Skill Challenges in Adoption and Use of ICT in Public Secondary Schools, Kenya

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Abstract

Adoption and use of ICT in schools in Kenya faces several challenges, including teacher's skills. For schools to benefit from using ICT, qualified teachers are needed. This study explored teachers' skills that influenced the process of adoption and use of ICT in public secondary schools in Meru County. The study adopted a descriptive survey research design. 105 (30%) schools were sampled through stratified sampling from a target population of 350 for the study. 315 respondents were sampled through simple random sampling. 220 (69.8%) questionnaires were appropriately filled and return. Data collected was analyzed by use of descriptive and inferential statistical techniques after which results were presented in tables. The study findings established that there was limited supply of qualified ICT teachers in Kenya. More ICT teachers should be employed in public secondary schools and trained in ICT skills to make them effectively deliver ICT based curriculum. In-service courses should be designed that can enable teachers to acquire ICT skills. Continued professional development of teachers is central to successful implementation of ICT in schools. Generally, teachers had positive attitudes towards adoption and use of ICT in schools.

Key words: Teachers' skills, Adoption, ICT, Schools, Kenya

1. Introduction

Research shows that adopting and using ICT in schools leads to significant expansion of education and pedagogical outcome which are beneficial to both teachers and students. When used appropriately, ICT can help to strengthen the importance of education to increasingly networked society, raising quality of education by making learning and teaching an active process connected to real life (Zaman, Shamim & Clement, 2011). Further studies shows that the adoption and use of ICT in schools can promote collaborative, active and lifelong learning, increase students' motivation, offer better access to information and shared working resources, deepen understanding, help student think and communicate creatively (Khan, Hasan & Clement, 2012). In other words, ICT seems to change the way teaching and learning is carried out in schools. With emerging uses of ICT in schools, teaching could be changed from emphasis on teacher centered to student centered, hence creating interesting and interactive learning environment. ICT facilitates a pedagogical shift entailing an educational interaction between teachers and learners.

However, studies suggest the benefits of adopting and use of ICT in schools all over the world has not been automatic. The effective implementation of ICT in schools is a multifaceted, complex process that just not involves providing the technology to schools but also involves teachers' competencies, schools readiness, long term financing and curriculum restructuring, among others (Zaman et al, 2011).

In practice, the usual teaching and curricula approaches still remain basically unchanged in many schools, while the technology is typically poorly adopted and underused in classroom (Dzidonu, 2010). It appears that the emphasis is on students ICT capabilities rather than application of ICT knowledge and skills to other subjects across the syllabus. Keengwe, & Onchwari, (2011) notes that, despite rapid growth in ICT access by teachers and students both at home and school, and substantially improved school ICT infrastructure (connection to internet, computer labs, availability of educational software, etc.) most teachers are not keen in adapting and using ICT tools during teaching and learning. It appears that their skills and attitudes towards ICT remain a challenge for them to adopt and use efficiently the technology in classroom.

Considerable research establishes that teacher skills and attitudes influence the decisions they make during planning for teaching. Jimoyiannis, & Komis, (2007) observed that most of reforms and initiatives initiated in schools failed due to their top-down approach that did not take into account teachers' skills, interest, and existing knowledge. Therefore an investigation of teachers ICT skills can provide insights into their preparedness in adopting and using technology in classroom. Both policy makers and research community in the world have been pre-occupied with establishing efficient and best ways of preparing teachers to adopt and use ICT as part of their daily teaching strategy.

Studies shows that all over the world, different countries have consistently initiated programs that are directed in making teachers adopt and use ICT in their day-today teaching and learning practices in school. According to Jimoyiannis, & Komis, (2007) countries like UK, Singapore, China, Australia, European Union (EU), etc. have established programs that aim at enhancing teachers' skills important in adapting and using ICT during teaching and learning processes. Many researchers consider designing and integrating efficient ICT teacher preparation programs as a key aspect to essential and successful, wide-ranging school reforms (Khan et al, 2012).

Across Africa, many countries have started investing considerable amount of money and designing new policies all aimed at making teachers adopt and use ICT in schools. However, there are many challenges some of which could be attributed to the teachers' skills in using ICTs (Zaman et al, 2011). For ICT to be effectively implemented in schools, teachers should be prepared to face challenges that come with its implementation.

In Kenya, the government recognizes the positive effect of ICT in making the country a middle level economy has is envisaged in Kenya vision 2030. Effort to implement ICT in schools was first initiated by publishing sessional paper No.1 of 2005 where ICT was given prominence. The idea was to equip public secondary schools with ICT infrastructure and integrate it in existing school curriculum in order to meet the challenges of information society. The publication stated that in every school; teacher, student and communities around it should participate in acquiring ICT skills desirable to benefit from knowledge-based economy by year 2015. Learning and teaching in schools was to be transformed to embrace ICT skills appropriate for twenty first century (GOK, 2005).

In 2006 the government disseminated National ICT policy on education with a section emphasizing that the government will encourage adoption and use of ICT in schools through; 1) promoting affordable ICT infrastructure in schools in order to facilitate acquisition of skills and knowledge through e-learning, 2) creating awareness of opportunities offered by ICT in schools, 3) promoting development of local e-content in order to address the needs of individual schools, 4) promoting enabling environment for integrating e-learning in curriculum to support ICT in schools, 5) promoting integration of ICT resources with other existing school resources, 6) establishing a national ICT centre of excellence where schools can draw parallels, 7) facilitating sharing of ICT resources between schools, 8) promoting public – private partnership in mobilizing resources to support ICT initiatives in schools, 9) promoting and facilitating training of teachers and school managers on ways to adopt and use ICT through in-service courses, and 10) facilitating rural electrification and connecting schools to electricity grid in order to support ICT, among other policies (GOK, 2006).

Some of achievement so far include; connecting over 300 rural schools with electricity, equipping over 500 public secondary schools with computers, establishing a unit at Kenya Institute of Education (K.I.E) to provide leadership in implementation of ICT in schools, Launching of e-content for schools in March 2010 by K.I.E, partnering with several organizations and private sector in providing computers to schools, among others (Laaria 2013). These efforts reflect the seriousness the government is attaching to implementation of ICT to schools. Now the focus is on training teachers to adopt and use ICT in teaching.

Despite its importance and strategies developed by government to implement ICT in schools, research conducted in many schools in the country has established that most of them are not effectively adopting and using ICT to support learning, teaching and management as intended (Manduku, Kosgey, & Sang, 2012). Laaria, (2013) revealed that despite efforts made by various stakeholders and importance of the ICT in education sector, the National ICT policy on education of 2006 has not been effectively implemented as was intended. While many countries have reported over 41% adoption of ICT in classroom in public secondary schools, the proportion remains considerably low in Kenya. This may be, because the strategy adopted by the government did not take into consideration teachers' skills, attitudes and reactions towards these new tools.

It is with this background that an investigation of teachers' skills in adoption and use of ICT in public secondary schools in Meru County, Kenya was conceptualized.

Purpose of study: This study was designed to investigate teachers' skills challenges in adoption and use of ICT in public secondary schools in Meru County, Kenya.

Objectives of the study: To get insights on the level of teachers ICT training and their perceptions on ICT adoption and use in schools.

Significance of the study: The findings and recommendations of this study are expected to provide a process or framework which should assist school managers in making decisions on how to adopt and use ICT in schools. The planners and policy makers are expected to use the findings of this study as a base for revising the current ICT policy in order to overcome the challenges hindering smooth adoption and use of ICT in schools in Kenya. Teachers are expected to find the result of this study useful as it highlights challenges they face during adoption and use of ICT in schools. Further, findings of the study are expected to open areas for further study by other researchers and academicians, hence benefiting the whole community.

2. Literature review

2.1 Level of ICT training

Adoption and use of ICT in schools requires skilled teaching staff and visionary school leadership. Teachers and school leaders need to be knowledgeable about the potential that ICT presents during teaching and learning in schools. Where this knowledge is lacking, policies formulated by government and investments made towards implementation of ICT in schools, frequently miss opportunities to realize the desired school reforms (Higgins & Moseley, 2011). Investment and planning for training ICT teachers seems to be treated as an additional cost rather than as an essential level for changes in teaching and school reforms.

A major challenge identified in many developing countries regarding adoption and use of ICT in schools is that there is no enough staff, and where there are, they are most likely IT professionals without any education experiences, skills, and/or qualifications. To effectively harness ICT for school purposes requires sustained investments in supporting teachers training in order to create new learning environment (Jimoyiannis, & Komis, 2007). Teachers play a critical role in implementation and use of ICT as they are at the centre of curriculum implementation and innovation at school level. However, many schools face a challenge of shortages of ICT teachers and other IT professional that support adoption and use of it in classroom. Many schools continue losing well trained ICT teachers to private sector which seems to pay higher salaries (GOK, 2010).

A survey by Kandiri, (2012) on ICT access and use in Kenya secondary schools shows that, of 2250 ICT teachers that graduated from universities and tertiary institutions in 2010, 1350 were absorbed in industrial and/or ICT service sectors and 900 went to teach ICT in various educational institutions. Of those in teaching service, 189 were in technical institutions and 711 were in secondary schools. This displays a relatively small number of qualified ICT teachers in Kenyan schools.

A report by Ministry of Higher Education, Science and Technology (GOK, 2010) on secondary school teachers' adoption and use of ICT also indicated the number of teachers skilled in ICT in secondary schools was low. The study revealed that out of the number available, few had ICT training effective in adoption and use of the technology in classroom. Out of 232 teachers in the sample, majority (57%) were reported to have trained at certificate level on basic computer skills, 73% were reported to have acquired ICT training through in-service courses and 43% were trained by private computer colleges.

Another study by Ayere, Odera & Agak (2010) on E-learning in secondary Schools in Kenya, reported that a number of teachers in schools had not received any training in ICT use during their formative years at teacher training institutions before joining the profession. 55% of the sampled teachers stated that they did not receive any ICT training at all. However, the study found that 51% of the teachers had taken self-initiative to undertake ICT training during the last three years they had been employed.

To successfully implement ICT in schools depends strongly on teachers' training on the technology. Drent, & Meelissen, (2008) observed that the level and quality of teachers training has a positive influence on how effective ICT is adopted and used in classroom.

Hennessy, (2010) established that most of programs towards teachers training in ICT, focused on basic literacy skills rather than on adoption and use of technology in teaching. According to Andoh, (2012) teachers training institutions have continued to emphasis teaching about the technology rather than on how to use technology to teach.

After analyzing and organizing a variety of approaches found in ICT uses in teacher training institutions, Andoh, (2012) concluded that these institutions were not adequately preparing their teacher trainees to effectively use technology in teaching and learning. A study by Ananiadou & Rizza (2010) on the use of ICT in teachers training colleges in nine OECD countries found that ICT was considered as a transversal subject cutting across all other subjects, hence nobody felt responsible for it. This, the authors concluded had negative impact on teacher trainees use of ICT when posted to schools. They recommended that continued and sustained training is important to make teacher trainees become effective and comfortable in adoption and using the technology once they start practicing. Rozell, & Gordiner, (2009) argued that there was need for teacher trainees meet the requirements for ICT skills in colleges, so that once they are practicing, they do not need to spend time learning. Further study by Peeraer, & Petergem, (2011) noted that the method of combining practical training and working on attitudes predicts use of technology in classroom. Letting teacher trainees use ICT during their training constitutes another way of making them acquire technology skills in other courses.

The problem of poor preparation of teacher trainees is not confined in developing countries only but also in developed countries. Ananaiadou & Rizza (2010) found that introduction of ICT in teacher training institutions is not yet compulsory and generalized in all the OECD countries. Quoting a study by Tan, del Valle & Pereira on teacher trainees accessibility to courses which include technology in United States, the authors showed that, out of 120 institutions understudy, 38% did not offer courses on educational technology at all, and 95% of courses offered did not involve use of ICT to support learner centered teaching.

Therefore, inadequate preparation of teacher trainees on how to use ICT in classroom could be perceived as a reason why teachers do not effectively adopt and use it once practicing. Teachers training institutions need to change strategy on how they train teachers with a view to giving them an opportunity to practice using technology before they are posted to schools. There is likelihood that teachers could adopt and use ICT in classroom if professional training provided them with ample time to learn, share, practice, and collaborate with colleagues about the technology. According to Higgins, & Moseley, (2011) inability of teachers to understand why they should use ICTs and how exactly they should use them is a barrier to implementation of ICT in schools.

2.2 Skills and competences appropriate in adoption and use of ICT in school

Research as shown that genders differ in their use of and skills in ICT, where males tends to demonstrate better skills in pure technical issues, whereas females use ICT quite naturally in their normal practices. According to Jimoyiannis and Komis, (2007), male teachers are positive about ICT in school while female teachers are neutral or negative. Studies have cited female teachers low levels of ICT use due to their inadequate skills, interest and technology accessibility. However, some studies disclose that gender variable is not a forecaster of adoption and use of ICT in schools (Andoh, 2012).

According to Prestride, (2012) computer aided teaching is the most appropriate skill required of a teacher, unfortunately, it is the least possessed by many. This may be because it is barely been part of their training course. According to Andoh, (2012) training should be directed to “using ICT to teach” rather than “learning to use ICT” Prestride, (2012) outlined some of ICT packages required of a secondary school teacher as data processing, word processing, use of internet, use of spreadsheet, use of presentation software like PowerPoint and e-mail. These ICT packages are important to teachers because they assist in creating lesson plans, analyzing and setting students’ tests, acquiring new knowledge and presenting lesson in a clear way among others. To acquire these skills, teacher educators should prepare teachers properly, as Higgins, & Moseley, (2011) noted, teachers who used ICT tools in classroom might have experimented or observed their own teachers use ICT tools during formative days in initial teachers training institutions.

2.3 Perceptions and attitudes towards ICT in schools and its effects in adoption and use

Research shows that if teachers perceive ICT programs are either satisfying their own needs or their students’ needs, it is likely they would implement it in school.

Research suggests that teachers' adequacy, skills, and attitudes influence successful implementation of ICT in schools (Keengwe & Onchwari, 2011). If teachers' perceptions are positive toward use of ICT, then they can easily provide useful insight about its implementation.

A study by Simonson (2008) revealed that teachers' skills, perception and attitudes were related to their use of ICT in teaching and learning. The more skilled teachers were in ICT, the more likely they were to use it in classroom. Further study by Drent & Meelissen (2008) revealed that positive attitude, personal entrepreneurship and computer experience had a direct positive influence on adoption and use of ICT by teachers.

A similar study by Huang & Liaw, (2008) shown that teachers' skills, attitudes and perceptions influenced their acceptance of the usefulness of ICT and its implementation in schools. A survey by EU School net in 2010 (cited by Andoh, 2012) involving teachers' use of Acer netbooks in six European Union countries, revealed that a large number of participants perceived use of netbook had positive impact on their learning, elicited interest, promoted individualized learning and helped to lengthen study beyond school day. However, a study by Korte & Husing, (2007) suggested that small number of teachers perceived benefits of ICT in schools were not clearly identified. Some teachers viewed ICT as waste of time and expensive. A report by Becta, 2008 on a survey of UK teachers (cited in Andoh, 2012) revealed that teachers' positivity about possible contributions of ICT in schools, was moderated as they became rather unsure and sometimes doubtful about specific and current advantages of it.

Woodrow, (2002) points that for successful transformation of school practice; teachers need to develop positive attitudes toward innovations. Van Braak, Tondeur, & Valcke, (2008) argued that positive computer attitudes by teachers are expected to foster implementation of ICT in schools. Further study by Teo (2012) on teachers' attitudes towards computer use in Singapore, found that teachers were more positive about their attitude towards computers and intention to use them, than the helpfulness of computer towards teaching and learning. These studies reveal that teacher's skills, perceptions, and attitudes influence adoption and use of ICT in schools.

3. Methodology of study

According to Mugenda, (2003) research methodology is plan of action, design, strategy or process that researcher choose and use in order to get the desired outcomes. This study employed descriptive survey research design. Sekran (2007) observed that descriptive survey research is intended to produce statistical information about aspects of education that interest policy makers and educators. It is a method of collecting information by administering a questionnaire to a sample of individuals. Descriptive surveys are designed to obtain information about the current status of a phenomenon or to answer questions like where, what, how, why, when, and who.

Target population: According to Orodho, (2008) specifying the population that is targeted for study is important as it helps researcher to make decisions on sampling and resources to use. This study target 350 public secondary schools in Meru County, Kenya. The schools were categorized as boarding schools (165) day schools (185).

Sampling size and sampling procedures: Kombo, (2006) argue that researchers selects a sample due to various factors that may hinder studying the whole population, while Sekran, (2007) observes that sampling procedures are strategies or procedures that are used to select a sample from a target population. According to Gay, (2002) stating the sample size and sampling procedures is important in order to establish representativeness of the sample for generalization. Stratified random sampling was used to select schools from each category in order to ensure all categories were adequately represented in the sample. Simple random method was then used to select respondents from various strata. There were a total of 105 (30%) schools in the sample which included fifty boarding schools and fifty five day schools. In the sampled schools, three teachers were randomly selected, making a total of 315 respondents.

Research instruments: questionnaires were used as main instruments for data collection. According to Kombo, (2006), questionnaires are widely used to obtain information about current conditions and practices and to make inquiries concerning attitudes and opinions quickly and in the precise form. Orodho, (2008) noted that questionnaires provide a cheap means of collecting data from large number of population.

Validity and reliability of research instruments: According to gay, (2002) validity is the degree to which a test measures what is supposed to measure. Mugenda, (2003) observes that reliability is the degree to which a test consistently measures whatever it measures.

In this study, validity of the questionnaires was ensured through judgment of experts in teaching, learning, ICT and research techniques, while reliability was established through test and re-tests method during pilot study.

Data Analysis: Orodho, (2008) observed that data analysis involves some manipulations of data collected through use of statistical tools in order to compute a number or a percentage. In this study, data was analyzed qualitatively and quantitatively using descriptive and inferential statistics.

Response rate: To ascertain in-depth of data collected, stating response rate of respondents is essential. Out of three hundred fifteen questionnaires distributed two hundred twenty (69.8%) were appropriately filled and returned. Ninety five (30.2%) were not appropriately filled and therefore were discarded during analysis. In any research, a return of more than 50% is acceptable (Mugenda, 2003). A return of two hundred twenty (69.8%) for this study was considered acceptable for analysis.

4. Findings and Discussions

This section of paper presents data analysis and interpretation of research findings. Mugenda (2003) defines data analysis as categorizing, ordering, manipulating and summarizing of data to obtain answers to research questions with its purpose being to reduce data to intelligible and interpretable form so that relation of research problems can be tasted. Research findings are presented in tables supplemented with some discussions.

Profile of respondents: The profile information of respondents included gender, age and experience in teaching as shown in Table1. Of 220 respondents, 150 (68.18%) were males and 70 (31.82%) were females. Majority of teachers 92 (41.82%) were between 41-50 years old while 57 (25.91%) had 10-12 years of teaching experience.

Table1. Profile of Respondents

Variable	Category	No.	%
Gender	Male	150	68.18
	Female	70	31.82
Age in years	Below 30	22	10.00
	31 - 40	56	25.45
	41 – 50	92	41.82
	Above 50	50	22.73
Teaching experience	1 - 3	17	7.73
	4 – 6	31	14.09
	7 – 9	48	21.82
	10 – 12	57	25.91
	13 – 15	42	19.09
	Over 15	25	11.36

4.1 Level of ICT training

One of the questions sought to determine the number of teachers who were computer literate. The findings indicated that in boarding secondary school, average number of teachers who were computer literate was 5.47 while in day secondary schools, the average number of teachers who were computer literate was 3.24. This meant that in boarding schools there were more teachers who were computer literate compared to those in day secondary schools. This was attributed to the fact that boarding secondary schools had better ICT infrastructure than day secondary schools. These findings were in agreement with a study by Manduku, et al (2012) which indicated more boarding secondary schools seemed to adopt and use modern ICT as compared to day secondary schools. The average number of teachers who were computer literate in the two categories of schools was found to be 4.355, meaning there was an average of four teachers who were computer literate in school.

The second question sought to determine whether limited supply of qualified teachers was a challenge in implementation of ICT programs. Majority of respondents181 (82.27%) perceived limited supply of qualified teachers was a barrier in implementation of ICT programs in schools. Only 39 (17.73%) indicated that supply of ICT trained teachers was not a hindrance in adoption and use of ICT tools.

The findings agreed with assertion that limited supply and development of ICT teachers is a major challenge and barrier to implementation of ICT in schools in Kenya. Many authors have shown that vast majority of teachers, in both secondary and primary schools have no skills and competencies to facilitate implementation of ICT in schools, (Kandiri, 2012).

In the area of training, the question sought to assess whether respondents perceived teachers were fully trained in ICT use. A five point Likert scale level was used, ranging from (1) for strongly disagreed to (5) for strongly agree.

Table 2. Adequacy of ICT training

Perception	No.	%
Strongly disagree	42	19.09
Disagree	117	53.18
Undecided	38	17.27
Agree	17	7.73
Strongly agree	6	2.73

As shown in table 2, the findings indicated that most of respondents disagreed with assertion that teachers were fully trained on how to use ICT tools in school. The results were in agreement with a survey by the Ministry of Higher Education, Science and Technology (GOK, 2010), which indicated majority of teachers trained through in-service courses offered during school holidays and given short period they were exposed to the training, few developed the required ICT skills.

4.2 Teachers' skills and competences appropriate in adoption and use of ICT in school

The study also sought to establish skills and competences respondents perceived were most appropriate during adoption and use of ICT in school.

Table3. Appropriate skills and competences needed during use of ICT

Skill/Competence	No.	%
Word processing (e.g. Microsoft word)	212	96.27
Data processing (e.g. Microsoft Access)	161	73.18
Presentation (PowerPoint)	152	69.09
Spreadsheet (e.g. Microsoft Excel)	119	54.09
Internet (WWW)	94	42.73
E-mail	71	32.27

As shown in table 3, word processing at 212 (96.27%) was considered the most appropriate skill teachers should posses. The findings are in agreements with Prestride, (2012) who found teachers to be most skilled and competent in word processing compared to other applications. Data processing was most appropriate to 161(73.18%) while use of presentation software was viewed by 152 (69.09%) and spreadsheet by 119 (42.73%) as the most appropriate skill and competence that teachers should posses. However, this was in contradiction with the report of Ministry of Higher Education, Science and Technology (GOK, 2010) which stated teachers tended to use computers for surfing internet more than they used for word processing. Overall, respondents' perceptions were consistent with findings of Prestride, (2012) who concluded that ICT skills and competences most appropriate for teachers are data processing, word processing, use of internet, use of spreadsheet, use of presentation software like PowerPoint and e-mail.

4.3 Teachers' perceptions of the adoption and use of ICT in school

To evaluate the perceptions of teachers towards adoption and use of ICT in schools, a 15 item with five point Likert-type scale ranging from (1) strongly disagree to (5) strongly agree was administered to respondents.

Table 4 Descriptive Statistics of teachers' perceptions of the adoption and use of ICT in schools

Variable	SD (%)	D (%)	N (%)	A (%)	SA (%)	Mean	StDev
1. Adoption and use of ICT in school will improve the operations in school	2.27	4.54	15.45	25.45	52.27	36.45	3.13
2. Use of ICT tools in school is beneficial in teaching and learning all subject areas in the curriculum	7.27	9.54	12.27	55.45	15.45	36.09	5.47
3. ICT can improve education	0.91	12.27	7.73	22.27	56.82	39.36	3.18
4. Use of ICT tools in teaching can be enjoyable and stimulating	16.82	14.55	3.18	45.45	20.00	29.71	5.01
5. Use of ICT will put more work on the shoulders of teachers	26.36	34.09	10.91	20.91	7.73	24.73	4.31
6. ICT tools are difficult to use	19.09	36.82	6.82	25.45	11.82	25.54	4.47
7. Capable teachers do not need ICT to teach	23.64	35.45	5.45	20.91	14.55	24.94	4.35
8. Adoption and use of ICT in school can relieve teachers of routine duties	41.36	25.91	10.45	14.55	7.73	27.63	4.73
9. ICT is useful for teachers work preparation (registers, exams, typesetting etc) only	19.09	39.09	8.64	17.73	15.45	25.20	4.38
10. Adoption and use of ICT can improve students' critical thinking	3.18	7.73	19.09	32.27	37.73	28.99	3.45
11. Use of ICT can enhance remedial instruction	6.82	9.55	12.27	29.09	42.27	29.21	2.65
12. Knowledge of how to use ICT tools by students and teachers is worthwhile skill	0.45	4.55	3.18	53.18	38.64	43.52	6.64
13. Adoption and use of ICT in school cannot contribute to learning because it does not stimulate students	34.55	46.82	2.27	13.18	3.18	35.73	5.68
14. Adoption and use of ICT can create jobs than they eliminate in school	13.18	14.55	16.82	40.91	14.55	25.53	4.45
15. Implementation of ICT in schools can reduce personal contact between teachers and students	28.18	51.36	7.27	8.64	4.55	35.81	5.76

Key: SD = Strongly disagree D = Disagree N = No opinion A = Agree SA = Strongly agree

As shown in table 4, majority of teachers' perceived adoption and use of ICT in schools will improve the operations in school (77.72%, mean = 36.45) and also use of ICT tools in school is beneficial in teaching and learning all subject areas in the curriculum (70.90% mean = 36.09). The majority of respondents also agreed or strongly agreed that ICT can improve education (79.09% mean = 39.36) and use of ICT tools in teaching can be enjoyable and stimulating (65.45% mean = 29.71). The findings are in agreements with study by Zaman, et al (2011) which reported that, when used appropriately, ICT can help to strengthen the importance of education to increasingly networked society, raising quality of education by making learning and teaching an active process connected to real life. Further, the findings were consistence with the result of a study done by Andoh, (2012) that concluded implementation of ICT improved management of schools as well enhancing performance of students. Majority of respondents disagreed or strongly disagreed with an assertion that ICT can put more work on the shoulders of teachers (60.45% mean = 24.73), ICT tools are difficult to use (55.91% mean = 25.54) and capable teachers do not need ICT to teach (59.09% mean = 24.94).

Further, respondents strongly disagreed or disagreed with the statement that adoption and use of ICT in school can relieve teachers of routine duties (67.27% mean = 27.63) and ICT is useful for teachers work preparation (exams, registers, typesetting, etc) only (58.18% mean = 25.06). The results are in agreement with Makhanu & Kamper, (2012) who found that use of ICT tools helped teachers execute their duties effectively and used them for enhancing classroom teaching. The respondents further agreed or strongly agreed use of ICT in school would improve students' critical thinking (70% mean = 28.99) and a record, 91.82% (mean = 43.52) perceived knowledge of how to use ICT tools by students and teachers is worthwhile skill.

In short, teachers' perceptions of adoption and use of ICT in schools were positive. The findings of this study are in agreement with the results of Manduku et al, (2012) which assessed the teachers' perception towards implementation ICT in education and found that Kenyan teachers held very positive perception towards ICT integration in education. Similar positive perception towards ICT use, as a tool for teaching and learning in schools, were found in a study carried out by Jimoyiannis & Komis, (2007) in 2006-2007 amongst Kenyan secondary school educators. From this study, it was revealed that teachers understood the importance of ICT in enhancing teaching and learning and were willing to integrate more technology into their day to-day professional tasks in school.

4.4 The extend of ICT adoption and use in schools

Teachers' were asked to indicate to which extend ICT tools (internet, computers, overhead projectors, printers, etc) were used in their schools either on a daily and/or weekly basis. Table 5 shows that majority174 (79.10%) indicated their schools used ICT tools to average extend, less extend or not at all.

Table5. Extend of ICT adoption and usage in schools

Extent	No.	%
To a great extend	12	5.45
To some extend	34	15.45
Average extend	66	30.00
To a less extend	76	34.55
Not at all	32	14.55

Note: No. = 220

This data suggest that though teachers' perceptions of adoption and use of ICT in schools were positive (as indicated in table 4) the technology was not adequately being used in schools. A test of relationship between perception of ICT adoption and use in schools and extend of ICT usage shows a weak positive linear relationship ($r = 2.13$, $r^2 = 4.54$, $\alpha = 0.08$ and $\beta = 2.13$) with a linear regression model: Extend of ICT usage in school = 0.08 + 2.13 perception of ICT adoption and use in school. It can be argued that this relationship is weak because only 10.11% of extend of ICT usage can be attributed to perception of ICT adoption and use in school. This implies that perception of ICT adoption and use in school does not automatically result to great extend of use.

4.5 Challenges affecting adoption and use of ICT in schools

Teachers' were asked to identify the challenges that they experienced during adoption and use of ICT in schools

Table6. Challenges affecting adoption and use of ICT in schools

Challenge	No.	%
Inadequate and poor training on ICT use	205	93.18
Inadequate ICT tools in schools	191	86.82
Lack of technical support	164	74.55
Limited and unreliable supply of electricity	142	64.55
Limited access to internet	125	56.82
Negative attitude towards computers in school	76	34.55
Limited support by management, parents and government	61	27.73

As shown in table 6, majority of teachers 205 (93.18%) indicated that main challenge on their skills was due to inadequate and poor training on ICT use, while 191 (86.82%) viewed inadequate ICT tools in schools was challenge they were facing. These findings are in agreement with a study conducted by Nchunge et al (2012) which found that some schools in Kenya had some ICT infrastructure but this could be limited to one computer in the office of the school head. Lack of technical support was perceived by 164 (74.55%) as challenge, 142 (64.55%) indicated limited and unreliable supply of electricity, 125 (56.82%) viewed limited access to internet, while 76 (34.55%) indicated negative attitude towards computers in schools and 61(27.73%) perceived limited support by management, parents and government as setback to effective adoption and use of ICT in schools.

These findings were in agreement with the findings of lau & Sim (2008) who asserted that the main challenges affecting ICT adoption and use in education were inadequate training of teachers, lack of ICT infrastructure and lack of technical support. The findings were also in line with results of a study by Manduku et al, (2012) which found that some teachers perceived use of ICT tools in teaching resulted in waist of students' time needed in preparing for national examinations and it disrupted the traditional norms in classroom.

4.6 Possible remedies suggested by teachers for challenges affecting adoption and use of ICT in schools

Teachers who responded to this study give some valuable insights on how to overcome challenges affecting adoption and use of ICT in schools.

Table7. Possible remedies for challenges affecting adoption and use of ICT in schools (multiple responses)

Suggested remedy	No	%
Enhanced teacher development in ICT through in-service courses	181	82.27
Fundraise to purchase ICT tools and other accessories	164	74.55
Creating awareness of opportunities offered by ICT in schools	140	63.64
ICT literacy should be made compulsory for all teachers	133	60.45
Sharing of ICT infrastructure among the schools	127	57.73

As shown by table 7, 0ne hundred and eight one (82.27%) suggested enhanced teacher development in ICT through in-service courses. Fundraising to purchase ICT tools and other accessories was proposed by 164 (74.55%), while 140 (63.64%) suggested creating awareness of opportunities offered by ICT in schools, 133 (60.45%) suggested making ICT literacy compulsory for all teachers and 127 (57.73%) proposed sharing of ICT infrastructure among schools to ease shortages. These results were in agreements with findings of Bukaliya and Mubika (2011) who found that schools and teacher training colleges in Zimbabwe were equipped with ICT tools through fundraising and financing from donors. Since teachers' competence is a very trendy theme national curriculum, ICT capabilities needs to be made compulsory for school teachers.

5. Conclusions

This study focused on teachers' skills challenges faced during adoption and use of ICT programs in public secondary schools in Meru County, Kenya. The study drew the following conclusions:

1. There is limited supply of qualified ICT teachers. Majority of secondary school teachers were not competent to facilitate use of ICT in schools. A major obstacle to adequately implementation of ICT to schools is lack of a critical mass of teachers who feel comfortable in using ICT and could therefore provide support and exemplary instances of good practice to those who are still not fluent with ICT use.
2. The level of ICT training of majority of the teachers is far from being satisfactory due to lack of proper exposure during formative training in initial teachers training institutions. Training through seminars/conferences during in-service courses did not give enough time for teachers to practice well with ICT tools.
3. The relevant ICT packages that secondary school teachers should be competent and skilled with are; word processing (e.g. Microsoft word), data processing (e.g. Microsoft Access), presentation (PowerPoint), spreadsheet (e.g. Microsoft Excel), internet and e-mail. However, most of teachers perceived they are not competent on them.
4. Making ICT skills compulsory for secondary school teachers can successfully improve teachers ICT skills and knowledge.
5. Generally, teachers perceived ICT adoption and use in schools was important has it can help in meeting varying needs of students, make their work more organized, make teaching effective and help in lesson plan preparation. Indications are that with proper training, teachers are willing to adopt and use ICT in teaching.

6. Recommendations

From the results of the study, the following recommendations are made:

1. More ICT teachers be employed in secondary schools and trained in ICT skills to make them effectively deliver ICT based curriculum. It is crucial that Kenya has well-trained teachers, able to implement ICT in schools in a mode that brings change from old to new pattern of learning which are much more student-centered than before.
2. Teachers should be given sufficient training on how to integrate ICT in teaching and learning. Teacher training institutions should align their curriculum in order to train teacher trainees on skills and competences required for classroom teaching through use of ICT. Teachers should be trained on detailed use of ICT rather than general training on computer use. ICT skills on word processing and other packages need to be taught to teachers so that they can realize the importance of these packages in teaching.
3. ICT skill standards for teachers should be set up which offers strategies for planning training needs and staff development programs in order to equip them with essential skills important in adoption and use of ICT tools in classroom. A more promising way forward should be a sustained professional development plan that draws on teachers local professional communities, encourages constant peer learning by teachers of similar subjects and age groups and supports reflective classroom performance. Teachers themselves need to become constant learners, with traditional teacher training models perhaps being replaced by models that allow teachers to learn independently, at their own rate and supported by ICT. Essential maintenance tools should be tools for self-assessment that direct teachers to appropriate knowledge sources.
4. Government and other stakeholders should mobilize resources for equipping schools with ICT infrastructure. There should be recognition that considerable learning could take place while teaching and even by learning from students. Therefore, schools should acquire up to-date ICT infrastructure that teachers and students could train and learn on. Teachers could be encouraged to learn from ICT infrastructure if they have an access to them. This would create interest and therefore encourage its implementation in school.
5. To foster a positive attitude to teachers on use of ICT in teaching and learning, there should be comprehensive in-service courses. In-service courses should be designed that will enable all teachers to acquire ICT skills. Continuing professional development of teachers is central to successful implementation of ICT in school.
6. Teachers need examples of good practice and leadership from their school leaders and necessary time for professional development, in order to successfully implement ICT in schools. Use of ICT by school leaders will have an encouraging commendable result on those teachers who may have a more unwilling attitude towards the technology, providing them a good encouragement to give a try. They need to be transformed from information consumers, using internet to access resources and information, into information producers who adapt the ICT for their particular cultural and educational reality.

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