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Technology literacy among grade one and two pupils in primary schools in Kisii County, Kenya

Edwin Obwoye Makworo

School of Engineering & Innovative Technology, Kisii University, Kisii, Kenya

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ABSTRACT

The use of technology as a tool for problem identification and solutions is on the rise in the world today. Many institutions have leveraged the power of technology to solve their existing problems. The young generation has also embraced technology and is applying it in varied ways ranging from entertainment to use for academic purposes. This research sought to find out the technology literacy among grade 1 and 2 pupils in public primary schools of Kisii County in Kenya. The population of the study constituted of 71,000 pupils in the two grades in the 710 schools in Kisii County. A sample size of 384 was determined using the Fisher formula and random sampling was used to collect data from 30% of the schools. Data were analyzed descriptively using the statistical package for social sciences. The findings indicated that 43.6% of the pupils had access to smartphones at their homes, 38.9% used them on a daily basis majorly to play games. The majority of the pupils were conversant with Facebook and WhatsApp. Among the recommendations is that academic institutions at the primary school level should start diverting the minds of the young towards tendencies to use more academic applications to enhance their learning skills.

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Introduction

Kenya is among the developing countries that have embraced mobile technologies in their service delivery in many sectors. Many homes own mobile phones but little research has been carried out to establish the technology literacy of children in lower primary classes especially with regard to use of smartphones.

Several researchers have conducted studies on technology and children. Hosokawa and Katsura (2018) conducted a research to clarify the link between mobile device use and child adjustment. The sample included 1,642 children aged 6 in first grade at elementary schools in Japan. The researchers performed inverse probability of treatment weighted (IPTW) logistic regression to compute odds ratios (OR) for emotional/behavioral problems according to mobile device use. The values for IPTW analysis were computed based on variables assessing socio-demographics and child characteristics. Among the participants, 230 (14.0%) were regular users (60 minutes or more on a typical day) and 1,412 (86.0%) non-regular users (under 60 minutes on a typical day). Relative to non-regular use, regular use of mobile devices was significantly linked to conduct problems (IPTW-OR: 1.77, 95% CI: [1.03–3.04], $p < .05$) and hyperactivity/inattention (IPTW-OR: 1.82, 95% CI: [1.15–2.87], $p < .01$). Based on these results, routine and frequent use of mobile devices appeared to be associated with behavioral problems in childhood.

Kabali et. al. (2015) carried out a study to examine young children's exposure to and use of mobile media devices. They conducted a Cross-sectional study of 350 children aged 6 months to 4 years at a pediatric clinic in an urban, low-income, minority community. The results indicated that most households had television (97%), tablets (83%), and smartphones (77%). At age 4, half the children had their own television and three-fourths their own mobile device. Almost all children (96.6%) used mobile devices, and most started using before age 1. Parents gave children devices when doing house chores (70%), to keep them calm (65%), and at bedtime (29%). At age 2, most children used a device daily and spent comparable screen time on television and mobile devices. Most 3- and 4-year-olds used devices without help, and one-third engaged in media multitasking. Content delivery applications such as YouTube and Netflix were popular. Child ownership of device, age at first use, and daily use were not associated with ethnicity or parent

* Corresponding author. ORCID ID: 0000-0002-6495-8678

education. The study concluded that young children in an urban, low-income, minority community had almost universal exposure to mobile devices, and most had their own device by age 4. The patterns of use suggest early adoption, frequent and independent use, and media multitasking.

It is evident that interactive mobile media devices have revolutionized children's access to and experience of media, but research is lagging behind its adoption. A critical first step is to understand when and how young children adopt mobile media devices. This research sought to find out the technology literacy among grade 1 and 2 pupils in public primary schools of Kisii County in Kenya. This is important because the technology literacy levels of the children greatly impact on their success in the use of digital learning devices that were provided to the primary schools for teaching and learning. The Kenya government through the Digital Learning Program (DLP) provided laptops to grade 1 and grade 2 children for use in learning using digital content developed by the Kenya Institute of Curriculum Development (KICD). The findings of this research will be important to education stakeholders in Kenya

The text in this research has been organized beginning with the introduction, literature review, methodology, Results and discussion and finally conclusions.

Literature Review

The use of technology has been on the rise worldwide in recent years. Many homes have digital devices for use in communication and entertainment. According to the Programme for International Student Assessment (PISA) 2015 results, 95% of 15-year old students on average across OECD countries had Internet access at home (OECD, 2017). This is a very high percentage among adolescents and it indicates a scenario where the home environment is becoming more dynamic and hence requiring new approaches to the home lifestyle. On a typical weekday, students spent more than two hours online after school; this is an increase of 40 minutes since 2012 (OECD, 2017). Children are "connected" in different contexts, not just the home environment. PISA 2012 data reported that across OECD countries 72% of students reported using computer technologies including desktops, laptops or tablet computers at school versus 93% at home (OECD, 2015).

Technology use is on the rise in other age groups as well, not just adolescents. As we become increasingly more reliant and absorbed in technology, it is no surprise that today's children have become avid users as well. Occasionally children are even more conversant with the use of current technologies and applications than their parents. Today many companies are developing laptops for children as young as five. Smart phones are now in almost all homes and are accessed in the hands of children as young as ten. The Kaiser Family Foundation found in their 2010 survey on Media use in 8-18-year old that this group spends an average of ten hours and forty-five minutes per day exposed to media. Even after multitasking is taken into consideration, the total still stands high at seven hours and thirty-eight minutes, more than an hour above the 2004 total (Hatch, 2011). Research suggests that preschoolers become familiar with digital devices before they are exposed to books (Brody, 2015; Hopkins, Brookes and Green, 2013). International trends are pointing to increases in use and younger ages of first access (Hooft, 2018).

The time that children spend using digital devices is increasing rapidly with the development of new portable and instantly accessible technology, such as smartphones and digital tablets. Furthermore, with the dramatically rapid development of media games, learning packages, and educational applications for young children, opportunities for using mobile devices have been growing, children's usage time has become increasingly longer, and child target users of mobile devices are becoming younger (Strasburger & Hogan, 2013, Strasburger, Jordan & Donnerstein, 2010 and Vandewater et. al, 2007).

A recent survey in Japan found that, according to the Japan Ministry of Education, the proportion of children using mobile devices for over an average of 1 hour per day was 15% among elementary schoolers and 48% among junior high schoolers (National Institute for Educational Policy Research, 2014). Children can use mobile devices anytime and anywhere for various purposes, such as playing games, doing schoolwork, chatting with friends, and surfing the internet. From traditional media like television and video games to new media including not only home computers but also mobile devices, such as smartphones and digital tablets, media are an increasingly dominant force in children's lives (Vandewater et. al, 2007 & Vandewater, 2009). Media devices are expected to play an increasing role in daily life, even among young children. The increasing amount of time that children spend using mobile devices has raised concerns about the influence of digital technology use on the health of developing children.

Several studies have suggested that the impact of computer use on children's development can be positive or negative, depending on the context of use. While computer use can be positively related to cognitive and academic skills (Li, Atkins & Stanton, 2006 and Anderson & Subramanyam, 2011), it can be negatively related to social and psychological development. For example, frequent computer use increases children's social isolation, robs children of time for social activities with others, and interferes with social development (Subrahmanyam et. al, 2000). In addition, frequent computer use may increase children's social isolation resulting in depression and loneliness (Amichai-Hamburger & Ben-Artzi, 2003). Furthermore, time spent using media (including both traditional and new media), can displace time used for quality parent-child interaction, such as sharing enriching experiences and activities. Thus, increased media exposure is likely to be associated with reduced parent-child interaction, including shared reading and playing together with toys, which reduces opportunities for verbal interaction with parents (Plowman, McPake & Stephen, 2010). Many studies have suggested that the reduced parent-child verbal interactions is associated with negative developmental outcomes, including language development, self-regulation and later academic achievement (Shimpi & Huttenlocher, 2007; Landry et al, 2002; Hart, 2000).

Similarly, time spent using media can reduce the time children spend playing with peers. Playing is an important element of childhood which supports the development of problem-solving skills and creative expression (Ginsburg, 2007). As frequent media use is likely to reduce children's playtime with peers and engaging in creative play, it is likely to interfere with the development of such skills (Vandewater, Bickham, & Lee, 2006 & Schmidt et al., 2008). Further, screen time through media use is likely to affect children's behavior and capacity to pay attention through several mechanisms, as it may lead to sleep disturbances, which can adversely impact development. Media use at bedtime has been associated with increased autonomic activation due to hyper-arousal, or disrupted melatonin production due to brightly lit screens (Kubota et al., 2002; Higuchi et al., 2005). Repeated exposure to violence and aggression through computer use (e.g., playing violent games or viewing violent media programs) can lead to aggressive and violent behavior (Ferguson & Olson, 2014). Exposure to violent media also tends to increase anxiety and fear, as well as the acceptance of violence as an appropriate means for solving conflicts. Finally, children with higher levels of media use, including the computer and television, tend to be less physically active due to the sedentary nature of media use, increasing the risk of obesity (Dennison, Erb & Jenkins, 2002; Bremer, 2005; de Jong et al., 2013).

Mobile devices are replacing desktop computers, and their uses are highly diverse, including access to internet, games, applications, learning, online communication and social networking sites. Therefore, in a rapidly changing era of digital technology, it is possible that using mobile devices like smartphones and tablets have diverse impact on child adjustment compared with traditional media. In addition, early childhood is a pivotal period in various areas of development. Previous research has indicated that the preschool and early school years are a sensitive period for the acquisition of social competences and related abilities associated to social adjustment (Watson et al., 1999; Cole, Teti & Zahn-Waxler, 2003; Stright, Gallagher & Kelley, 2008). Therefore, the first year in elementary school is an important developmental period during which children are expected to acquire social abilities that will prepare them for social and emotional success.

Clearly, digital technology offers many potential benefits to children, allowing them to connect with peers or access educational resources or entertainment (Livingstone and Bober, 2006; Valkenburg and Peter, 2009; boyd, 2014). At the same time, there are legitimate concerns around who children interact with online (Pew Research Center, 2012), if they experience cyber-bullying or access age-appropriate content (Boyd and Hargittai, 2013), or whether screen-based communication may jeopardize their social development or well-being (George and Odgers, 2015).

In Kenya, many organisations like Plan International Kenya have worked alongside partners to increase literacy among school children through the use of technology. Plan International alongside SOS Children's Villages, technology companies, the government and civil sector groups have endeavored to share the benefits of technology with communities in Kenya. The Kenya's vision 2030 programme recognizes the value of Information Communication Technology (ICT) in its growth to a rapidly industrializing economy by the year 2030 and the government came up with a flagship project for education and training called the Digital Learning Programme (DLP) where primary schools were supplied with digital learning devices. This has accelerated the interest in learners to use technology applications both at home and in school. Therefore, the current study aimed to establish the technology literacy of early school year children in order to lay ground for further researches to establish the effect of technology literacy on their development and academic achievement.

Research and Methodology

Research Design

Research design directs the research activities to ensure that valid conclusions are attained (Durrheim, 2009). A research design is described as a planned framework for action that serves as a connection between research questions and the execution or implementation of the research (Durrheim, 2009; Babbie & Mouton, 2004). Survey research design was adopted for this research. A survey is an attempt to collect data from members of a population in order to determine the current status of that population with respect to one or more variables (Mugenda & Mugenda, 2003). Survey design is chosen because it's economical and has a rapid turn-around in data collection. It also has the advantage of identifying attributes of a large population from a small group of individuals (Babbie, 2008; Fowler, 2002).

Population

The population of the study constituted of 71,000 pupils in grade 1 and 2 in the 710 public primary schools in Kisii county.

Sample size determination

The sample size was determined using the fisher formula

$$n = \frac{z^2 p(1-p)}{\delta^2}$$

Where; z - Statistical constant (1.96)
 P - Prevalence of undetermined population (0.5)
 δ - Error of margin (0.05)

After substitution, $n = 384.16$ (~384)

Using the finite population correction factor

$$n_1 = \frac{n}{1 + \frac{n}{N}}$$

a sample size of 381 standard one and two pupils was arrived at. The response rate was 319 (83.7%). This was taken as 100 percent for data analysis. 30% (237) of the schools were sampled randomly for inclusion in the research.

Sampling procedures

According to Kothari (2004), an optimum sample is the one that fulfills the requirements of efficiency, representativeness, reliability and flexibility. This sample should be in the range of 10%-30% (Mugenda and Mugenda, 2003). Simple random sampling was applied in the selection of the schools. Purposive sampling was used to select grade 1 and 2 pupils since they are the one currently involved in the digital literacy programme (DLP).

Research instruments

Researcher-administered questionnaires were applied in collecting data from the pupils. According to Mugenda and Mugenda (2003), a researcher-administered questionnaire is one in which the researcher engages the respondent and fills the responses in the questionnaire. This was prompted by the fact that grade 1 and 2 pupils were not mature enough to fill the questionnaires on their own.

Data Presentation and Analysis

Data collected was analysed by use of descriptive statistics. Descriptive statistics involves tabulating, graphing and describing data. This simplifies data so that the general trend can be seen (Orodho, 2003). Mugenda and Mugenda (2003) notes that the purpose of descriptive statistics is to enable the researcher to meaningfully describe a distribution of scores or measurements using a few indices or statistics. The data was edited and coded and then analyzed with the aid of the statistical package for social sciences and results presented in tables in form of frequencies and percentages.

Result and Discussion

The response rate was 319 (83.7%). 96 (30.1%) of the respondents were grade 1 while 223 (69.9%) were grade 2 pupils. According to gender, 159 (49.8%) of the respondents were male while 160 (50.2%) of the respondents were female.

254 (79.6%) of the respondents indicated that they had phones in their homes of which 139 (43.6%) indicated that they had access to smartphones. 193 (60%) of the pupils said that they had used a smartphone. Table 1 gives the response on frequency of smartphone use by the pupils.

Table 1: Frequency of Smartphone use

Smartphone use	Response frequency	Response percentage
Daily	124	38.9
Weekly	106	33.2
Monthly	80	80
Never	9	9
Total	319	100

As indicated in table 1, majority 124 (38.9%) of the pupils used smartphones on a daily basis. According to Sunday (2019), Kenya is one of the leading countries in smart phone adoption in the continent with the number of users estimated at over 41 per cent as at 2018, up from 25 per cent five years ago. Most of the new smart phone owners are young people in their late teens and early 20s, digital natives who have grown up immersed in the hyper-connected world that their parents are still learning to adopt. This research findings indicate that young children age 7-9 years have also recently embraced and are immersed in the use of smartphones. This has often created anxiety among many Kenyan parents of a growing digital gulf between the generations that create new parenting challenges. This findings agree with studies by Sabben et al. (2019) who found that more than 90% of the Kenyan population own mobile phones. This has great implication on shift of family value and social interactions.

The difference in percentage in the numbers of smartphones available in the homes (79.6%) to the percentage that are able to access (43.6%) is indicative of a situation of restricted access. Many parents normally feel that young children should not access mobile phones since this may be addictive. This finding agrees well with a study by Lydia (2015) who observed that there are a range of people at home—parents, siblings and other relatives such as grandparents and cousins—who may act as sources of support by monitoring activities, helping when things are difficult, providing encouragement and praise for achievements, and assisting children

to manage their emotions if they get frustrated. However, family members could also hinder access to use of technology. Older siblings could dominate use of devices, preventing their younger brothers and sisters from participating in games or watching videos, and parents who worked from home blocked their child's use of a computer or smartphone if its primary function was related to their employment.

Asked what they use the smartphones for, 63.9% indicated that they played games including motor games, animal games and sports, 5% used the smartphone for dictionary access while 14.4% used it for other applications. Studies by Anderson (2017) concur with the findings of this research. Anderson found out that children's use of mobile and interactive media has increased rapidly over the past decade with recent estimates revealing that the majority of parents own smartphones, on which they allow their children to play games or watch videos. Up to 75% of young children have their own tablets, and infants are estimated to start handling mobile devices during the first year of life (Anderson, 2015).

Several authors suggest that to improve children's mental well-being, it is more important to focus on other factors such as family functioning, social dynamics at school and socio-economic conditions, while also ensuring that children use digital technology in moderate amounts. Moderate use of digital technology tends to be beneficial for children's mental well-being, while no use or too much use can have a small negative impact (Daniel, 2017).

With the increased digital technology use by children of young ages, important questions arise around how time spent on digitally-mediated activities may affect children in positive or negative ways (Putnam, 2000; Turkle, 2011; Bell, Bishop and Przybylski, 2015; George and Odgers, 2015). This therefore calls for controlled access and use of digital technologies among the grade 1 and 2 pupils. If this is not put to check, social and academic life of these children will be affected in the future.

The respondents were further asked to give an indication of whether they were conversant with internet, twitter, WhatsApp, email, Facebook and google and table 2 shows their responses.

Table 2: Response on conversant applications

Application	Response frequency	Response percentage
Internet	147	46.1
Twitter	108	33.9
Whatsapp	173	54.2
E-mail	86	27
Facebook	228	71.5
Google	83	26

N=319

It can be seen that Facebook (71.5%), WhatsApp (54.2%) and Internet (46.1%) were popular among these pupils. This finding indicates that many pupils are acquainted with the major social platforms that many adults use in their social networking. This is pointing to a future scenario where these learners will be deeply engrossed with media platforms and so there is need to start thinking in time on how to guide these young learners to incline towards using this social media platforms for not only social networking but also for academic purposes.

Studies carried out by Badri et. al. (2017) found that in Abu Dhabi, policymakers and schoolteachers are finding that technology has disrupted their traditionally adopted methods, processes, and strategies that worked for their students. Hence, the interpretation is clear. As teachers embracing this changing technology, there is a compelling call for using and adopting social media networks to leverage student engagement in its various applications. This is more so true for teachers handling the lower grades in Kenyan primary schools. Such engagement will no doubt improve the delivery of curriculum in an innovative way and accommodate new directions in teaching that focus on "student-directed" learning style (Douglass and Sherrill, 2014).

Conclusions

The technology literacy among young children in grade 1 and grade 2 in Kisii county is quite well developed and this is a clear indication that it will keep moving up in the course of time. Most children have indicated access to smartphones at home and are acquainted with the internet and popular social networking applications like WhatsApp and Facebook. The access to digital technologies especially smartphones is on the rise each passing day as parents and siblings keep acquiring these devices for communication and social networking at home. The access and use of smartphones by young children in the homes is inevitable and hence parents and teachers should come up with innovative ways of handling these young children in the face of technology. Innovative teaching methods that leverage on smart technologies should be adopted by teachers in order to leverage on the skills that

this young generation have. The use of smartphones should also be controlled to ensure that children grow up while having a well-balanced life.

Following the findings of this research, the following recommendations are made:

- i. *The primary school educators should start diverting the minds of the learners to lean towards more academic applications when using smart phones at home. This can be encouraged by teachers pointing out to specific educational applications and even drawing examples from them in order to motivate learners to search for them out of the curiosity created.*
- ii. *Parents should encourage their children to engage more with applications that will engage them on numeracy and literacy skills most of the time in order to improve their academic achievement.*
- iii. *The education sector in Kenya should work closely with mobile application developers to come up with applications that focus more on the current curriculum. This will ensure relevance of academic applications to the Kenyan curriculum.*
- iv. *The 'screen time' for young children should be put to check since this has an impact on the mental/psychological, social and physical wellbeing of the children. Parents should be at the forefront to ensure controlled use of the digital devices at home.*

Further research should be carried out to establish the following:

- i. *How to engage and maintain children participation in academic tasks using mobile applications in order to improve their academic performance.*
- ii. *Teachers knowledge on academic mobile applications and use in teaching and learning in the face of dynamic technological world.*
- iii. *Update recommendations for families and providers on the use of mobile media by young children.*

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