RESEARCH ARTICLE

TEACHERS' USE OF INFORMATION COMMUNICATION TECHNOLOGY (ICT) IN TEACHING AND LEARNING: EVIDENCE FROM SODO TOWN ADMINISTRATION SECONDARY SCHOOLS, SOUTHERN ETHIOPIA

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ABSTRACT

This study has been conducted with the objective to assess teachers' use of information communication technology (ICT) in teaching and learning in secondary school context. The study involved descriptive survey. Three high schools were selected from six high schools by simple random sampling technique. Data was collected from 130 teachers' selected from three high schools based on gender stratification. Questionnaire designed by Papanastasiou, E. C., & Angeli, C. (2008) was adapted to measure teachers' use of ICT in teaching and learning. The analysis of quantitative data was done by mean, standard deviation, independent t-test and one way ANOVA. The findings of the study revealed that there was no statistically significant difference between the mean teachers use of ICT in teaching and learning of male(n=94,M=14.38,SD=2.72) and females(n=36,M=14.02,SD=3.2), t(128)=0.63,p>0.05. The result about teachers' use of ICT in teaching and learning across service years, revealed that there was a significant difference at p < .05 level for the three conditions [F (2, 127) = 4.84, p < 0.05]. Result also indicated that inadequate number of computers shared the highest mean score as factors affecting the use of ICT in education. Eventually, conclusions, recommendations and areas of further research were forwarded based on the major findings to enhance teachers' use of ICT in teaching and learning.

INTRODUCTION

Countries all over the world have identified the significant role of information and communication technology (ICT) in improving education (Kozma & Anderson, 2002), and have invested heavily in increasing the number of computers in schools and in the networking of classrooms (Pelgrum, 2001). The prominence of ICT also puts the various education systems under pressure to use ICT in teaching and learning. Due to the explosion of knowledge, educational institutions including schools cannot continue as venues that transmit knowledge from the teacher to the learner or use the textbook as the only source of information. Schools are therefore expected to promote the acquisition of knowledge and skills through the use of new technologies to ensure efficient, continuous and lifelong learning (E R Mathipa, 2014). Many governments in Africa have tried to put emphasis in education especially since independence. This has seen many government increase budget allocation in education (UNESCO, 2000). The move is motivated by the fact that education is the cornerstone of economic growth and development.

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Education helps to mitigate poverty and its effects by developing human capital consequently increasing the level of social and private benefits. There is substantial evidence that ICT is an integral part of the global society and its value in schools is to help in knowledge creation, knowledge sharing, problem solving, communication, group and cooperative learning, the development of economic and social change. Tedla (2012) states that new technologies have the potential to promote and to transform teaching and learning processes. He furthers asserts that ICTs also provide effective teaching-learning atmospheres by providing opportunities for effective communication between teachers and learners. These new technologies also help learners in the development of knowledge and skills, cooperation, communication and problem solving. ICT in education centers on four interwoven components – the teacher, the learner, the curriculum and the tools. The tools represent ICT. The teacher has to be conversant with the curriculum, split it into learnable units for the learner and then select appropriate and relevant tools that will assist him in disseminating the learning concepts to the learner. Also, he has to select tools that will not make the learner depend solely on him but be capable of learning at his

own pace, having been in possession of the curriculum that has been split into learnable units. The tools are expected to be learner-friendly whereby the teacher's presence is not always needed and he does not have to turn himself to a content expert but a coach and a mentor, guiding the learner on how to effectively utilize the materials (Eze & Olusola, 2013). Research results (Makgato, 2012) indicate that teachers do not use ICTs due to the fact that they are afraid of new innovations and change and are technophobic despite the availability of ICTs in their schools. In many instances lack of technological skills is another contributor in non-use of ICT in teaching and learning. Some teachers shun ICT and continue to use traditional methods of teaching and learning, and as such limit the use and importance of ICT.

Statement of the Problem: According to Hennessy, Ruthuen and Brindley(2005) ICT has great role in the assurance of quality education in different countries of the world. In many of developing countries, teacher use of ICT in teaching and learning is considered that crucial; the integration is not effectively utilized as expected and experienced in advanced countries. Previous research on teachers' use of ICT in secondary school classroom has points out that infrastructure development remains the biggest constraint for the use of ICT in the education sector. The cost of equipment and bandwidth are barriers to entry for schools, and therefore, students. This is compounded by the major distribution disparity of infrastructure between the urban and rural areas of Ethiopia. Shortage of ICT materials and software can critically limit what teachers can do in their teaching learning process. (Harry Hare, 2007).

With the existing infrastructure, there are obvious challenges to affect the implementation of ICT in classroom activities. For instance, the strategy envisages the integration of ICT into the learning, teaching and administration of the school system through education information management systems. But with only 40% of schools in Ethiopia having computers, this may be a daunting task. And of the schools that do have computers, most of them are in Addis Ababa. A related challenge is that most schools have limited or low access to the internet. (Harry Hare, 2007). Poor use of ICT in teaching and learning process constitutes a concern that initiated the paper. This study sought to unearth answers for the following research questions.

- What are the factors affecting the use of ICT in education?
- Do male and female teachers' significantly differ in their usage of ICT for teaching and learning?
- Is there a difference in secondary school teachers' level of teaching experience with their usage of ICT for teaching and learning?

General objectives: The general objective of this study was assessing teachers' use of information communication technology (ICT) in teaching and learning; focusing on secondary school context.

Specific objectives

- To Identify factors affecting the use of ICT in education
- To examine teachers' use of information communication technology in teaching and learning as a function of gender.

- To examine teachers' use of information communication technology in classrooms activities based on teaching experience.

Research Design: To accomplish the desired objectives, this study employed a descriptive survey design which was under quantitative approach. This research design was seen to be the most desirable because the study tried to describe the current situation about teachers' use of information communication technology (ICT) in teaching and learning by collecting data from sampled participants at one time.

Research Site and Population of the Study: The site of this study was Wolaita Sodo town, Southern Ethiopia, selected secondary schools and the duration of the survey was 2018/2019 academic year. The town administration has 6 high schools with 295 teachers which is located in Sodo town.

Sample Size and Sampling Techniques: As aforementioned, Sodo town administration is organized in to 6 secondary schools. As a result, the researcher decided to select 3 secondary schools, namely Sodo, Wadu and Otona by using simple random sampling technique and the selected schools were comprised 209 teachers. It represents the town administration for this study purpose. Alreck & Settle, (2004) wrote that a sample larger than 10% of the target population is necessary, because as sample size increases, sampling error decreases. In order to determine a representative sample size for this study and draw a sample from the population, a standard formula developed by Kurtz, (1983) was applied. The researcher decided to utilize this formula because it allows obtaining maximum sample size, maximum heterogeneity or maximum variation sampling. The estimate of the population (p) was assumed to be 50% (.5), the maximum allowable error (*E*) was assumed to be 5% = .05, the standard normal value corresponding to the desired level of confidence (z), or a confidence interval of 95%, was assumed (z = 1.96). The formula is indicated below.

$$n = \frac{n_0 N}{n_0 + (N-1)}$$

Where:

$n_0 =$ is a sample size drawn from the population: i. e. $p(1-p)(\frac{Z^2}{E^2})$

n = is a sample size drawn from a finite population
N = is a population size
Hence, n can be written as:

$$n = \frac{p(1-p)\left(\frac{Z^2}{E^2}\right)N}{p(1-p)\left(\frac{Z^2}{E^2}\right) + (N-1)}$$

Based on this formula the sample size of this study was:

$$n = \frac{0.5(1-0.5)\left(\frac{1.96^2}{0.05^2}\right)209}{0.5(1-0.5)\left(\frac{1.96^2}{0.05^2}\right) + (209-1)}$$

$$n = \frac{80,276.9}{592.1}$$

$$n = 135.5$$

the proportion of each school was determined based on the number of teaching staff they have and sample size computed by using the formula and then participant selection was done by simple random techniques because a simple random sample represents the target population more accurately than a samplechosen using other sampling procedures (Alreck & Settle, 2004) and gives each member of the sampling frame an equal probability of selection. The population of each school and the number of participants from each school is indicated in table one below.

Table 1. Distribution of Schools, With Population and Sample Size

N	Name of the schools	Population size			Sample size		
		M	F	T	M	F	T
1	Sodo Secondary School	88	36	124	56	23	79
2	Wadu Secondary School	41	13	54	27	9	36
3	Otona Secondary School	23	8	31	15	5	20
	Total	152	57	209	98	37	135

Research Instruments: A Questionnaire known as evaluating the use of ICT in education: psychometric properties of the survey of factors affecting teachers teaching with technology designed by Papanastasiou, E. C., & Angeli, C. (2008) was adapted to measure teachers' use of Information Communication Technology (ICT) in teaching and learning: The instrument consists of different subscales each of which describes teachers' use of ICT in teaching and learning. Teachers' were asked to respond to items on two different rating scales which was designed to measure factors affect the use of ICT in teaching and learning with scale ranging from 1 (strongly agree), 2 (agree), 3 (disagree), to 4 (strongly disagree) and skill scale which was designed to measure teachers use computers as learning tools in classrooms activities with its scale points ranging from 1 (completely disagree), 2 (disagree), 3 (neutral), 4 (agree) to 5 (completely agree).

Pilot Study (instrument tryout): The validity and reliability of the research tool was checked by reviewers and pilot study before collecting data for the study. After developing the questionnaire, to establish its content and face validity it was first submitted to instructors of measurement and evaluation working in the University, Department of Psychology and to research specialists to judge the clarity of wording and the appropriateness of each items and its relevance to the construct being measured. The items were thoroughly inspected for relevance and clarity; the content validity of the instruments, omissions, vague items and terminology were improved and made to measure what they were supposed to measure by incorporating their corrections, suggestions, and comments. Following designing the instrument for data collection, pilot testing was done on 50 subjects similar to those to be included in the main study in Bugale Walelu secondary school (which is one of the high schools in Sodo town administration).

The questionnaires were filled out properly and collected. The Cronbach alpha reliability coefficients were calculated for both parts of the scale items. The calculated reliability indices, for both factors affect the use of ICT in teaching and learning skills and teachers use computers as learning tools in classrooms activities parts of the scale were 0.84 and 0.82, respectively. Based on the pilot testing results, the wording and overall organizations of the items were revised. In doing this, the validity and reliability of the different subscales were checked along with the necessary revisions.

Methods of Data Analysis: The data were processed using descriptive and inferential statistics on the basis of their appropriateness for answering the research questions. Descriptive statistics (mean value and standard deviation) were used to describe and summarize factors affect the use of ICT in teaching and learning skills and teachers use computers as learning tools in classrooms.

Independent sample t-test was employed to see whether there was statistical significant mean difference between participants in their ICT usage for learning tools as a function of gender. One way ANOVA was employed to see whether there was statistical significant mean difference between participants in their computers usage as learning tools in classrooms activities skills across service years. The (alpha) value for test of significance was set at 0.05 levels.

Data Analysis

Major Quantitative Results: A total of 135 questionnaires were distributed to respondents of the three high schools and 130 or 96.3 % of the instruments were properly filled and returned. Therefore, the response rate is 96.3 %.

Descriptive statistics of factors affecting the use of ICT in education: In order to answer the first research question formulated earlier, descriptive statistics (mean values and standard deviations) were used to summarize data on factors affecting the use of ICT in education on the six categories of factors affecting the use of ICT in education as shown in table 2 below.

Table 2. Descriptive statistics of factors affecting the use of ICT in education

Variables	Mean	Std. deviation
Inadequate number of computers	2.83	0.96
Lack of internet connectivity	1.36	0.64
Lack of access to computers	2.54	1.13
Insufficient or irregular power supply	1.33	0.47
High cost of hardware and software	2.19	0.98
Structural arrangement of computers	1.36	0.64

Table 2 above, showed that among the six categories of factors affecting the use of ICT in education, inadequate number of computers shared the highest mean score among the participants' of the study with (M=2.83, SD=0.96), followed by the mean score of lack of access to computers with (M=2.54, SD=1.13). The same table showed that high cost of hardware and software results shared mean score (M=2.19, SD=0.98). Lake of internet connectivity and structural arrangement of computers equally shared mean score with (M=1.36, SD=0.64).Finally in this table, the least mean score was, the mean score of insufficient or irregular power supply with (M=1.33, SD=0.47).

The results indicated in descriptive table above clearly revealed that factors affecting the use of ICT in education rely on the first category (inadequate number of computers) than the other categories. An independent t test was conducted to determine if a difference existed between the mean difference in teachers' use of ICT in teaching and learning of male and female teachers. There was no statistically significant difference between the mean teachers use of ICT in teaching and learning of male (n=94, M=14.38,SD=2.72) and females (n=36, M=14.02, SD=3.2), t(128)=0.63,p>0.05.

Table 3. General summery of descriptive statistics and independent t test for teachers' use of ICT in teaching and learning by gender

Variable	Descriptive				t-test for equality of means		
	Sex	N	Mean	Standard deviation	t	df	p-value
Teachers use of ICT in teaching and learning	Male	94	14.38	2.72	0.634	128	.134
	Female	36	14.02	3.2			

Table 4. General summary of descriptive statistics and one-way ANOVA for teachers' use of ICT in teaching and learning by service years

Group	N	Mean	SD	Sum of squares	df	Mean square	F	Sig.
1-5 years	18	13.44	1.14	74.44	2	37.22	4.84	.009
6-10 years	49	13.59	2.47	976.02	127	7.68		
>10 years	63	15.06	3.26		129			

Teachers' use of ICT in teaching and learning across service years: As it was explained earlier, in order to answer the third research question, which was aimed at examining the difference in teachers' use of ICT in teaching and learning across service years, one way ANOVA was employed and the general summary of the result obtained were here indicated below in Table 4. The numbers used in table above, column 1 (named group) stands for: 1 - teachers with 1-5 service years, 2 - teachers with 6-10 service years and 3 - teachers with greater than 10 service years and represent the three conditions used in one way between subject analysis (ANOVA), significant at $p < 0.05$). As shown above, the result about teachers' use of ICT in teaching and learning across service years, revealed that there was a significant difference at $p < .05$ level for the three conditions [$F (2, 127) = 4.84, p < 0.05$]. Post hoc comparisons to evaluate pair wise differences among group means were conducted with the use of Tukey HSD test since equal variances were tenable. Tests revealed significant pair wise differences between the mean scores of teachers having 6-10 service years and greater than 10 service years, p<.05. Teachers having 1-5 years do not significantly differ from the other two groups, p>.05

DISCUSSION

Result of the first research question indicated that, among the six categories of factors affecting the use of ICT in education, inadequate number of computers shared the highest mean score among the participants' of the study with (M=2.83, SD=0.96), followed by the mean score of lack of access to computers with (M=2.54, SD=1.13). This finding in line with the study by Sang et al (2010), Tedla (2012) and Tay (2011) there are barriers that impede the implementation of ICT in teaching and learning. The school characteristics are factors that are perceived as major obstacles and comprise inadequate access to ICT, internet connectivity, technology related training, ICT policy and time. These variables are interrelated and consequently the success of or the failure of the implementation of ICT in teaching and learning does not depend on one individual factor but it is a process which involves a set of interrelated factors (Tay et al: 2012; Tedla, 2012). Similarly, Afshari (2009) states that limited access to ICT are a barrier to effective use of class. The statistical procedure, which was used to indicate the difference, existed between the mean difference in teachers' use of ICT in teaching and learning of male and female teachers. There was no statistically significant difference between the mean teachers use of ICT in teaching and learning of male (n=94,M=14.38,SD=2.72) and females(n=36, M=14.02, SD=3.2), t(128)=0.63,p>0.05.

The result of this study is similar with the study by (Orduah Stephen, 2017) who found that no significant difference between the mean scores of the male and female teachers in the use of information and communication technology. The result of the analysis indicates no significant difference, t (198) = - 0.398, P > 0.05. The findings that teachers' use of ICT in teaching and learning across service years, revealed that there was a significant difference at $p < .05$ level for the three conditions [$F (2, 127) = 4.84, p < 0.05$] is consistent with previous research in this area (Dudzinski et al., 2000). He indicated that teaching experience is developed over time and that teachers who have taught for a long duration are knowledgeable on teaching issues. This is because they are perceived to have the ability to relate prior knowledge to new experiences. Focusing on teacher experience, Clotfelter et al., (2006), found that teachers with more experience are more effective than those with less experience. The researcher therefore considered the information given by the respondent to be reliable because most of the teachers had taught for a long period of time and therefore were considered to have information on their experiences on the use of ICT to facilitate teaching and learning in schools. The result of this study is also in line with the study by (K. M. Cassim, S. D. Eyono Obono, 2011) who found that demographic factors significantly (p < 0.05) affect teachers' perceived adoption of ICT for the teaching of word problems: teaching experience (p = 0.018).

Conclusion

From the result of the study, it was concluded that the use of ICTs in secondary schools was hindered by different factors. Inadequate infrastructure shared the highest percentage. There was no gender disparity in the use of ICT among male and female teachers. It was also evidenced with data that there was significant difference among teachers' as a function of ICT in teaching and learning across service years in Sodo town administration, Southern Ethiopia.

Recommendation

The following recommendations are suggested to address the findings and conclusions of the study.

- As quality improvement has become a central priority of education, the school administrator, town administration and Zone education desk should invest heavily to provide adequate number of computers in schools and also enhance internet connection in the schools to ensure easy access to teaching learning materials in the web. They also develop school ICT

- policy that would enable them integrate use of ICTs in teaching and learning in class.
- The school directors, local government and even the university should work in collaboration to improve the provision of resources teachers' need for effective teaching learning process.
- To develop teachers technological knowledge; training should be given to both male and female teachers to enable them effectively utilize ICT in their teaching learning process.
- Further study can be comparing private and public secondary school teachers' use of Information Communication Technology (ICT) in teaching and learning can be another dimension to broaden the understanding about the implementation of ICT.
- For future study, similar quantitative research can be carried out in different secondary schools in Zone administration.

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