DIGITAL DIVIDE IN WORK AND STUDY AMONG MATURE STUDENTS
FURTHERING THEIR EDUCATION IN KENYAN UNIVERSITIES: THE CASE OF KENYATTA UNIVERSITY

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ABSTRACT

The aim of this research was to investigate the digital divide among mature students furthering their education in Kenyan Universities. To achieve this, the study sought to establish the following: if the students had access to electricity and computers, if they had basic computing skills and also if they used computers to perform work as well as study tasks. In addition, the study investigated gender and the education level effects on the digital divide. Data were collected from mature students pursuing doctoral, masters and bachelor degrees in education at Kenyatta University. A number of students reported that lack of electricity; computers and basic computer skills were their major hindrances to digital inclusion. The study findings revealed that mature students who were pursuing doctoral and masters degrees had higher levels of basic computer skills and computer use in their work and study than their bachelor degree counterparts. Contrary to the popularly held view that females are not as good as males in computer technologies, the findings of this study revealed no gender differences between males and their female counterparts in accessing computers, possession of basic skills and the use of computers to support both work and study. Further to this, high cost of computers, lack of computer skills and limited computer access were reported to be the barriers to crossing the digital divide. To increase digital inclusion the respondents suggested that universities should offer ICT as a common unit. In addition universities should provide enough computers for student use and they should also enforcement e-Learning. Individual factors such as computer ownership and cultivation of positive attitudes towards computers were also identified as barriers to digital inclusion. The study recommended that rural electrification be fast tracked.
to enable installation of computers and internet which should be made affordable. Equally, ICT infrastructure should be installed at the teacher training colleges and at the universities to increase the student-computer ratio thus enabling the students to cross the digital divide more easily.

**Key words:** Digital Divide, Digital Inclusion, ICT, Computers, Barriers, Mature Students, Teachers, Kenya

1.1 Introduction

The benefits of accessing and using technology are enormous and they touch on every aspect of individuals’ lives including socialization, business, travel, study and work. In line with this Teo and Chai (2008) aver that in the technologically based world, individuals must access and use technology for social interactions, to further their information and knowledge base, to adjust to the many demands of life and to perform job tasks. Whereas some people have access to and use computer technologies to do this, there are those lacking in various degrees of access and use of these technologies, hence the concept digital divide. According to Mason and Hacker (2003); Paaraer and Petegem, (2011) the digital divide is a concept used to refer to the gap that separates people who have new forms of computer technologies and those who do not. Benard (2011) refers to the digital divide as the inequalities that exist among people in access, adoption and literacy in the digital world. This paper is grounded on the fact that many factors determine if an individual is able to cross the digital divide in terms of accessing and using computer technologies or not. These factors are identified as access to computers, possession and use of computer skills which are further determined by several demographic variables like age, sex, education and geographical locations. In concurrence with these views are Fuchs and Horak, (2006) who reiterate that important determinants of the digital divide are access; usage and usage benefit of computer technology. Furthermore, Maceod (2005) agrees that while electronic literacy has for a long time been identified as a factor behind the digital divide it has also been identified as a means to overcoming it.

This paper investigated the digital divides among mature students furthering their education in Kenya with a specific focus on digital divides caused by lack of electricity, computer access, knowledge and skills to use computers for both work and study tasks. Majority of the mature students investigated were teachers employed either in private sector in Kenya or by the Teacher Service commission. Primary and secondary school teachers in Kenya, who wish to upgrade themselves academically, enroll for bachelors, masters and doctoral degree programs in Kenyan universities. This is important because it enables them to
“repackage” themselves by acquiring more knowledge and skills; it also elevates their social status thus improving their earning power as well as their chances for promotion. With higher degrees, the teachers can also get employment in other sectors of the economy. Like everybody else in the world these teachers are pressurized to have digital literacy so as to apply these skills in the performance of their work in line with global trends. To effectively undertake their university studies they are further required to use computer technologies to access internet for vital information and to take various university courses online. This is in agreement with Brooks (2005) who echoes the same views by adding that ICTs increases the quality of education in schools and universities and leads to the development of highly skilled workforce and an improved economy. In addition, ICT inclusion has for long been reported to change the whole dynamics of learning by introducing flexible delivery, customized education programs and access to information (Oliver, 2002).

In agreement with the above sentiments was Benard (2011) who further emphasized that there were higher expectations for technology at home, school and work. It also confirms the expectations that teachers in Kenya use technology to register students for national examinations (on-line registration) and also to access examination results from the Kenya National Examination Council website. Hence, to be effective and efficient in a technologically changing world the mature students are left with little choice but to cross the digital divide and embrace technology in all spheres of their work and study lives. This is true today as it was a decade ago when Oliver (2002) averred that ICT supports what is learned in schools and universities. In addition to this the international trend is to make the use of computers mandatory in work and study as was the case reported by Yeung, Taylor, Hui, Lam-Chiang and Low (2011) in Singapore. That is why the teacher in Kenya is pressurized to cross the digital divide in many areas of professional and academic life. This paper argues that although teachers are expected to embrace technology there are challenges that may militate against various levels of digital inclusion a position similar to the one reported in Vietnam by Peeraer and Petegem (2011). Hence, this paper was concerned with exploring the digital divide that has existed between teachers who have access to and use computers and their counterparts who do not, an old concern raised elsewhere by (Heemskerk, Brink, Volman and Dam, 2005).

This study focused on important factors determining whether or not the teachers would cross the digital divide or not. These factors have been identified as: access to electricity, ownership of or access to computers, availability of training, competence in computer technologies and computer use. Studies conducted in Kenya have revealed that teacher’s integration of technology in the classroom may not be as
high as may be expected Mwaura (2012) as only a minimal percentage of teachers studied had access to computers either at home or school. This confirms that in some places the picture has not changed much since Cuckle and Clarke (2002) associated little use of ICT by teachers to difficulties in access to computers and lack of active support as well as competing demands on student-teachers time.

This study further argues that to successfully cross the digital divide teachers need supportive environments at work and at the university such as; availability of basic infrastructure like provision of electricity. In addition to this they also need affordable hard ware and soft ware as well as acquisition of basic and higher computer skills. Further to this gains towards crossing the digital divide would be made if internet is both affordable and connectivity reliable. Addressing demographic variables like gender, age, technophobia, computer technology experience, computer availability and current computer use is important as it may be the key that leads to digital inclusion for the majority of the teachers experiencing challenges crossing the digital divide. The study further recognized that the need for women to embrace computer technologies is higher today than ever before because like their male counterparts they cannot afford to be on the wrong side of the digital divide. This is in agreement with Sainz and Lopez (2009) that there is need for more inclusion of women in ICT in higher education (Sainz and Lopez-Saez, 2009). Women are reported to have had more negative attitudes towards computers than men (Ayalon (2003), Zarrett and Malanchuk, 2005). Studies have identified gender differences in the use of computer with females using computers to complete tasks while males use them as recreational devices (Hou 2006 and Erstal, 2006). According to Zarrette and Malanchuk (2005) the way many computer programs are designed is faulted as computer games and programs are made to interest males a reason that calls programmers to develop gender sensitive soft ware.

Giving further insights as to why the digital divide still exists among teachers, various researchers have identified negative attitudes, computer anxiety, technophobia, computer availability, computer technology experience, ICT equipment and supports as well as lack of role models as the barriers to crossing the digital divide among teachers (Rosen and Weil, 1995; Clarke, 2002 and Ceyham, 2004). Another finding by Rosen and Weil (1995) confirmed that even when computers were available teachers may not use them due to worries about computer machinery in the classroom, computer errors, and learning to use computers. More recently, Mwaura (2012) identified educational level, training, attitudes, and frequency of technology use as key determinant of ICT use among study participants.

In addition, low levels in the usage of computers has been reported in studies elsewhere as was the case reported by Lim and Kline 2006; Rosen and Weil (1995) who established that there were low levels of
computer utilization as teachers were not integrating computers in the standard curricula. Another relevant resource is Mwaura (2012) who reported low levels of ICT use among primary schools, secondary schools and teachers in teacher training colleges in Kenya. Anderson’s (2006) study reported that few teachers bring active ICT use in connection with pupils learning. Important variables determining computer use have been identified as gender, age, of starting computer use, frequency of computer use, not having computers and attendance of courses related to computer (Ceyhan 2004).

2.1 Statement of the problem

In a bid to make university education accessible to teachers who are already in service, Universities in Kenya run several programs. A common feature in these programs is the fact that the students must take some of the university courses through e-learning, which makes competence in computer knowledge a vital indicator of success in studies as well as work. This is in agreement with the view expressed by Adetimirin (2011) that ICT complements learning as it enables students to complete assignments and do research. It is imperative that universities establish the computer technologies competencies the mature students have before expecting them to take up courses through computer technology. In agreement with this view are Heemskerk, Brink, Volman, and Dam, (2005) who aver that ICT can facilitate learning or inhibit it, if important learner characteristics are not put into consideration. This study therefore explored the extent to which the mature students undertaking various degrees at Kenyatta University have been able to cross the digital divide and use technology in their work and study. The study has specifically focused on access in the following areas; infrastructural, hardware and software as well as skills and usage. Since the mature students come from diverse backgrounds some of them may enjoy various degrees of ICT access to smoothly undertake both work and study using computer technologies while others may not. The study also sought to find out how gender and education level were factors influencing the digital divide among the study respondents.

2.2 Study objectives

The study investigated the extent to which mature students studying various degree programs in the school of education at Kenyatta University have crossed the digital divide by specifically investigating their access to electricity, computers at their place of work, establishing their competence in general computer use, extent of computer use in performance of various job tasks as well as use of computer technology to support study at the university. In addition, the study investigated the effects of the degree
program and gender on the digital divide, perceived barriers to digital inclusion and the strategies to increase digital inclusion.

2.3 Theoretical Framework

Figure 1 presents the structural model of digital divide gaps effects theory which was used to inform the study.

Figure 1: The structural model of digital divide gaps effects theory by De Sanctis and Poole (1994)

According to the structuralism theory of digital divide gaps people with resources, abilities and knowledge are likely to possess technologies earlier than those without. Hence they become digitally included early and enjoy the benefits crossing the digital divide. According to De Sanctis and Poole (1994) these benefits include, use of technology in communication, search for employment, they have ability to communicate more widely and they gain economic competitiveness and productivity. These people are also able to process, manage knowledge. The people who do not have resources are unable to take up technology and are all the time disadvantaged which more often than not deepens the digital divide. This theory was found to be applicable to this study in the sense that the mature students who are also teaching in various schools across the country may have challenges crossing the digital divide. Those
among them with access to such resources as electricity, computer hardware and software may also get the necessary motivation for training in both basic and higher skills thus crossing the digital divide more easily than their counterparts without the resources. People pursuing higher degrees are also likely to have more resources than their counterparts pursuing bachelor degrees and hence are more competent in computer technology use for work and study.

2.4 Conceptual Framework of the Study

Figure 2 presents the conceptual framework of the study.

Figure 2: Conceptual Framework: Navigating the digital divide
According to the conceptual framework of the study if mature students pursuing various degree programs at the universities have access to computers and possess basic and higher computer skills they will apply these to benefit both work and study. On the other hand those individuals without the computer access or the competencies necessary are bound to experience enormous challenges in work and study. This is because they will experience difficulties accessing important information pertaining to work and study through computer technologies. If the teachers take a proactive role to acquire the competencies and if work stations and universities provide enabling environments, gains towards crossing the digital divide will be made. This way, teachers undertaking various degree programs will cross the digital divide hence becoming efficient in their work and study.

3.1 Research Methodology

The study adopted a descriptive survey design. The research was conducted at Kenyatta University which currently has the highest number of students in Kenya (approximately, 61,000) and drawn from all geographical locations of the country. The school of education was also preferred because it has the highest number (approximately, 25,000) of students in Kenyatta University. From the seven departments within the school of education, students taking courses in the Educational Psychology Department were purposively sampled because they were mature and working which was an important consideration in the study. Another consideration for using these groups was that they joined the university when e-Learning classes had been introduced and it was interesting to find out how they were coping with the new demands of using ICT in their studies.

The target population for this study comprised of second year Bachelor of Education students studying under the Institutional Based Students program, masters and doctoral degrees students in the school of Education during the academic year 2012/2013. The total sample comprised of 180 mature students, that is, 113 females and 67 males categorized as follows bachelor of Education 65 female and 38 males, masters of education 28 females and 19 males and doctor of education 20 female and 10 males. A structured questionnaire developed by the researchers was used to collect qualitative and quantitative data. The questionnaire was administered by the researchers during normal lecture hours.

3.2 Findings of the study

3.2.1 Gender and degree program

A summary of the findings relating to gender and the degree pursued is presented in figure 3.
These findings reveal that majority of the mature students studied were pursuing bachelor of education, 36% of whom were females while 21.1% males seconded by masters of education students at 15.6% female and 10.6% males. Mature students pursuing doctor of education were the fewest at 11.1% female and 5.6% males. These findings show that female mature students outnumber the male counterparts in all three degree programs.
3.2.2 Gender and working station

Findings on gender and working stations are presented in figure 4.

![Gender and Working Station Crosstabulation](image)

**Figure 4: Work Station by Gender**

According to these findings 14.0% of males and 31.1% of females worked in primary schools while 21.3% males and 33.5% worked in secondary schools.

3.2.3 Power sources

The source of power is an important determinant of the digital divide as it is associated with the presence or absence of technological devices like the television and computers. The presence of electricity is an indicator that people can access technology and thus cross the digital divide. With regard to the source of power the study respondents were asked to indicate whether they had electricity from the mains, generator, solar energy, battery or if they had no source of electricity at all. Their responses were summarized in Figure 5.
Results presented in figure 5 show that 70% of the subjects reported having electricity from the mains while 2.29 have generators. The subjects relying on solar energy were 5.71% while those who relied on battery power are 2.86%. The percentage of subjects who had no source of power was 18.29%. These results indicate that although majority of subjects had power supply from the mains and can cross the digital divide more easily, the rest of the subjects have very basic challenges of power supply making crossing the digital divide a remote possibility. The results concur with De Sanctis and Poole (1994) that people with resources access technology and are early technology adopters while those without resources lag behind in adoption of technology. The implications of these findings for this study is that there individuals who will remain on the “wrong side” of the digital divide until the most basic infrastructure is put in place.

3.2.4 Access to computers

The first major objective of this study was to investigate the participants’ access to computers at their place of work as well as establishing their competence in general computer use. In this objective, the research first sought to establish if mature students pursuing various degrees in Kenyan universities owned a personal computer, a laptop, had a computer in the office or shared a computer in the office. Secondly, the respondents were expected to indicate if they sought computer services at a nearby cyber
café or from one more than 5 kilometers away from home and workplace. Thirdly, they were asked to indicate whether they had access to computers at all. The results are presented in Figure 6.

**Figure 6: Access to Computers**

The study findings indicated that only 15.71% of the students had personal computers while 33.72% had personal laptops. Those with computers in the offices were 22.22% while 19.92% sourced computer services from cyber cafes. If the respondents had neither personal computers nor computers in the office it certainly meant that they lacked the most basic of requirements to enable them use technology to perform job tasks. These results are a further indicator that the majority of the respondents were not materially enabled to cross the digital divide which may have translated to the fact using technology for work and study continued to remain a challenge.

In order to determine if there was significant difference in the access of computers among the students pursuing different degrees, the data was subjected to ANOVA and the results showed that there were significant difference in the access to computers among the students pursuing different degree programmes (F = 22.76, p =0.000, p< 0.05). Post hoc analysis revealed that students pursuing masters and Ph. D degrees had more access to computers compared to those in the B.ED programme. The difference
in access to computers between masters and Ph. D students was not significant. These findings are in agreement with earlier findings by Lime & Kline (2006) and further confirmed by Mwaura (2012) that teachers experienced difficulties of access to computers both at home and in the school. These findings also showed that there was a relationship between education level and the digital divide with respondents pursuing higher degrees being more advantaged than their counterparts taking bachelor of education degree. The implication of the findings was that the level of education was a key factor to crossing of the digital divide.

3.2.5 Possession of basic computer skills
Crossing the digital divide is highly aided by the possession of basic computer skills. With regard to this objective, the respondents were asked if they possessed basic computing skills like knowledge of computer parts, creation, storage and retrieval of documents as well as the use of Universal Serial Bus Connector (USB). In addition the respondents were asked if they are users of internet, email or social media. The findings are presented in figure 7.

![Figure 7: Possession of Basic Computer Competencies](http://www.ijsse.org)

The results showed that 25.55% of the respondents reported having low basic skills in computer use while 18.98% reported having had average basic computer skills. In addition to this 55.47% of the respondents reported high basic computer skills. These results are an indicator that there is a challenge in knowledge
access among the study respondents a condition responsible for inability to cross the digital divide. The group without the basic computer skills stands disadvantaged in many ways as they are unable to use technology to keep up the flow of crucial information meant to improve their lives.

Further, it was found that there was significant difference in competence, in general computer use among the students (F = 16.13, p =0.000, p< 0.05). These results indicated that the level of degree being pursued had a bearing with the ability to cross the digital divide and that the gap between people with computers and those without tended to narrow among respondents pursuing higher university degrees. These results were in agreement with Mwaura (2012) who reported that educational level, training, frequency of technology use, were factors likely to determine technology use.

When the data was subjected to post hoc analysis, it was further revealed that students pursuing masters and Ph. D degrees had more competence in general computers use compared to the students in the B.ED programme. However, like in access to computers, the difference in competence in general use of computers between masters and Ph. D students was not significant as evident. These findings raised a similar concern as the one raised by Macleod (2005) that levels of electronic literacy such as operations, saving files, navigating, word processing, internet searches as well as the development of higher skills unlocks access to ICT. Therefore respondents who reported lacking these skills found it difficult to cross the digital divide.

3.2.6 Use of computers to perform job tasks
The study further sought to investigate the level of computer use by the respondents to perform job tasks. The research respondents were asked to indicate if they had sufficient computer proficiency to perform the following job related tasks; type and print examinations, use computer prepared notes, use internet as a source of information, check job related web sites, register students on line and check students’ examinations on line. The results were presented in Figure 8.
According to the results 37.50% of the respondents reported low competence in computer use to perform work related tasks while 36.76% reported average competence in computer skills to perform job related tasks. The respondents who reported having had high proficiency in computer skills to perform job related tasks were only 25.74%. These results confirm that many of the respondents were yet to cross the digital divide well enough to enable them to access and use computers to support their work. These findings echoed the sentiments aired by Underson (2006) that few teachers bring active ICT use in the classroom.

3.2.7 Use of computer technology to support study

With regard to the use of computer technology to support study at the university, the study sought to establish if the respondents were able to access the university website and download relevant information, type and submit assignments and if they were comfortable with e-Learning. The results were presented in Figure 9.
The results presented showed that 10.14% of respondents reported low use of computer to support study while 63.04% reported having had average computer use to support study at the university. Study respondents with high computer use to support study were only 26.81%. These results are a further indicator that a great number of the respondents were challenged with regard to computer competencies to support their study at the university. The results echoed a concern raised earlier on by Oliver (2002) that ICT had not been extensively used in education as it had been used in other sectors.

The level of degree being pursued as a factor determining the extent of use of technology to support study was investigated. More specifically, the study sought to establish if there were significant differences in the extent of use of computer technology to support job tasks. The results showed that there was a significant difference ($F = 6.56$, $p = 0.000$, $p < 0.05$) and this difference was in favour of Ph.D and masters students. Further analysis revealed that the Ph.D students reported more use of computers to support study while B.ED reported to have the least use of computers to support study.
With reference to gender dynamics in the utilization of computer technology the results revealed that there were no significant gender differences in competence in computer use (t = -0.64, df=135, p> 0.0), no significant differences in the use of computers to support job tasks (t = -0.67, df=134, p> 0.0) and no significant gender differences in use of computer to support studies t = 0.37, df=136, p> 0.05). These findings go contrary to what is usually accepted as the norm that women do not do as well as men in ICT (Sainz and Lopez, 2009) with Hargittai (2010) adding that social environment and gender constitute barriers to ICT.

3.2.8 Barriers to the Use of Technology to Undertake Work and Study Related Tasks

For this objective, the respondents were asked to indicate what they perceived as barriers in their use of computers to support work and study. The findings for this objective were presented in figure 8.

![Figure 8: Barriers to Use, Access and Use of Technology](image)

Results reveal that 30% of the respondents reported that high cost of computers constituted major challenge while 16.67% attributed their challenge to lack of computer skills. Another 21.11% of the respondents attributed the challenge to busy school schedules that leave them with little time and energy to pursue computer skills. This difficulty was identified by Al-Senaidi (2009) who noted that institutional support and time are the barriers to ICT adoption by individuals. A further 32.22% attributed their
challenges to limited computers and internet access. These results are echoed Dodlo (2009) who suggested that creating an enabling environment was instrumental to people’s adoption of ICT.

3.2.9 Strategies to Enhance the Efficacy of Teachers in the Use of Technology as a Tool to Promote both Study as well as Professional Competence

The respondents were asked to suggest some of the methods the university could use to promote access and use of technology. The findings were presented in figure 9.

Figure 9: Strategies to Enhance Teachers’ Efficacy in ICT

According to the findings 78.46% of the respondents suggested that the university should have ICT as a common unit while 13.85% suggested that the university should provide more computers in the laboratories. A further 7.69% suggested that e-Learning should be made compulsory.

3.2.10 Strategies to Enhance Teacher Efficacy

The respondents were asked to suggest what should be done at individual level to improve computer access and use. The findings are presented in figure 10.
Results revealed that 62.34% of the respondents suggested that ICT training would help them enhance efficacy in ICT while 19.48% suggested that computer ownership would help them acquire efficacy in ICT. 18.18% of the respondents suggested that if they developed positive attitudes towards technology use it would enhance their efficacy in ICT. According to these results, it is clear that the issues of access, knowledge and attitudes are responsible for the inequalities that exist among those who owned computers and those who did not. These findings supported what Oliver (2002) expresses, that lack of training, motivation and need to adopt ICT as teaching tools were crucial in bridging the digital inequalities.

4.1 Conclusion of the Study
In conclusion, the findings of the study revealed that there were inequalities in the use of computers to support work and study among the study respondents as evidenced by those who reported having had no access to basic infrastructure like electricity. Access to computers was another challenge identified by the study respondents as evidenced by those who neither own a personal computer nor a laptop. Some respondents reported no access to computers at home or in their work place. In addition, majority of respondents reported having had either average or low competence in basic computer skills. According to the findings of the study respondents pursuing masters and doctoral degrees reported having had more access to computers and used them to support work and study as opposed to their counterparts pursuing bachelor degrees. The results did not find gender differences in computer ownership and use to perform
work and study tasks among study respondents contrary to popularly held belief that females lag behind their male counterparts in ICT competencies. The study respondents identified high cost of computers, lack of computer skills and limited computer access as the main barriers hindering them from using computers for work and study. Strategies universities should use to promote use of technology in work and study were identified as introduction of ICT as a university common unit, provision of more computers and making e-Learning compulsory. Individual strategies suggested included promoting the use of technology in work and study, training in ICT, ownership of a computer and the cultivation of a positive attitude towards the use of technology.

4.2 Recommendations of the Study

Based on the study findings as well as the conclusions drawn, this study recommended that rural electrification be fast tracked in regions without electricity as a first step towards introducing technology and crossing the digital divide. The study also recommended a cutting down of the price of technology so that many more people can afford computers as well as reliable internet connectivity. This would enable more people to cross the digital divide. If this is done, then it would be in agreement with sentiments expressed by Seale (2009) that if computers and internet are distributed equally and used well they are powerful tools that can increase learning among marginalized students. The study further recommended that ICT training to be structured in the schools and teacher colleges so that every teacher becomes a proficient user of technology thus crossing the digital divide.

In addition, the study recommended that the universities establish the entry behavior for students in relation to ICT competencies. This would advise universities the computer technology skills students lack and based on this the programs to hoist in order to address the knowledge gaps among the students. Further to this the universities should also introduce learner friendly methods in order to inculcate positive attitudes towards computer technologies among the students. Over and above these, it was recommended that universities could also increase the computer-student ratio to ensure that all students have access to computers. The study encourages individual mature students to take personal initiative to own computers, learn basic computer skills and use computers to enrich their work as well as study at the university as this will enable them cross the digital divide.

5.1 REFERENCES
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