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**Influence of Teacher Factors on ICT Integration in Teaching and Learning in Public Secondary Schools in Kimilili Sub-County, Kenya**

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**Abstract**

This study examined the influence of teacher characteristics on ICT integration in teaching and learning in public secondary schools in Kimilili Sub-County, Bungoma County, Kenya. Teacher characteristics examined were age, gender and teacher competency in ICT skills. Cross-sectional survey research design was adopted. Stratified and simple random sampling techniques were used to select the study sample. Validity of research instrument results was done with the help of research experts. Reliability was established using test re-test technique. Data were analyzed using descriptive and inferential statistics. Descriptive statistics involved use of frequencies, percentages, means and standard deviations. Inferential statistics made use of T-test, one-way ANOVA and simple linear regression. Study findings showed that teachers' age and teacher competency in ICT were significant factors influencing ICT integration, whereas teachers' gender was not significant. All teachers should be trained in ICT so as to acquire the competency of integrating ICT in their teaching. Both male and female teachers should be encouraged to integrate ICT in their teaching since gender is not a factor influencing ICT integration. We recommend that older teachers to be specially trained so as to embrace ICT in teaching. A comparative study on implementation of the policy in public and private secondary schools should be done.

**Key Words:** Kenya, Gender, Age, Teacher competency in ICT, ICT integration, Kimilili Sub-County

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## **Influence of Teacher Factors on ICT Integration in Teaching and Learning in Public Secondary Schools in Kimilili Sub-County, Kenya**

By

Musungu W. Joseph, Prof. Paul Ogula & Dr. Jennifer Munyua

### **Introduction and Background**

Education and training has always been considered to be a solution for all problems affecting mankind. It is also seen as a means for economic growth, improved incomes and employment. Swarts and Wachira (2009) observed that education could fulfill its expectations if it were relevant and geared towards providing the citizenry with the required knowledge, skills, attitude and values to survive, and completely take up roles in the modern and ever changing complex world. Education systems world-wide are increasingly adopting the new Information and Communication Technologies (ICTs) to impart learners with knowledge and skills needed in the 21<sup>st</sup> century (Owour & Kaburu, 2014).

The Kenya government is committed to the exploitation of ICTs for development and education. All its major strategy and policy documents emphasize the role that ICTs could play in this sphere. Examination of the various policy documents such as Kenya Vision 2030, The Kenya Constitution 2010, Sessional paper no. 14 of 2012 and the National ICT Master Plan revealed that the Kenya government recognized the central role of ICT and e-learning in human development. In order to make Kenya a middle-level economy, Kenya Vision 2030 recognized the value of ICT by putting the implementation of ICT in schools at the core of achieving the vision. One of the flagship projects of the social pillar of Vision 2030 was the development of a robust supply programme for ICT infrastructure. The aim of the program was to increase access to ICT facilities in schools across the country and to encourage information and communication technology in schools across the country.

The government finalized the National ICT Strategy through the Ministry of ICT in 2006. The policy aimed to improve the livelihoods of Kenyans by ensuring that accessible, productive, reliable and affordable ICT services were available. The aim of the National ICT Policy was to incorporate ICTs into teaching and learning processes. This gave the Ministry of Education (MOE) the impetus to develop its sector policy on ICT in education. The National ICT Strategy for Education and Training was formulated in June 2006 by the ministry of education. The ICT strategy for the education sector has come to be referred to as the ICT policy for the education sector, (2006). Its vision was to "make ICT a universal educational and training tool" and its mission statement was to "integrate ICT into education and training for better access, learning and management." The policy was established to direct the ICT sector's investors, partners, implementers and beneficiaries. One of the main concerns of ICT education policy was to ensure that ICT incorporation in education took place by facilitating the use of ICT in schools, colleges, universities and other educational institutions. It also advocated for promotion of e-learning, capacity building and supporting training in ICT of implementers and policy makers.

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The vision of the ministry was to promote ICT as a universal education and training tool. It also called for the transformation of teaching and learning in order to integrate modern pedagogies suitable for the 21st century. It was hoped that the implementation of ICTs would increase access, efficiency, and equity in the delivery of education services in the country. Incorporation of ICT in the teaching environment was expected to improve quality of education through enhanced teacher skills, adaptation of teaching to the diversity of learners and improvement in management of schools. Other benefits envisaged were provision of immediate feedback to students, increased attentiveness and interest of students as well as improved communication between partners in education who include teachers, students and parents

### **Statement of the Problem**

Integration of ICT in teaching and learning in public secondary schools is still low, despite Kenyan government's efforts to mainstream ICT in schools. Since the adoption of the ICT policy for education sector in 2006, government efforts have been geared towards integration of ICT in teaching and learning in schools by provision of ICT equipment, infrastructure, capacity building in ICT and development of digital content for the curriculum. It was hoped that integration of ICT in teaching and learning would have many benefits such as improved learner outcomes in academics, especially in sciences and mathematics, as well as improved retention and transition rates of learners. The government's vision 2030 of an ICT literate population that will aid the economy relies heavily on ICT. Teachers play a big role in teaching and learning and their personal characteristics greatly influence integration of ICT in classroom teaching. A review of literature shows that no study has been conducted to establish influence of teacher characteristics such as age, gender and competency in ICT on ICT integration in teaching and learning. This study therefore examined the influence of teacher characteristics on ICT integration in teaching and learning in public secondary schools in Kimilili Sub-County, Kenya.

### **Research questions**

1. What is the relationship between teacher's gender and ICT integration in teaching and learning in public secondary schools in Kimilili Sub-County, Kenya?
2. Is there a relationship between teacher's age and ICT integration in teaching and learning in public secondary schools in Kimilili Sub-County, Kenya?
3. What is the relationship between teacher's competency in ICT skills and ICT integration in teaching and learning in public secondary schools in Kimilili Sub-County, Kenya?

### **Research Hypotheses**

**H<sub>1</sub>:** There is a relationship between teacher's gender and integration of ICT in teaching and learning.

**H<sub>2</sub>:** There is a relationship between teacher's age and integration of ICT in teaching and learning.

**H<sub>3</sub>:** There is a relationship between teacher's competency in ICT skills and integration of ICT in teaching and learning.

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## **Review of Related Literature**

### **Integration of ICT in Teaching and Learning**

Studies have linked increased teaching quality and quantity and student learning with consistent use of ICT resources in classroom teaching, such as computers and the internet (Miima, Ondigi and Mavisi, 2013). This contributed to the idea that student learning is positively influenced by the integration of ICT resources in classroom teaching. As a result, the Kenyan government has developed projects for the introduction of ICT resources in schools. A literature review reported mixed results about the level of ICT incorporation in teaching and learning in the classroom. In support of the learning process, Ayere et al. (2010) defined e-learning as the purposeful use of electronic systems or computers. They established that provision of audio, audio-visual and audio-visual conferencing, computer conferencing, and multimedia both online and offline ICTs usually facilitated and promoted classroom teaching and learning practices and concepts. This in turn promotes and improves access, quality and equity and stimulates learner's interest and motivation for life-long learning.

Vajravelu and Muhs (2016) carried out a study to examine integration of ICT in teaching and learning Mathematics in the University of Central Florida, United States of America (U.S.A). The department of Mathematics in the University developed an innovative teaching method that incorporated use of computers and MylabsPlus software. The integration of ICT program was aimed at enhancing problem solving skills to improve on students' performance and retention in calculus classes. Findings of the study revealed that power point slides were liked and frequently used by lecturers especially for large classes. Power point was used to present basic content for the course. This improved students' attention to the lessons. Use of power point was used in providing breaks to students through presentation of interactive figures. Use of technology enabled students to complete their assignments in good time. It enabled lecturers to provide immediate feedback because assignments were done and marked online.

Mwalimu and Bwalya (2016) carried out a study to evaluate teachers' perceptions and experiences on introduction of ICTs as a mainstream subject in Secondary schools in Lusaka, Zambia. Specifically, the study ascertained views on whether the ICT policy was meeting its intended objectives and also established challenges towards implementation of the policy. Study findings revealed that implementation of ICT policy were low in government owned institutions as compared to private institutions. Private institutions were more equipped with ICT resources as compared to government owned institutions. Adu (2012) conducted a study in Lagos, Nigeria, to compare the extent of ICT integration and use by secondary school students. Findings revealed that integration of ICTs in government schools was low. It was also established that students' exposure and competency in use of ICT facilities was at average level. Integration of ICTs affected usage of ICT facilities in government schools.

### **Integration of ICT in Teaching and Learning in Kenya**

A review of literature on ICT integration in teaching and learning in Kenya showed that there was limited knowledge in this area. Karsenti et al. (2011) reported that integration of ICT was

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relatively low in African countries compared to other countries globally. Teaching was mostly done using the same old techniques that put the teacher at the centre of the learning process. Owour and Kaburu (2014), from their findings showed that although ICT was taught as a subject, integration into classroom to enhance e-learning was very slow. They further established that focus was on ICT as a subject, rather than enhancement of curriculum effects on teaching and learning in schools. They also found out that there were no strategies in schools set to explore affordable ICT solutions.

In their study, Kidombo, Gakuo and Kindachu (2011) established that integration of ICT in teaching and learning in Kenyan secondary schools depended on school leadership, professional training of the teachers in ICT, school manager's level of ICT skills competence and presence of school ICT policy. They also found out that Kenya lacked adequate connectivity and network infrastructure. In rural and low-income areas, there was low penetration of the national physical telecommunications infrastructure. There has therefore been restricted access by schools to high-speed email and internet connectivity. In Githunguri Sub-County, Kenya, Gichimu (2016) studied factors affecting ICT integration in teaching and learning in public secondary schools. The study found that ICT integration in teaching and learning was very limited. In many schools, computer use was limited to typing of examinations, analysis of examination results, accessing of emails and preparation of lesson plans, but not for use in teaching and learning. In schools offering computer studies, emphasis was on learners to acquire basic computer skills rather than using the computer as a tool to enhance teaching.

Chepkemoi and Wanyonyi (2017) carried out a study to examine the use of ICT in teaching Kiswahili Play in public secondary schools in Uasin Gishu County, Kenya. The study sought to establish ICT skills among teachers of Kiswahili Play and attitude towards ICT. The study findings revealed that there was limited use of ICT in teaching Kiswahili play in public secondary schools. Gichimu (2016) investigated factors influencing the integration of ICT in teaching and learning in public secondary schools in Githunguri Sub County, Kenya. The study examined teacher factors, infrastructural and managerial factors influencing integration of ICT in teaching and learning. Study findings showed that ICT has been used in teaching and learning to a minimal extent. Teachers used ICT mostly in preparing for students' assignments and making and storing teaching notes. There was a positive correlation between teachers' qualification, confidence and Integration of ICT in instruction.

In the teaching and learning of mathematics in secondary schools in Nairobi County, Amuko (2015) explored pedagogical practices in the integration of ICT. Findings revealed that there were low levels of ICT integration and that mathematics teachers were not well prepared to integrate ICT in the teaching of mathematics. The study revealed further that teachers faced major challenges such as expectation to develop their technological skills and knowledge as well as ICT use in their teaching without support. This resulted to poor attitude towards ICT that led to low levels of ICT integration in instruction.

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### **Relationship between Some Teacher Factors and Integration of ICT in Teaching and Learning**

This section reviewed studies on relationship between teacher factors and ICT integration in classroom teaching and learning. The factors discussed were: teacher's age, teacher's gender and teacher's competency in ICT skills.

### **Relationship between Teacher's Gender and ICT Integration**

Mixed findings were obtained from research on gender and its effect on ICT use. Some studies have shown that gender, age and motivation have had a major effect on digital pedagogical competence. For example, by using a study of 1138 university students from Belgium, Tondeur et al (2016) found that there were still gender-related differences and reported that women's attitudes towards ICT were not as positive in general terms as those of men. Similarly, Balta and Duran (2015) suggested that their female colleagues were more likely to incorporate ICT into their teaching practice, whereas male teachers displayed higher levels of digital competence. Lin et al (2013) concluded in the same vein that female pre-service teachers were more secure in their digital pedagogical skills, but less so in their digital personal knowledge compared to males. On the other hand, there were no substantial variations on this respect in a number of studies on the inclusion of pre-service teachers and emphasis on the use of ICT (Van Braak and Tondeur (2010), Siddiq et al, 2016).

Guillen-Gamez et al (2019) examined ICT usage among future primary education teachers by pre-service foreign language teachers according to gender, age and motivation. Findings have shown that prospective foreign language teachers possess pedagogical digital expertise in the use of medium-low ICT. There was however no significant difference regarding gender, while age as a variable influenced the level of pedagogical digital competence. The study was relevant as it pointed out that gender did not influence use of ICT by the pre-service teachers of languages. The study however only focused on pre-service teachers and only those taking foreign languages, unlike the current study whose focus were on In-service teachers and in all subjects. The lack of consensus in relation to the findings obtained on the issue of gender necessitated this study.

Some studies have reported that female teachers have low levels of ICT utilization than their male colleagues. Volman and Van Eck (2011) attributed this to female teacher's limited technology access, inadequate skills and lack of interest. The males on the other hand used more ICT in their teaching and learning processes than their female counterparts (Kay, 2016). Lalitha and Prased (2014) revealed that differences exist between male and female teachers in the use of ICT in teaching. They pointed out that males were more likely to use CT in classroom than females because more males had attended training and how to teach with ICT, as compared to the females. Ayokunnu (2016) carried out a study on ICT needs and competence level of basic technology in Kwara state. The study found that the use of ICT in teaching and learning did not vary substantially between male and female teachers. This contradicted Lalitha and Prased (2014) finding that significant difference exists between male and female teachers when it came to utilization of ICT in teaching.

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Further contradictory findings were found to exist on the link between demographic factors and teacher's willingness to use ICT tools (Ayot, Ogembo & Ondigi, 2015). Alazzam, Bakar, Hamzah and Asimiran (2012), for example, discovered that gender, age and teaching experience were not important predictors of the willingness of teachers to use ICT instruments. On the other hand, on the basis of demographic variables, Lau and Sim (2015) found variations in a teacher's ability to use ICT resources. Ayot et al. (2015) examined the ability of teachers to implement ICT resources into teaching in the classroom. The analysis was performed in Kwale County in the Msambweni Sub-County. The research sought to determine whether his/her willingness to incorporate ICT was affected by demographic factors such as age, gender, years of teaching experience and the teacher's field of teaching specialization (department). The research also explored the magnitude of the contribution of contextual variables, such as the level of mastery of teachers in ICT integration. The study established that while age and having access to an internet enabled mobile phone were negative significant predictors of teachers willingness to integrate ICT, gender, teaching experience and teacher's area of specialization were positive significant predictors of ICT integration. Mastery of ICT or rather, competency in ICT skills was found to be significant.

### **Relationship between Teacher's Age and ICT Integration in Teaching and Learning**

Prior experiences by different groups of teachers based on age and length of teaching experience can lead to differences in perceptions towards computer use. This in turn influences their use of ICT in teaching. Younger teachers may have been exposed more to computers as part of their secondary and college schooling as compared to older teachers since ICT in education is a recent phenomenon. On the other hand, older teachers might have had limited exposure to computers, therefore learning to integrate ICT in classroom teaching may result to poor attitude towards ICT.

Previous studies have pointed to mixed findings about relationship between teacher's age and computer use in teaching. A research on the impact of demographic features on the ICT readiness of technical and vocational teachers in Malaysia was conducted by Alazzam, Bakar, Hamzah and Asimiran (2012). Sex, age and teaching experience were demographics included in the study. The study results showed that there were no major effects of age and teaching experience on the overall ICT preparation of teachers in the integration of ICT in teaching and learning. There was however a major influence of gender on the ICT preparation of teachers.

Alazzam et al (2012) findings were similar to those of Inan and Lowther (2009), Brooks et al (2014) who established that there was no relationship between age of a teacher and computer use. The studies pointed out that what mattered most was whether the teacher had knowledge and competency in ICT. On the other hand, some studies found strong relationships between teacher's age and ICT integration. Bulent et al (2009) established that age was the main demographic variable influencing computer use by teachers. Njagi et al (2014) found out that there existed a significant correlation between age and a teacher's perception towards computer use in teaching. Sternad and Bobek (2013) too came up with similar findings. Other findings by Kalogiannakis (2008) established that teacher's age influenced their readiness and adoption to

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use ICT during their teaching process. This study therefore investigated the relationship between teacher's age and integration of ICT in teaching and learning.

Indeed, researchers have come to varying conclusions about the connection between age and the incorporation of ICT into teaching by teachers. Cabero and Barroso (2016) reported that younger teachers' ICT skills were greater than their older counterparts. After evaluating 356 Norwegian newly trained pre-service teachers, Gudmundsdottir and Hatlevik (2018) attested that those who had recently graduated appeared to be more positive about incorporating ICT into the learning process. On the other hand, researchers such as John (2015) found that the 30 to 50 age group had a more optimistic attitude towards its participation in the teaching process than those under 30 and over 50 classes, when examining the attitude of pre-service teachers towards ICT and its application in the classroom. Therefore, the research concluded that age affected the incorporation of ICT in teaching. Siddiq et al (2016) concluded that they were aware of its utility in the teaching process, even though older teachers felt they were less skilled in the use of technology. Nonetheless, some studies have shown a negative link between age and the attitude of teachers towards ICT (Saddiq et al 2016, Vanderline, Aesaert & Van Braak, 2014).

More recent studies still point to mixed findings regarding the issue of a teacher's age and ICT integration in classroom teaching. Osadebe and Ojukonsin (2018) conducted a study to establish if age determined the constraints teachers faced while using ICT in teaching and learning. The study found out that those experienced and older teachers faced more constraints of ICT use than the younger and less experienced. This was attributed to older teachers lacking enough exposure to ICT. Teo (2018) contended that older teachers were less confident with using computers than young teachers. He also pointed out that many 'advanced age' teachers have no training in computer education at college and as a result, they need training in computer skills to help them to use computers in their work. New innovations intimidate the older than the younger generation. From the review of literature above, it is not clear how age affects a teacher's ICT integration. These mixed findings from various studies about a teacher's age and integration of ICT in classroom teaching necessitated this study.

### **Relationship between Teacher's ICT Competency and ICT Integration in Teaching and Learning**

Three main variables that make integration of ICT easy in the learning process were identified by Zaitadun, Khawla, Noor and Jamalladin (2012). They are Teachers' competency in ICT skills, Teachers' confidence level in using ICT and Teachers' satisfaction on ICT training programmes. ICT sought to enhance the learning outcomes of students by incorporating technology appropriately to increase the efficiency and effectiveness of the teaching and learning process. There have been efforts therefore to improve competency of teachers in ICT skills in almost all countries in the world. Teachers are being trained in the use of ICTs in teaching and classroom management. The importance of acquisition of ICT skills is based on the premise that ICT adds value to the process of learning and in the overall organization and management of learning institutions.

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Zaidatun et al. (2012) conducted a study on relationship between teachers' ICT competency, confidence level and satisfaction towards ICT training programmes among postgraduate students. The study was done in Malaysia and respondents were Malaysian teachers who were postgraduate students in a Malaysian university. The study established that Malaysian teachers had a high level of competency in ICT skills. The findings also showed that there was a strong positive correlation between teachers' ICT competency and teachers' confidence level in using ICT in the teaching and learning process.

In Turkey, Tozkopara, Emre and Usta (2015) carried out a study to determine teacher candidates' competencies in Technological pedagogical knowledge in Turkish teaching department of Mevlana (Rumi) University. The study also examined the effect of Instructional Technology and Material Design (ITMD) course on TPACK. Study findings revealed that there was a significant difference in teachers' scores between pre-test and post-test. Post-test scores were higher than pre-test ones. This implied that ICT training had an effect on teachers' performance. It was also established that TPACK played an important role on the subject of teachers' needs, about technology, pedagogy and content in order to ensure professional development of teachers. It was also concluded that Instructional Technology and Material Design (ITMD) is important for TPACK model as well as the general approach and skills of pedagogy and instruction.

Mwangi and Khatete (2017) investigated on teachers' professional development needs for pedagogical ICT integration in public secondary schools in Nairobi and Kiambu Counties. Specifically, the study sought to find out teachers professional development needs and challenges towards ICT integration in education. Findings of the study revealed that there was a variance in teachers' use of ICT especially between personal and pedagogical use. Most teachers opined that approaches used in professional development did not equip them adequately for independent use of ICT in schools. They cited that professional development courses both pre-service and in-service did not go beyond awareness and computer application skills. A teacher should have competency in the use of ICT in general and in pedagogy so as to enable integration. Hennesy (2010) emphasized that teacher's ICT skills and access to professional development play a significant role in implementation of ICT in schools. Dzionu (2010) observed that in many African countries, lack of well trained teachers and low levels of ICT skills and knowledge was a major obstacle in integration of ICT in learning in schools. Training of teachers in computer usage and literacy is important as it helps a teacher acquire the necessary skills to apply ICT in teaching.

A review of literature revealed studies that pointed out a strong relationship between teacher competency in ICT and integration of ICT in classroom teaching and learning. Giordano (2015) found out that at the end of the training, teachers began to use internet for instructional purposes and later on the usage became permanent. This implied that when teachers have acquired competency in ICT skills, they are more likely to integrate it in their classroom teaching. Uslue and Bumen (2012), in their study, observed that after training in ICT, the teacher's usage of technology for preparation education and instruction increased, both in-classroom and out of classroom. Buabeng- Andoh (2012a) conducted a study to analyze the

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skills, attitudes and behaviors of teachers in second-cycle institutions in Ghana regarding ICT use. A strong significant association ( $r=.68$ ) between the ICT use of teachers and their competence was shown by the correlation study. The correlation statistic used in the study was that of association of the two variables and was therefore inconclusive as to whether competency in ICT causes integration, a gap this study filled.

A strong positive association between teacher ICT competence, frequency of use of ICT and the perceived value of ICT among teachers of biology was established by Sorgo, Verckovnik and Kocijancic (2010). They concluded that ICT competence and trust among teachers were predictors of the use of ICT in teaching. The correlation analysis done could however not tell prediction. A stronger prediction test like regression could have been used. The study focused on teachers of biology alone whereas the current study established competency and ICT integration across all subjects offered in the secondary level curriculum. Similarly, Wei, Piaw, Kannan and Moulod (2016), examined the relationship between teacher ICT competency and acceptance and use of school management system in Malaysia. The findings showed that there was a statistically important positive association between the competence of teachers in ICT and the adoption and use of the school management system by teachers (SMS). Just like the other studies, this study used correlation which could not establish prediction between the variables. Besides, it focused on the use of SMS alone, which is just an aspect of the many tools for ICT integration.

Other studies however revealed that although professional competency training increased competency of teachers in computer skills, the use of ICT in classroom teaching was still low (Yurdakul, Yildiz, Cakar & Uslu, 2010). This showed that while training improved teacher's usage of technology skills, it failed to significantly change the level of integration of ICT in the classroom. Sandholtz and Rilly (2014) revealed that while the technical abilities of teachers are powerful determinants of ICT integration, they are not requirements in the classroom for the successful use of technology. They believed that training programs based on pedagogical training in ICT instead of technical support allowed teachers to implement teaching and learning technology more effectively.

In a report on the incorporation of ICT into teaching and learning by teachers, Bingimlas (2014) found that teachers had a deep desire to implement ICT into education, but that they faced many obstacles. Lack of trust, lack of competence and lack of access to resources were the main barriers. The study noted that because trust, competence and resource accessibility were critical components of ICT integration in schools, it was important to provide teachers with ICT tools, effective professional development, adequate time and technical support. It is worth noting that no one component in itself is sufficient in producing sufficient integration but the presence of all the components increases chances of successful integration of ICT in learning and teaching opportunities.

### **Research Design**

The study adopted cross-sectional survey research design. Cross-sectional survey research design describes the current characteristics of a sample at one point in time and therefore has no time

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dimension. The design was found suitable because the study involved collection of data on large scale comprising of 84 respondents that generated numerical and statistical data for analysis.

### **Target Population**

The targeted population included all the heads of academic departments in the thirty two (32) public secondary schools in Kimilili Sub-County. Heads of department are at the centre of curriculum implementation in the department and were therefore suitable to participate in the study.

### **Sample**

Eighty four (84) heads of academic departments from 21 sampled public schools in Kimilili Sub-County took part in the study. These comprised of male and female teachers from the different category of schools ranging from Sub-County, County and national schools. The schools were sampled using stratified random sampling techniques.

### **Instrument**

A heads of department questionnaire was used to collect data. It consisted of nine sections with instructions on how to fill.

### **Validity of Instruments' results**

A committee of three research colleagues was set up to validate the questionnaire. The committee evaluated the questionnaire by checking on clarity of instructions, appropriateness and relevancy of items in the questionnaire in answering the research questions. They also checked on the sequencing of the items, wording of the items and question spacing of the data collection instruments. Items were then corrected in line with the observations of the committee.

### **Pilot-testing of the Research Instrument**

The questionnaire was pilot-tested with 8 heads of department of both genders from two schools in a neighboring sub-county and revised.

### **Reliability of Instrument's Results**

To determine the reliability of questionnaires, the test-retest approach was used. The questionnaires were first administered to respondents in two schools that were not part of the study and their scores noted. After a week, the same instruments were re-administered to the same respondents. A second set of scores were obtained. Pearson product moment correlation coefficient was calculated for the two sets of scores and found to be 0.76. This was taken to be reliable.

### **Data Collection Procedure**

The researcher distributed questionnaires to Heads of departments in the sampled schools for self-administration and collected back.

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### Data Analysis

Data were analyzed descriptively using mean scores and standard deviations. Independent sample T-test and Simple linear regression and one-way ANOVA were used to find out relationships between gender, age, ICT competency and ICT integration in teaching.

### Results and Discussion

**Table 1: Distribution of Heads of Department by gender**

| Gender | Frequency | Percent |
|--------|-----------|---------|
| Male   | 60        | 71.4    |
| Female | 24        | 28.6    |
| Total  | 84        | 100.0   |

Source: Field Survey 2020

Study findings shown in Table 7 revealed that 60 of the respondents representing 71.4 percent were male while 24 of the respondents representing 28.6 percent were female. This implied that more men hold the administrative position of Head of Department (HOD) in schools than female. This situation could be attributed to gender imbalance that has been in existence in many African countries, though in Kenya, it was being addressed with the promulgation of the 2010 new constitution. The 2010 constitution stipulated that at least one third of all public positions and appointments should be of either gender.

**Table 2: Distribution of Heads of Department (HODs) by age**

| Age              | Frequency | Percent |
|------------------|-----------|---------|
| Less than 25 yrs | 4         | 4.8     |
| 25-35 yrs        | 24        | 28.6    |
| 36-50 yrs        | 40        | 47.6    |
| 51-60 yrs        | 16        | 19.0    |
| Total            | 84        | 100.0   |

Source: Field Survey 2020

Findings in Table 2 showed that majority of Heads of Department (HODs) 56 (66.6%) were above 36 years, implying they have had a long teaching experience to enable them to qualify for the position, since HOD position is earned as a promotion with a certain teaching experience among other requirements. The few 4 (4.8%) of the HODs could be in acting capacity since they were less than 25 years of age and may not have qualified for the position.

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**Table 3: ICT Integration according to Gender**

| Gender | Mean for ICTN Integration |    | Std. Deviation |
|--------|---------------------------|----|----------------|
| Male   | 2.1222                    | 60 | .59075         |
| Female | 2.1250                    | 24 | .62070         |
| Total  | 2.1230                    | 84 | .59568         |

Source: Field Survey 2020

Findings in Table 3 showed that of those who took part in the study, 60 were male while 24 were female. Males had 2.1222 while females had 2.1250. This implied that females had a slightly higher mean for Integration of ICT than males.

**Table 4: Comparison of ICT integration by age**

| Teacher's Age    | Mean of ICTN Integration |    | Std. Deviation |
|------------------|--------------------------|----|----------------|
| Less than 25 yrs | 2.5625                   | 4  | .71159         |
| 25-35 yrs        | 2.3681                   | 24 | .43746         |
| 36-50 yrs        | 2.0708                   | 40 | .47274         |
| 51-60 yrs        | 1.7760                   | 16 | .83927         |
| Total            | 2.1230                   | 84 | .59568         |

Source: Field Survey 2020

Findings in Table 3 showed that there is a relationship between teacher's age and integration of ICT in classroom teaching. Younger teachers had higher ICT integration means as compared to older teachers.

### Tests of Hypotheses

Three null hypotheses were tested at 0.05 level of significance

**H<sub>01</sub>:**  $\mu_1 = \mu_2$  - There is no significant difference between mean ICT integration scores of teachers of different gender.

**H<sub>02</sub>:**  $\mu_1 = \mu_2$  - There is no significant difference between mean ICT integration scores of teachers of different age groups.

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**H<sub>03</sub>:** There is no significant relationship between mean ICT integration scores and mean ICT competencies of teachers.

**Null Hypothesis 1**

**H<sub>01</sub>:** There is no significant difference between mean ICT integration scores of teachers of different gender.

Independent sample T-test for difference between means of ICT integration scores of teachers of different gender. Results are summarized in Table 5

**Table 5: Means, standard deviations and t-value**

Levene's Test for Equality of Variances

|                             | F    | Sig  | T     | Df     | Sig(2-tailed) |
|-----------------------------|------|------|-------|--------|---------------|
| Equal variances assumed     | .145 | .704 | -.019 | 82     | .985          |
| Equal variances not assumed |      |      | -.019 | 40.608 | .985          |

Source: Field Survey 2020

Since the p-value (.985) is greater than the significance value  $\alpha = 0.05$ , the null hypothesis is not rejected and its concluded that there is no significant difference between mean ICT integration scores of male and female teachers.

**Null Hypothesis 2**

**H<sub>02</sub>:** There is no significant difference between mean ICT integration scores of teachers of different age groups. Results are summarized in Table 6

**Table 6: ANOVA Summary Table**

|  | Sum of Squares | Df | Mean Square | F     | Sig. |
|--|----------------|----|-------------|-------|------|
| ICT Integration in Teaching and Learning * Age | 4.249          | 3  | 1.416       | 4.496 | .006 |
| Within Groups                                  | 25.202         | 80 | .315        |       |      |
| Total  | 29.451         | 83 |             |       |      |

Source: Field Survey 2020

Findings in Table 6 showed that the p-value (0.006) was less than the alpha value (0.05) hence the difference was significant. The null hypothesis that there is no significant difference between mean ICT integration scores of teachers of different age categories was rejected. It was concluded that there was a significant difference between means of ICT integration of teachers of different age groups. A teachers' age therefore influenced his or her extent of integration of ICT in teaching.

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### Null Hypothesis 3

**H<sub>03</sub>:** There is no significant relationship between ICT integration scores and ICT competencies of teachers.

**Table 7: Simple Linear Regression Summary Table**

| Model | R                 | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|-------------------|----------|-------------------|----------------------------|
| 1     | .581 <sup>a</sup> | .338     | .330              | .48760                     |

Source: Field Survey 2020

a. Predictors: (Constant), Competency in ICT

In order to establish whether teacher competency in ICT was a major factor in teacher's integration of ICT, simple linear regression analysis was carried out. Findings in Table 7 revealed that R square value was 0.338, indicating that 33.8 percent of the variance in dependent variable was explained by the independent variable. This implied that teacher competency was a moderately strong predictor of ICT integration in teaching and learning. This led to the rejection of the null hypothesis and conclusion that there was a significant relationship between teacher competency in ICT and ICT integration in teaching and learning.

### Conclusions

The study looked at influence of teacher factors on ICT integration in teaching and learning. The factors were teacher's gender, age and competency in ICT. The study concluded that age and ICT competency significantly influenced ICT integration whereas gender did not. Younger teachers and those who were highly competent in ICT skills integrated ICT more in their teaching.

### Recommendations

Based on the findings and conclusions of the study, the following recommendations were made:

1. All teachers should be trained in ICT so as to acquire the competency of integrating ICT in their teaching.
2. Both male and female teachers should be encouraged to integrate ICT in their teaching since gender is not a factor influencing ICT integration.
3. Older teachers to be specially trained so as to embrace ICT in teaching.

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