ICT Competence Of TVET Trainee-Teachers: A Case Study In Islamic University Of Technology

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Abstract

The importance of ICT in empowering teachers and learners, and enhancing teaching and students' achievement has been highlighted in several studies. ICT integration in the developing nations needs to be addressed so as to ensure total integration of ICT in the school curriculum. This study examines the level of basic ICT competence of technical and vocational education training (TVET) trainee-teachers' from different OIC countries. The differences in basic ICT competence of the trainee teachers having different educational background were also examined. The data was collected through a competence test and it was analysed using percentages, means, and t-test statistics. It has been found that the majority of the TVET trainee teachers were competent in the field of ICT. However, trainee-teachers coming from Computer Science and Engineering (CSE) background did relatively better than the trainee-teachers from Mechanical and Chemical Engineering (MCE) and Electrical and Electronic Engineering (EEE) groups. The ICT competences of the MCE and EEE groups were found similar.

Keywords— *TVET trainee-teachers; ICT Competence; TVE*

1. Introduction

Information and communications technologies (ICT) are a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information. Communication and information are at the very heart of the educational process, consequently ICT-use in education has a long history. ICT has played an educational role in formal and non-formal settings, in programs provided by governmental agencies, public and private educational institutions, for-profit corporations and non-profit groups, and secular and religious communities.

The use of information and communication technology (ICT) is becoming an integral part of education in many parts of the globe (Sala, 2004; Kuntoro& Al-Hawamdeh, 2003; Leidner&Jarvenpaa, 1993). Bangladesh is not left behind as ICT gradually finds its way into the educational systems (Ajayi, n.d.; Darkwa & Mazibuko, 2000; Brown, 2002; Darkwa&Eskow, 2000) despite chronic limitations brought about by economic disadvantages (Adesola, 1991).

The potentials of information and communication technology (ICT) to facilitate students' learning, improve teaching and enhance institutional administration had been established in literature (Kazu & Yavulzalp, 2008; Kirschner & Woperies, 2003). The use of information and communication technology as a tool for enhancing students' learning, teachers' instruction, and as catalyst for improving access to quality education in formal and non-formal settings has become a necessity.

The fundamental strategies of higher education institutions outline the need to form citizens able to participate responsibly in all the fields of social life, and act productively and creatively in the development of their functions. In addition, they encourage the curricular design centred in learning and based on competencies; including proficiency in ICTs, as one of the alternatives that allows achieving the objective of education and pertinence in relation to the transformations occurring in the world.

Huerta, Perez and Castellanos (2000), consider that the globalised world requires an increase in the productivity of social actors. They have also highlighted the need for mechanisms that allow changing the educational process with respect to the organization, contents and teaching methods in order to connect education more effectively with the real work, to acquire qualified staff capable of responding to the needs of production, technological innovation, the management of ICTs and competition in global markets.

The development of competencies is proposed as an approach that is closer to the needs of the labour market (Ben Youssef and Dahmani, 2008). It can be said that competent persons, in any given profession, are those who perform well the role that is expected from them. This definition corresponds with Ibarra's (Estévez et al., 2003: 5), who defines competencies as a "set of abilities, skills, knowledge, and attitudes needed for optimal performance in a given occupation or productive role". Linking this concept to ICT competencies, it can be said that the latter are a group of skills, knowledge and attitudes that are applied to the use of information and communication systems, including the equipment involved, and specifically, according to Godoy (2006), the ability to make Web designs, manage presentations, databases, graphics software, spreadsheets, online bibliographic databases, web browsers, e-mail and chat applications, and word processors, among others. ICT skill is one of the employability skills recommended by UNESCO (UNESCO-UNEVOC, 2011; Dlamini, P., 2011).

The main objective of this study was to investigate the competence of TVET trainee teachers in the field of information and communication technology (ICT). Therefore, this study examined: (1) the level of competence of trainee-teachers in using the ICT. (2) The influence of educational background on TVET trainee-teachers' competence in ICT.

The study was guided by the following questions: (1) Whether TVET trainee-teachers have the basic competencies in field of basic ICT. (2) If there is any difference in the level of ICT competence of the trainee-teachers with background of computer science and engineering, electrical and mechanical engineering.

2. Scope and Methodology

This study measured ICT competence of TVET trainee-teachers from different OIC countries including Comoros, Uganda, Nigeria, Afghanistan, Yemen, Senegal, Gambia, Somalia, Pakistan and Bangladesh. The Trainee-Teachers are pursuing Bachelor of Science in Technical Education (B.Sc.TE) at the Department of Technical and Vocational Education of Islamic University of Technology. The number of teachers (participants) was 36. Among these participants: 10 have electrical engineering background, 10 mechanical engineering and 16 computer science and engineering background. There were no female trainee teachers. The data was analyzed quantitatively.

Test Instrument

The aim of the test was to find out the level of basic ICT competence of TVET trainee teachers. The test instrument used for this research was developed by the authors. However, some test-items were taken from standardized test designed by the Qualifications and Curriculum Authority in London and some were self-designed. It consists of 30 Multiple-Choice Items. The test measured five categories of ICT competences of the trainee teachers. The duration of the test was 30mins. Category A included six questions on *Basic computer operation and issues* it measured the competences such as data protection, I/O devices, data storage, PC operation and basic commands. Category B contained 6 questions and focused on *Use of office application software*. it measured the competences such as editing and formatting word document, basic understanding of office applications, etc. Category C contained 7 questions and focused on *use of internet resources*. It measured the competences such as health and safety issues, basics of Internet, e-communication skills etc. Category D contained 6 questions and focused on *use of Peripheral ICT equipment*. It measured the competences such as different parts of computer, printer, scanners, cameras etc. Category E contained 5 questions and focused on G*raphical software.* It measured the competences such as photo editing, digital image capturing, image formats etc.

To validate the test, it was presented to experts/ teachers. They reviewed the items. These teachers/ experts have a long teaching and/or industry

experience in the field of ICT. They have assessed the test questions on the basis of a five-point leickert type scale. They were asked if the content of these questions were relevant to basic ICT Skills. Furthermore, this questionnaire asked: the degree of complexity and comprehensibility.

The results of this assessment are shown in Figure 1 to 3.

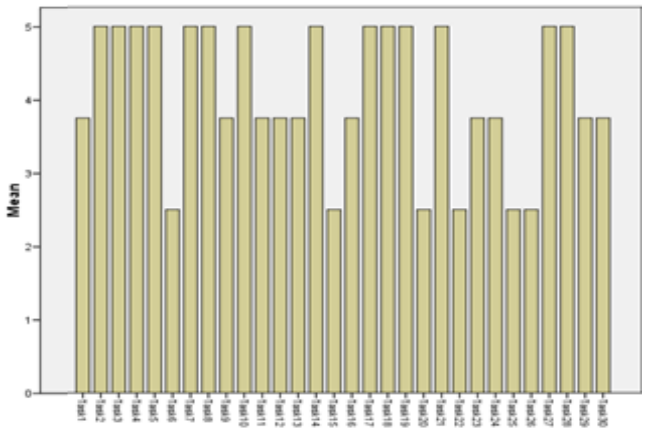

Figure 1: ICT-relevancy of the tasks assessed by experts/teachers

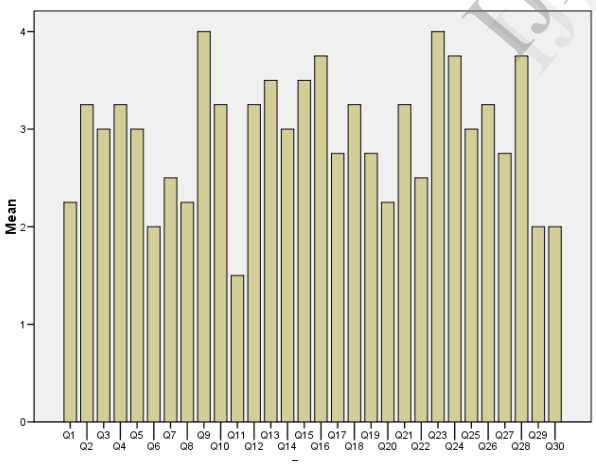

Figure 2: The degree of comprehensibility of the task assessed by experts/teachers

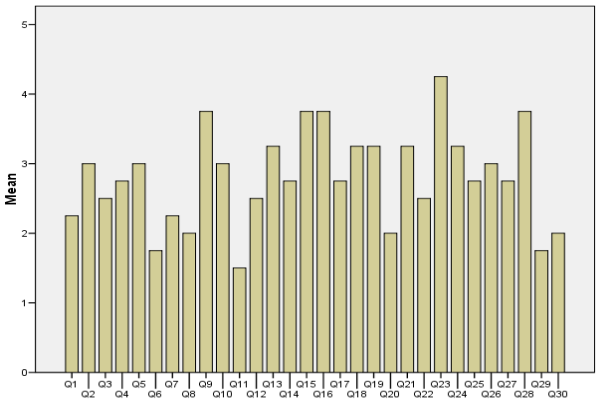

Figure 3: The degree of complexity of the task assessed by experts/teachers

3. Findings:

Competency level of TVET trainee-teachers

The quantitative data was analyzed statistically using mean, standard deviation, bench mark to present the details about the competence of trainee-teachers in the field of ICT. Furthermore, T-test and ANOVA was used to find the answer of the research questions. Bench mark was defined as: (Very competent = more than or equal to 85%, competent = 84% -70%, average = 69% -55% and not competent= below 55%) (IUT CALENDAR, 2011), pp 43).

The competence test results show that TVET trainee teachers have an average level of competency as compared to the Bench Mark given above. The average points achieved by trainee teachers were found above 55%. The Table 1 and Figure 4 show the statistics and the histogram of the scores, respectively.

Table 1**:** Statistics of trainee teacher achievement in competency test

Mean	N	SD	Min	Max
67.228	36	12.43	33.3	90

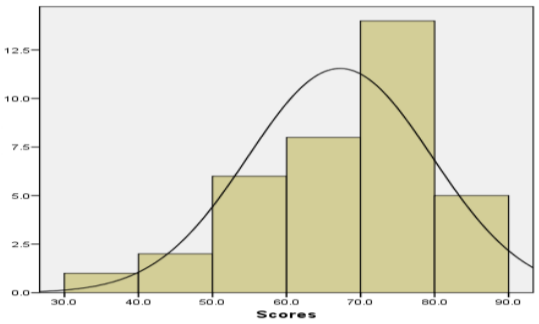

Figure 4: The histogram of score obtained by TVET trainee-teachers.

In this study we also investigated that if any difference in ICT competence of the trainee teachers having different educational background. The histograms of the marks obtained by these three groups of trainee-teachers are shown in Figure 5 to 7.

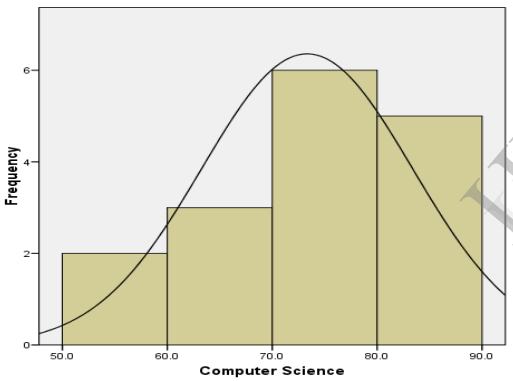

Figure 5: The histogram of score obtained by trainee-teachers having Computers Science and Engineering background.

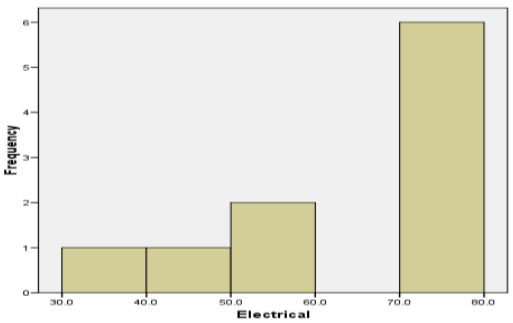

Figure 7: The histogram of trainee-teachers having Electrical engineering background.

The data of these three groups were analyzed using the ANOVA test. It is seen, as in Table 2, that the three groups (CSE, EEE and MCE) differ with F value = 4.115 and the significance level *p* is 0.025.

Table 2: The differences among three groups of trainee-teachers having different educational background.

	Sum of Squares	df	Mean Square	F	Sig. p
Between Groups	1080.228	2	540.114	4.115	0.025 <0.05
Within Groups	4331.579	33	131.260		
Total	5411.807	35			

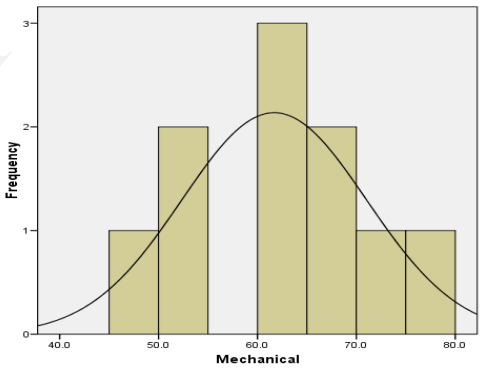

Figure 6: The histogram of trainee-teachers having Mechanical Engineering background.

The findings shows that trainee-teachers' competence in ICT differs significantly, compared to the p-value + 0.05. However, it may happen that not all three groups differ from each other. There may be trainee-groups whose performances are more or less similar.

The *Student Newman-Keuls* test, also labeled as 'post-hoc' analysis, was applied in order to make a posteriori pair-wise comparison. The results of this test are given in Table 3.

Table 3: Homogeneous subsets of different backgrounds in TVE

Student-Newman-Keuis		
		Subset of backgrounds
Background	N	1
MCE	10	61.690
EEE	10	63.000
CSE	16	73.325
Sig. p		0.05

In Table 3 all the three groups of trainees with different backgrounds belong to subset 1. It shows that these three groups do not differ among themselves so significantly, because it lies only on the p-value = 0.05.

Therefore, the results of the two tests (the ANOVA and the *Student Newman-Keuls* test) conducted above contradict each other. But, based on our own observation, particularly the statistics from Figure 5 to 7, we can say that the performance of MCE-Group and EEE-Group are similar, and the performance of CSE-Group is relatively better compared to other two groups.

TVET trainee-teachers' ICT competency in different task categories.

To further examine trainee teachers' ICT competence the test items in five different categories as mentioned earlier, the test in table 4 scores are presented (categories-wise) of ANOVA shows that F_{cal} = 1.737and F_{cri} = 2.68 as F_{cal} was less than F_{cri}. The Sig. = 0.162greater than 0.05, which means that the differences between the task categories have no significant.

Table 4: Statistics of TVET trainee-teachers' competencies on different task categories.

Categories	**Mean in %**	**Std. Deviation**
Basic computer operation and issues	71.719	20.2665
Use of office application software	73.581	21.2306
Use of Internet Resources	73.786	16.9123
Peripheral ICT Equipment	65.556	16.9780
Graphical software	51.369	21.5784
Total	67.202	21.0652

Table 5: Comparison of trainee teachers' competency on different task categories: results of ANOVA.

Df	**Mean square**	**F**	**Sig.**
3	611.249	1.737	0.162

The *Student Newman-Keuls* test, also labeled as 'post-hoc' analysis, was applied in order to make a posteriori pair-wise comparison. This test reveals the differences between categories. The results of this test are given in Table 6.

In Table 6 Category *Graphical software tools* within Subset 1 attained a category average of only 51.37 points (the lowest category average), whereas, other Categories which belong to subset 2 do not differ among themselves so much (p-value 0.281).

Table 6: Homogeneous subsets of different categories.

Student-Newman-Keuls

Category	**N**	**Subset for alpha = 0.05**	
		1	2
Graphical design	36	51.369	
Use of Peripheral ICT Equipment	36		65.556
Basic computer operation and issues	36		71.719
Use of office application software			73.581
Use of Internet Resources			73.786
Sig.		**1.000**	**0.281**

3. Discussion

The potentials of Information and Communication Technology (ICT) as an educational tool in teacher education had been well established by several studies. This study investigated TVET trainee-teachers' competencies in the field of ICT. The finding of this study indicates that TVET trainee teachers, who are studying at the Department of Technical and Vocational Education at IUT have an average level of competency towards the use of ICT.

This study also revealed significant positive effect of TVET trainee-teachers' educational background on the development of ICT competencies. However, among the five categories, the trainee-teachers were found having insufficient competencies in using Graphical Design Tools.

4. Implications

Ultimately, we hoped to provide teacher-trainers, educators and professional developers with specific suggestions for preparing and supporting trainee teachers in their efforts to prepare training courses with required ICT competences. These suggestions may help policy makers in OIC member countries to create a roadmap which will lead teachers to become sufficient users of ICT in their classes.

This study highlighted that trainee teachers need to be aware of more basic as well as advanced ICT applications and they need to be further educated regarding use of peripheral ICT equipment and graphical software.

5. Conclusions

In this study, it was found that TVET trainee teachers have an average level of competency towards the use of ICT. The results revealed that among the basic ICT competency different categories came well, trainee teachers in the area of Basic computer operation and issues, Use of office application software and Use of Internet Resources. However the same trainee teachers lacked required competence in the Use of Peripheral ICT Equipment and Graphical software tools. The findings underscore the need to introduce trainee teachers to more courses on ICT with needed hands-on experiences.

Furthermore, this competences test measured only the basic ICT competencies of the trainee-teachers, therefore, the authors recommend that the in-depth ICT competences should be measured according to UNESCO ICT competency Standards for teachers.

6. References

Adesola, A. O. (1991). The Nigerian University Systems: Meeting the Challeges of growth in Depressed Economy. *Higher Education, 21, 121- 133.*

Ajayi, G. O. (n. d). *Some Aspects of Information Communication Technology Development in Africa*. Retrieved August, 14, 2004, from http://www.tenet.res.in/commsphere/s8.1.pdf

Ben Youssef, A., &Dahmani, M. (2008): "The Impact of ICT on Student Performance in Higher Education: Direct Effects, Indirect Effects and Organizational Change". In: "The Economics of E-learning" [online monograph]. *Revista de Universidad y SociedaddelConocimiento (RUSC)*. 5 (1). UOC. http://www.uoc.edu/rusc/5/1/dt/eng/benyoussef_dahmani.pdf

Brown, I. (2002). Individual and technological factors affecting perceived ease of use of webbasedlearning technologies in a developing country.*Electronic Journal of InformationSystems in Developing Countries, 9*(5), 1-15.

Darkwa, O., &Mazibuko, F. (2000). Creating Virtual Learning Communities in Africa:Challenges and Prospects. *First Monday, 5*(5).

Dlamini, Peterson (2011). Strengthening Skills development through ICT & e-Learning to enhance Youth employability to fight hunger & Poverty – A case for Swaziland. Proceedings of the 5th Annual UNESCO-UNEVOC e-Learning Summit, Dar es Salaam.

Estévez, E. H., Acedo, L. D., Bojórquez, G., Corona, B., García, C., Guerrero, M. A., et al. (2003): La práctica curricular de un modelobasado en

competenciaslaboralespara la educación superior de adultos (The curricular practice of a model based on work competencies for the higher education of adults). *RevistaElectrónica de InvestigaciónEducativa*, 5 (1). http://redie.uabc.mx/vol5no1/contenido-estevez.html

Godoy, C. (2006): Usoseducativos de las TIC: Competenciastecnológicas y rendimientoacadémico de los estudiantesbarineses, unaperspectiva causal (Educational uses of ICTs: technological competencies and academic performance of students from Barinas, a causal perspective). In: *Educere-investigaciónarbitrada.* http://www.scielo.org.ve/scielo.php?pid=S13164910200 6000400012&script=sci_arttext

Huerta, Pérez &Castellanos (2000): *Desarrolloporcompetenciasprofesionalesintegrales*(Deve lopment through professional and integral competencies). www.jalisco.gob.mx/srias/educación

IUT CALENDAR, (2011). Dhaka: Department of Research, Extension, Advisory Services and Publication (REASP).

Kazu, I. Y. &Yavulzalp, N. (2008).An analysis of the primary school teachers' usage of instructional software.*International Journal of Emerging Technologies, 3* (1), 45-53.

Kirschner, P. &Woperies, I. G. J. H. (2003). Pedagogic benchmarks for information and communication technology in teacher education. *Technology, Pedagogy and Education, 12* (1), 127-149.

Kuntoro, R. D., & Al-Hawemdeh, S. (2003). E-learning in Higher in Institution in Indonesia.*Journal of information and Knowledge Management, 2*(4), 361-374.

Qualifications and Curriculum Authority, 83 Piccadilly, London W1J 8QA. (2004). Retrieved from http://www.qca.org.uk

Reetz L (1990) *Zur Bedeutung der Schl¨ usselqualifikationen in der Berufsbildung. In: Reetz, L. and Raitmann, T. (Hrsg.): Schl¨ usselqualifikationen. Dokumentation des Symposiums in Hamburg. " Schl¨ usselqualifikationen – Fachwissen in der Krise"*. Hamburg: Feldhaus.

Sala, N. (2004). Web Based Teaching and Learning: Two Swiss Example. *Proceedings of the 2004 IRMA International Conference*, USA.

Student, W. (1908). The probable error of a mean. Biometrika. 6(1):125.

UNESCO-UNEVOC (2011). "Skills and Employability through E-learning". 5th Annual UNESCO-UNEVOC TVET Summit.

U.S. Department of Education. (1996). *Getting America's students ready for the 21st century: Meeting the technology literacy challenge. A report to the Nation on technology and education. U.S. Department of Education.* . Washington, DC: U.S.: Government Printing Office.

Vargas-Zuniga F (2005) *Key Competencies and Employability. In: The new ILO Recommendation 195 – Human resources development: education, training and lifelong learning*. ILO. ISBN 9290881860.

Vedantham, A., & Breeden, L. (1995). Networking for K-12 education: The federal perspective. *Internet Research* , pp. 5(1), 29-39.