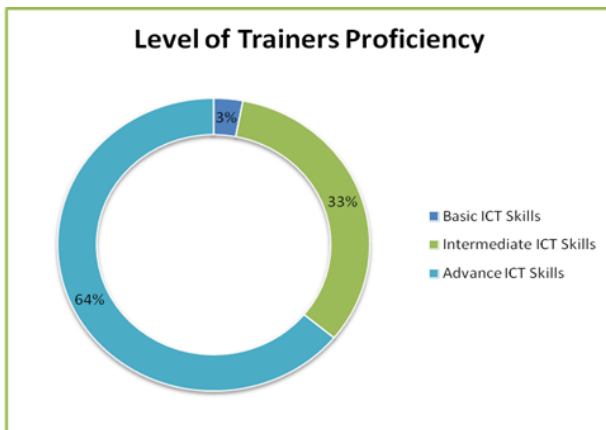


Fig. 1. Trainers' level of proficiency in ICT

Figure 2 indicates the level of computer proficiency comprising of three levels advance, intermediate and beginner. The displays shows that (27) 64% of the engineering trainers were proficient in advanced ICT skills and reported that their computer proficiency was good while (14) 33% reported to be moderately proficient in computer Intermediate ICT skills. Computer proficiency is the ability to use digital technology networks, and to define access, manage, integrate, evaluate, create, and communicate information ethically and legally in order to function in a knowledge society. This implies that for every 100 trainers in engineering courses, 64 have computer literacy computer skills is the knowledge and ability which allows one to use computers and related technology. The proficiency skills were categorized into three specific ICT levels namely Basic ICT Competency Skills, Internet Skills, Multimedia Skills and Advanced ICT Skills. Basic ICT Competency Skills are a group of ICT skills in the most widely used applications such as word-processing, spreadsheets, and presentation. They are skills necessary for generating textual, organization and presentation of digital information. Internet Skills would refer to a group of skills related to transmitting and exchanging ideas and working with others remotely through technology while Multimedia Skills are group of skills that involves creating and manipulation of digital images and videos which involves creating, editing, and publishing them. Advanced ICT Skills on the other hand are skills that relate to creating ICT software, database management, and analysis of research data. Trainers ICT skills levels comprised of the ability to use: word processor, Microsoft Excel, power point Presentation and internet to research and communicate.

The trainers' competency in ICT was sought and findings presented in Figure 2.

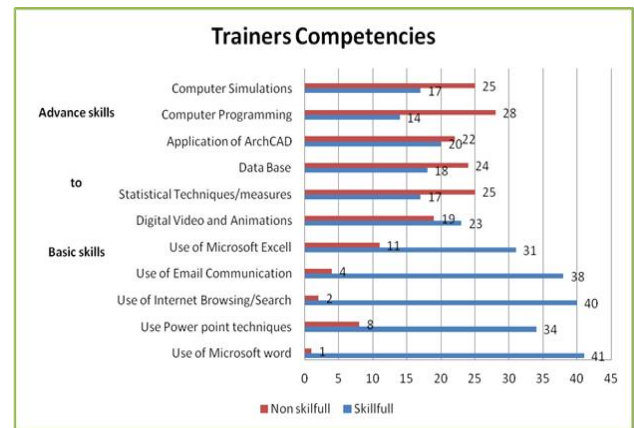


Fig. 2. The levels of trainers' competency

The bars in figure 2 shows a total (41) 93% of the trainers reported that they were very skillful in using Word processor application and (31) 74% of the respondents reported that they were very skillful in using Spreadsheet application (Microsoft Excel) while (34) 81% were very skillful in preparation and using power point presentation application. This is an indication that averages over 70% of engineering trainers were knowledgeable and skilled in using this set of basic ICT applications.

Skills in basic ICT applications are perceived to be minimum competence in computer basic applications. The implication of these results is that a majority of the trainers have got basic skills to perform common operations using a computer. This data reveals that the trainers have the capacity to use word processor to develop an excel sheet display and can carry out the presentation comfortably. A total of (40) 95% of the respondents reported that they were skillful using internet to search and communicate. These results give a clear indication that a majority of the trainers in the engineering had well developed skills in using and accessing internet resources. This implied that a majority of the trainers can effectively use ICT online tools to disseminate and access information. The trainers are not limited by technology to access new knowledge being developed in the global economy.

The multimedia skills comprised of the ability to use Digital Video and Animation, Computer Simulations, Computer Aided Design and Drafting and the use of digital images. Multimedia group of skills are the abilities necessary for generating and editing audio-visual objects that is videos and images using computer. The results in showed that a total of 54% of the respondents reported to be skilled in using digital video and animation. 43% of the respondents reported that they are skilled in using computer simulations. 47% of the respondents reported to be skilled in using Computer Aided design and Drafting software. 54% of the respondents stated that they skilled in using the digital images. On average the result indicated that slightly less than half (49%) of the trainers are skilled in using multimedia. This implies that more than half of the trainers were able to use digital images and video in the classroom or rather they were literate in multimedia skills. The multimedia skills are rated as specialized ICT skill which requires manipulations of computer operations. The Trainers Advance ICT Skill level category included the ability to use statistical measurement, database and programming language being the fourth class.

The fourth category indicates three skill areas which can be considered technical in nature that required advanced skills of using computer. The results show 40% of the respondents were skilled in using statistical measurement, 43% in using database and 30% using programming language. In summary, other than basic ICT and internet skills, all other ICT skill areas; Multimedia had less than 50% skilled respondents.

In a study conducted by Mwangi (2013) in a tertiary institution found out that trainers' lack adequate knowledge and skills in both content and pedagogy. The limited knowledge and skills of the trainers also limits the potentials to use the technology for teaching and learning according to Nunes & Gaible (2002). The research results were found to be in-line with the findings of Postman (2000) that integrating technology in classroom is commonly not accepted among scholars because of lack of competence.

The trainers' use of ICT in various teaching and learning activities was sought and the findings presented in Figure 3.

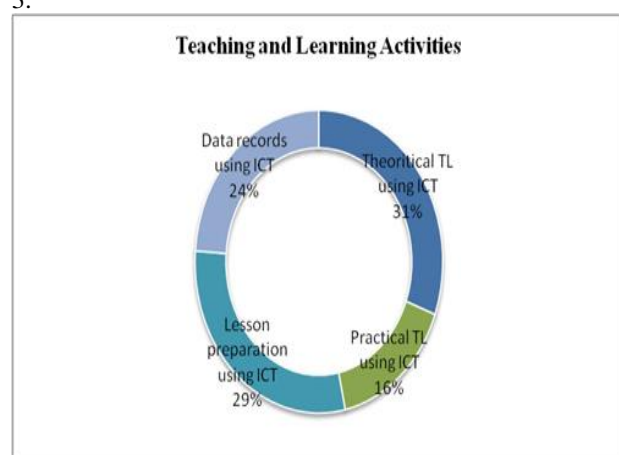


Fig. 3. The levels of Teaching Activities

Figure 3 shows results of trainers' ICT capacities to integrate ICT in various teaching and learning activities. The results revealed that across all the teaching and learning activities, the application of ICT tools is significantly low. 27% of the respondent use ICT in theory lesson, 14% in practical lesson, 21% for recordkeeping and 38% for lesson preparation. This is an indicator that there is observed low use of ICT in teaching and learning in the national polytechnics. The level of ICT competency and confidence encourages and motivates trainers as observed by Tasir et al (2012) to apply the knowledge and skills in lesson preparations and also inspires them in slides preparation and searching the internet observed by Zafarullah & Pertti, (2017). The adoption of ICT in teaching and learning is only achievable with sound understanding of principles and ideas therein.

IV. CONCLUSIONS AND RECOMMENDATIONS

The study concluded that that the trainers were willing to participate actively in integrating ICT in the instructional process and thus had positive perceptions. In addition, over 80 % of trainers were practically competent in the general use of ICT but minimally integrated ICT in the instructional process. The study recommended that national polytechnics should take advantage of the positive

perception by trainers and formulate a policy on ICT integration in the instructional process in line with the existing government policies. Another recommendation was that national polytechnics should undertake capacity building for trainers on ICT integration in the instructional process.

ACKNOWLEDGMENT

Mutai thanks the project's supervisors of their immeasurable support, the family members; Grace, Alice, Vincent, Eddy and Beth, and colleagues for their back-up and benevolence.

REFERENCES

- Agyei, D. D. & Voogt, J. M. (2011). Exploring the potential of the will, skill, and tool model in Ghana: Predicting prospective and practicing teachers' use of technology. *Computer & Education*, 56 (1), 91- 100
- Akaba-Altun, S. (2005). Bilgi teknolojisi sınırlarında denetim. *Euroasian. The Journal of Educational Research*. 5(18), 1-16.
- Cassim, K. M. & Obono, S. E. (2011). On the factors affecting the adoption of ICT for the teaching of word problems. *In Proceedings of the World Congress on Engineering and Computer Science*, 1, pp. 19-21.
- Cavas, B., Cavas, P., Karaoglan, B., & Kisla, T. (2009). A study on science teachers' attitudes toward Information and Communication Technologies in Education. *The Turkish Online Journal of Educational Technology – TOJET*, 8(2), 20-32. 19.
- Connelly, L.M (2009). Mixed Methods Studies. *MEDSURG, Nursing*. Vol. 18, No. 1 20.
- Gülbahar, Y. (2007). Technology planning: A roadmap to successful technology integration in schools. *Computers & Education*, 49(4), 943–956.
- Jonassen, D. H., & Reeves, T.C. "Learning with Technology: Using Computers as Cognitive Tools". In D. H. Jonassen (Ed.), *Handbook of research for educational communication and technology* (pp. 693-719). New York: Simon and Schuster, 1996
- Kim, M. C. & Hannafin, M. J. (2011). Scaffolding problem solving in technology-Enhanced learning environments (TELEs): Bridging research and theory with practice. *Computers & Education*, 56(2), 403–417.
- Lenke, C., Coughlin, E. & Reifsnieder, D. (2009). *Technology in schools: What the research says: An update*. Culver City, CA: Commissioned by Cisco.
- Mwangi, W. (2013) Lesson from the implementation of MDGs in Kenya options for a post 2015 framework. 57. In Omwenga, E., Waema, T., & Wagacha, P. (June 2004). A model for introducing and implementing e-learning for delivery of educational content within the African context. *African Journal of Sciences and Technology* 5(1) 35-48.
- Nunes, C. A. A., & Gaible, E. (2002). *Development of multimedia materials*. In W. D.Haddad & A. Draxler (eds), *Technologies for Education Potentials and Prospects*, 7(pp94-177). Prepared by UNESCO and AED knowledge enterprise INC.
- Pernia, E.E. (2008). *Strategy Framework for Promoting ICT Literacy*.
- Postman, N. (2000). 'From the end of education' in Williams et al 4th editions *Reading for the 21st century: tomorrow's issues for today's students*
- Rojewski, J. W. (2009). *A Conceptual framework for TVET*. In R. Maclean, & D Wilson (eds). *International handbook of education for the changing world of work 1863-1877* Springer science + Business media BV
- Tasir, Z., Abour, K. M. E. A., Halim, N. D. A., & Harun, J. (2012). Relationship between Teachers' ICT competency, confidence level, and satisfaction toward ICT training programmes: A case study among postgraduate students. *Turkish Online journal of education technology*, 11(1), 138-144.
- Tedla, B. A. (2012). Understanding the importance, Benefits and Barriers of ICT on Teaching and Learning in East African Countries. *International Journal for e-learning Security (JeLS)*, Volume 2, Issues 3/4, 1-9.

- Zafarullah S. & Pertti V. (2017). *Effects of ICT on job satisfaction of Teacher Educators: Evidence from University of the Sindh Province of Pakistan*. URL: <http://doi.org/10.5430/ijhe.v6n4p122>. published by Sciedu press. Retrieved October, 4th 2019.
- Zarini, M. (2009). 'Switched on: International approaches to skills development through ICTs,' In Maclean, DWR, eds. International handbook of education for the changing world of work, Springer science+ business media B.V, pp1935-1946.
- Zhao, Y. & Frank, K. A. (2003). Factors Affecting Technology Uses in Schools: An Ecological Perspective. *American Educational Research Journal*, 40 (4), 807-840
- Zimmerman, B. J. (1989). Models of Self-regulated learning and academic achievement. *Journal of Educational Psychology*, New York, Vol 81, No 3,329-339.



Daniel C. Mutai is a Principal of Rift Valley Institute of Science and Technology -Nakuru, Kenya.

He completed second and first degree in 2004 and 2010 respectively at Moi University-Eldoret, Kenya. He has also Higher Diploma in Electrical Engineering and Electronic with special attention to Engineering Mathematics and control Engineering. He has been involved in Management of five different Technical Training Institution; Principal of National Polytechnic and Technical Institutes. He has published research papers in several journals including International Journal of Multidisciplinary and current Educational Research (IJM CER) and European Journal of Research and Reflection in Educational Sciences amongst others.

Mr. Mutai; FIET is a full member of Institution of Engineering Technologist and Technicians (IET: Kenya.)