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TEACHERS' TECHNOLOGICAL KNOWLEDGE ON INTEGRATION OF INFORMATION COMMUNICATION TECHNOLOGY AND MATHEMATICS PERFORMANCE OF STUDENTS IN PUBLIC SECONDARY SCHOOLS OF MAKUENI COUNTY, KENYA

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ABSTRACT

Introduction: There are three components to teaching with technology: information, pedagogy and technology, as well as their interrelationships which make up the Technological, Pedagogical and Content Knowledge (TPACK) framework, which improves teaching and learning.
Purpose: The purpose of this study was to establish relationship between teachers' technological knowledge on ICT integration and students' performance in Mathematics in public secondary schools in Makueni County, Kenya.
Methodology: The study adopted correlational study design. The target population was 15,410 respondents, which included 251 principals, 407 Mathematics teachers, and 14,752 form three students. The study sample comprised of 25 principals, 42 Mathematics teachers, and 375 students drawn from the study population. Data were collected using questionnaires, interviews and group discussions. Experts' review and piloting were utilized to improve the validity of the questionnaire items. Cronbach's alpha was used to determine the reliability of the questionnaire items and found a correlation coefficient of 0.939. Quantitative data were analyzed using descriptive and inferential statistics, while qualitative data was categorized into themes and analyzed thematically.
Results: The study findings revealed that for every unit increase in teachers' technological knowledge in ICT integration, there was 81% increase in Mathematics performance, and hence technological knowledge at $\alpha = 0.05$ level of significance, was statistically significant.
Recommendations: The study recommends that schools should intensify ICT integration in the teaching and learning of Mathematics to improve performance in the subject.

Keywords: Content, Integration, Pedagogy, Technology

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PUBLIC INTEREST STATEMENT

Teaching with technology in education is crucial because, teaching and learning is not only happening in the school environment, but also can happen even if teachers and students are physically far apart. This study found out that schools that embraced technology in the teaching of Mathematics performed far much better in both internal and national examinations compared to their counterparts who used conventional methods of teaching. Based on these findings, secondary school principals are encouraged to ensure that their teachers have been trained in Information Communications Technology (ICTs) and that they teach using technology in order to register improved performance.

INTRODUCTION

Information and technology have a long conjoined history. Understanding how technology affects a discipline's processes and skills is crucial to implementing effective technical resources for instructional purposes. Technological Knowledge (TK) requires that teachers apply computer literacy productively at work and in their everyday lives, to recognize when information technology can assist or impede the achievement of a learning goal, and to continually adapt to changes in information technology (Thompson & Mishra, 2009).

Willermark (2017) investigated how the Technological Pedagogical and Content Knowledge system has been used to demonstrate the need for teachers' Technological Pedagogical and Content Knowledge (TPACK). The research consisted of a systematic review of 107 peer-reviewed journal papers published between 2011 and 2016 that discussed the use of TPACK in scientific studies. It contributes an overview of how the method has been used to classify instructor TPACK in recent research, supplementing previous review research with more recent data on general characteristics of TPACK studies. Findings showed a variety of approaches and instruments to examine teacher TPACK. The current study found out and confirmed that these findings were also true for the sampled public secondary schools in Makueni County, Kenya.

In Europe, research has shown that teacher integration of technology into a Mathematics classroom has an impact on student outcomes (Hegedus, Tapper & Dalton, 2016). However, the study also established that availability of technology in classrooms alone does not improve student outcomes in Mathematics. The teacher's choices on how to incorporate ICT into the Mathematics classroom determines whether students' results improve or deteriorate. The study on the relationship between ICTs and mathematical achievement explicitly shows that ICTs have a positive impact on students' results at the primary school level (Cheung & Slavin, 2013; Demir & Basol, 2014; Chauhan, 2017).

According to Oyelekan and Aderogba (2011), successful incorporation of ICT in education is a key factor in deciding which countries can progress in the future in Sub-Saharan Africa. Tamim et. al. (2011), on the other hand, conducted a second order meta-analysis based on 25 meta-analyses conducted over a 40-year cycle and concluded that "average students in classrooms where technology is used would score 12 percentile points higher" than a student in a more conventional classroom without technology. By fostering relations between visual representations and formal meanings, technology-enriched learning experiences inspire students by improving their ability to discover, re-construct (or re-invent) and clarify mathematical concepts. As a result, the applet can be considered a computational tool since it elicits well-known mathematical principles while also promoting the advancement of mathematical ideas through student–applet collaborative utilization schemes (Cheng & Leung, 2015).

Teachers' incorporation of technical capabilities into teaching and learning can be evaluated for two reasons. First, maintaining high-quality teaching standards in schools is critical in ensuring that students are introduced to a program that incorporates technological affordances (Handal, Cavanagh, Wood &

Petocz, 2011). Second, determining existing teachers' ICT learning and teaching capabilities is essential for designing professional development plans at both the school and systemic levels (Polly, McGee & Martin, 2010). Ayoub, Petra, Jules, and Joke (2015) worked in Tanzania to integrate ICT into Science and Mathematics teacher education in order to improve technical pedagogical material skills. According to the study's findings, there were substantial improvements in technology-related components of TPACK between pre- and post-assessment outcomes of pre-service teachers' perceived experience and skills in incorporating technology in teaching.

Secondary school Mathematics teachers in Kenya lacked technological expertise, according to the results of a report conducted by Kamau (2014) on factors linked to technology acceptance. Teachers' decisions to use technology in the classroom were often hampered by a lack of technology instruction and time to complete the syllabus and schedule technology-enhanced lessons, according to the report. This study found that after several years since the implementation of the ICT policy in 2006, it appears that what is claimed is just paper work and has not been done because teachers' level of competence in the use of ICT as a pedagogical method is still poor, and it is on this basis that ICT incorporation in teaching in Kenya is not a successful practice in many secondary schools. ICT may have been integrated in the study field, but little has been done to determine the relationship between teachers' technical skills in ICT integration and students' performance in national examinations in Mathematics. This research filled this gap.

Teacher's perception is another important aspect of integration of ICTs in the teaching of Mathematics in schools. In Australia, teachers' perceptions of their technological skills (Forgasz, 2006) and their views concerning the usefulness of ICTs for classroom instruction have been shown to be powerful predictors of intended and enacted usage of these tools (Stols & Kriek, 2011). Even though technology has the potential to enhance learning and teaching in Mathematics classrooms (Dawson, Heathcote, & Poole, 2010), ICT tools are often employed on low-level tasks such as online practice that have no significant bearing on student learning outcomes in Mathematics (Cavanagh & Mitchelmore, 2011). Nuruland Zaleha (2008) also identified the attitudes and beliefs of teacher trainees on the Math TPCK elements. Studies on PCK and integration of ICT in education either quantitatively or qualitatively were seen more towards showing that the technology is part of a pedagogical tool in education. However, this knowledge should be generated along with the content and pedagogical knowledge.

Therefore, a number of TPACK-related scales have been designed to examine teachers' perceptions of integrating technology, content and pedagogy in areas such as internet use (Lee & Tsai, 2010), pre-service education (Schmidt et al., 2009), online distance education (Archambault & Crippern, 2009), and Science education (Graham et al., 2009). ICT based learning could change students' perception or attitude that Mathematics is a difficult subject because ICT integration could open an opportunity where students and teachers may access a variety of information relevant to solving specific learning difficulties, exposure to more tests and a varied type of questions which the teacher couldn't be able to give to the learners in class. It was therefore found important to understand the concepts in Mathematics rather than just follow steps and get satisfied with getting the right answers. This thought was shared by Tsai (2012), who was of the opinion that problem-solving approach in students' collaboration through ICT medium could help students be more confident and more involved in the learning context and in their courses.

The Ministry of Education in Kenya in collaboration with partners developed the Kenya Education Sector Support Programme (KESSP), where ICT featured in 2005 as one of the priority areas identified in this sector programme. With the development and approval of the Ministry's policy through the Sessional Paper No. 1 of 2005, entitled 'A Policy Framework for Education, Training and Research' and the approval of the National

ICT Policy in 2006, this strategy became a vehicle through which policy objectives can be achieved. This strategy gives a snapshot of what is required for ICTs not only to have an impact in reducing the digital divide but also as a tool for curriculum delivery and learning (MOE, 2006), Mathematics included.

Integration of ICTs in education is well articulated in the recent Odhiambo report (2012) that led to the Sessional Paper No. 14 of 2012 on reforming education and training sector in Kenya. Both sessional papers provide a policy framework within which integration of ICTs or modern tools in teaching and learning is to take place in various regions and areas in Kenya. The largest volume of research on the relationship between technology use and performance in core subject areas has been conducted on Mathematics instruction. Mathematics instruction also has the longest history of using technology for instructional purposes and boasts of several impressive systems (Ungerleider & Burns, 2002).

Various reports show that Mathematics as a subject at secondary level is wide in content and may not be covered adequately within the recommended time frame (KIE, 2005). National examination results at form four level, which is the culmination of secondary school Kenya Certificate of Secondary Education (KCSE), released by the national examinations body, Kenya National Examinations Council (KNEC), continue to show poor performance in Mathematics (KNEC, 2020), a scenario that motivated this study.

STATEMENT OF THE PROBLEM

Dismal performance in Mathematics in national examinations is a remarkable problem facing the education sector in Kenya. It has demotivated learners and dimmed teachers' chances for promotion. To mitigate the problem, many schools are training their teachers in ICT skills and emphasizing teaching with technology. It is evident that mastery of technological knowledge by teachers is critical to effective teaching with technology. Teachers' integration of ICT in teaching has the potential to accelerate, enrich and deepen skills, to motivate and engage students longer in learning activities, to help them relate school experience to work practices, encourage cooperative learning and support various types of interaction, as well as strengthening teaching and learning. Previous research in developed countries has mostly focused on the availability of ICTs and the challenges teachers and students face in integrating ICT, with little known about the relationship between teachers' integration of ICT into teaching and secondary school students' performance in Mathematics. This research addressed this gap. The study's main goal was find out how teachers' technological knowledge in ICT integration correlates with students' performance in Mathematics in public secondary schools in Makueni County, Kenya.

PURPOSE OF THE STUDY

1. Assess teachers' level of technological knowledge in ICT integration in the teaching of Mathematics
2. Determine the relationship between teachers' technological knowledge in ICT integration and performance in Mathematics
3. Establish how teachers' technological knowledge in ICT integration impact on Mathematics performance in public secondary schools in Makueni county

RESEARCH QUESTIONS

1. What technological competencies required in the teaching of Mathematics do teachers' possess?
2. What is the relationship between teachers' technological knowledge in ICT integration and performance in Mathematics?
3. What is the impact of teachers' technological knowledge in ICT integration on Mathematics performance?

HYPOTHESIS

1. There is no statistically significant relationship between teachers' technological knowledge in ICT integration and performance in Mathematics

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METHODOLOGY

Research Design

This study adopted the correlation research design. According to Lavrakas (2008), a correlation study is useful for establishing the relationship between variables. Past studies indicate that the correlational research design uncovers a relationship that enables conclusions to be drawn regarding the causal relationships, and it allows the researcher to collect more data rather than doing experiments (Levin, 2006). In this regard, the correlational research design enabled the researcher to examine the relationship between ICT integration and students' performance in Mathematics in public secondary schools of Makueni County.

The study targeted 251 principals, 14,752 form three students, and 407 Mathematics teachers, giving a total of 15,410 respondents. The overall sample size for this study was a total of 442 respondents, that is, 375 students, 25 secondary school principals and 42 Mathematics teachers. A sample of 10 percent was considered appropriate for principals and Mathematics teachers for the correlation research (Gay, 1992). To sample the students, the study was guided by (Krejcie & Morgan, 1970) sampling table. Table 1 shows the distribution of the target population and sample sizes for the principals, Mathematics teachers and students per sub-county.

Population and Sample

Table 1: The Distribution of Target Population and Sample Size

Sub-county	No. of Schools	No. of Principals		No. of Teachers		No. of Students	
		Population	Sample	Population	Sample	Population	Sample
Nzaui	45	45	4	75	8	2657	68
Makueni	46	46	5	78	8	2806	71
Kibwezi	51	51	5	86	9	2907	74
Mukaa	42	42	4	72	7	2352	60
Makindu	31	31	3	40	4	1593	40
Mbooni	36	36	4	56	6	2437	62
Total	**251**	251	**25**	407	**42**	14752	**375**

The researchers purposively sampled the secondary school principals and Mathematics teachers since the interest was in getting specific respondents that bear attributes that can achieve the study objectives (Orodho, 2004). The study stratified the schools into National, Extra-county and Sub-county categories and then adopted simple random sampling to select the students from each of the strata. This was done to enable the respondents have an equal chance to participate in the study. Additionally, due to their large number, this guarded against wild samples and ensured that no sub-population was omitted from the sample (Orodho, 2004). Finally, the number of students in each stratum was proportionately sampled according to the population size from each category.

Instruments for Data Collection

The researchers obtained research permits from the relevant institutions and personally collected data from the sampled schools. First, the researcher informed school principals in advance of the intended study and made familiarization visits to the research area to ascertain the availability and accessibility of the respondents. This ensured that he developed a close rapport with the respondents for easy administration of the research instruments. During data collection, from each of the sampled schools, the researcher explained the purpose of the study and then personally administered the teachers' questionnaire (TQ), conducted interviews with the principals and carried out focus group discussions with the students. Once the questionnaires had been issued to the teachers, the filled questionnaires were collected by the researcher at an agreed later date. The return rate for the questionnaires was 81 per cent. The academic performance in Mathematics was obtained by including the mean scores in Mathematics for both first and second terms respectively.

Methods of Data Analysis

The study yielded quantitative data obtained using questionnaires and qualitative data generated from focus group discussions and interview schedules. Quantitative data was analyzed using descriptive statistics which included frequencies, percentages, mean and variance; and this was based on the study objectives. Statistical Package for Social Sciences (SPSS) version 23 was used as a tool for data analysis. Quantitative data collected through questionnaires was analyzed by first editing and then coding and inputting the coded responses into the computer for analysis. Other tests carried out included analysis of variance (ANOVA) statistics that was used to compare the significant differences in means between the various groups in the study. Qualitative data was categorized into themes and analyzed thematically.

RESULTS

Research Question 1: What technological knowledge in ICT integration do teachers have?

Table 2: Teachers' Technological Knowledge in ICT Integration

Statement	1	2	3	4	5	Mean	SD
I know about technologies that I can use to teach Mathematics	2.9%	23.5%	17.6%	50.0%	5.9%	3.32	1.0
I know about technologies that I can use for understanding and doing Mathematics	8.8%	23.5%	14.7%	50.0%	2.9%	3.15	1.1
I know how to fix my own technical problems	11.8%	50.0%	20.6%	17.6%	-	2.44	0.9
I can learn technology easily to teach Mathematics	5.9%	14.7%	35.3%	44.1%	-	3.18	0.9
I keep updated with new emerging technologies	33.3%	39.4%	12.1%	9.1%	6.1%	2.15	1.2
I frequently play around with technology while teaching Mathematics	52.9%	29.4%	-	14.7%	2.9%	1.85	1.2
I know a lot about the different technologies used in teaching Mathematics	8.8%	41.2%	14.7%	32.4%	2.9%	2.79	1.1
I have the technical skills needed to use technology.	14.7%	32.4%	8.8%	41.2%	2.9%	2.85	1.2
I have had opportunities to work with different technologies	50.0%	20.6%	8.8%	14.7%	5.9%	2.06	1.3
TOTAL	**20.0%**	**30.6%**	**14.7%**	**30.4%**	**3.4%**	**2.64**	**1.1**

Table 2 shows that teachers knew about technologies that they could use to teach Mathematics (M=3.32, SD=1.0), they knew about technologies that they could use for understanding and doing Mathematics (M=3.15, SD=1.1) and teachers also knew how to fix their own technical problems (M=2.44, SD=0.9). The study further revealed that teachers could learn technology easily to teach Mathematics (M=3.18, SD=0.9), teachers kept being updated with new emerging technologies (M=2.15, SD=1.2) and frequently played around with the technology while teaching Mathematics (SD=1.85, 1.2). The findings showed that teachers knew a lot about the different technologies used in teaching Mathematics (M=2.79, SD=1.1), they had the technical skills needed to use technology (M=2.85, SD=1.2) and had opportunities to work with different technologies (M=2.06, 1.1).

As presented in Table 2, teachers succeeded in knowing about technologies that they used to teach Mathematics with a variation of (1.0), but did poorly in ensuring that they frequently played around with technology while teaching Mathematics with a variation of (1.2).

Research Question 2: What is the relationship between teachers' technological knowledge in ICT integration and performance in Mathematics?

Model Summary on Teachers' Technological Knowledge and Performance in Mathematics
Table: 3: Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.369[a]	.136	.109	1.197

a. Predictors: (Constant), Technological Knowledge
b. Dependent Variable: Performance

The findings of the model summary in Table 3 show that performance in Mathematics in secondary schools in Makueni County were explained by 13.6% of the variability on technological knowledge in ICT integration (R^2=.136) while the rest of the issues that determined performance in Mathematics in public secondary schools could be explained by other factors**.**

The study further calculated the mean score of the extent to which teachers' technological knowledge to integrate ICT in teaching Mathematics impacted on students' performance in secondary schools in Makueni County. After the analysis, the results were as shown in Figure 1.

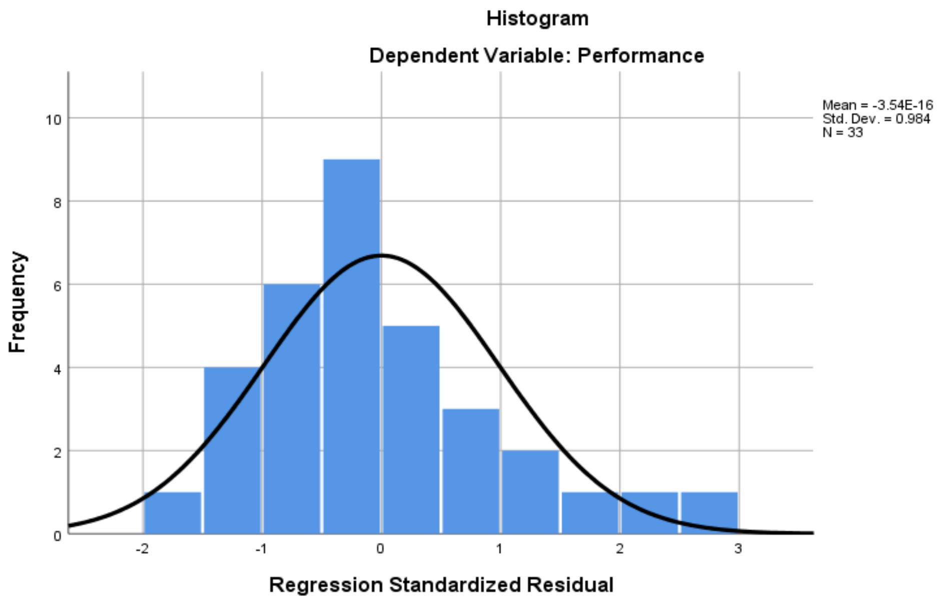

Figure 1: Distribution of Teachers' Technological Knowledge and Performance in Mathematics

As shown in Figure 1, the average (Mean, M) score was (M=3.54) obtained from students' performance in Mathematics (data provided by a total of 33 teachers), with a standard deviation SD of (0.98) from first term and second term as a result of teachers' technological knowledge in ICT. As presented in the Figure, the score of Mathematics performance was normally distributed.

Research Question 3: What is the impact of teachers' technological knowledge in ICT integration on Mathematics performance in public secondary schools in Makueni County?

Table 4: Academic Performance in Terms of Mean Score

Performance	First Term Mean Score	Second Term Mean Score	Mean Score
Mean	3.3727	3.5060	3.4394
Standard Deviation	1.2499	1.2627	1.2563
Minimum	1.7120	1.9230	1.8175
Maximum	6.5670	6.7230	6.6450

As show in Table 4, the average performance in Mathematics was a mean score of 3.4394 equivalent to grade D, with a variation of 1.26 from the mean; the best score was a mean score 6.5670 equivalent to grade C+ and the poorest mean score was 1.7120, equivalent to grade D-; the schools that integrated ICT in teaching consequently registered better performance compared to those that little integrated or used "chalk and talk" methods in teaching. This confirms the research findings by Tamim et al. (2011), who conducted a second order meta-analysis based on 25 meta-analyses conducted over a 40-year cycle and concluded that "average students in classrooms where technology is used would score 12 percentile points higher" than a student in a more conventional classroom without technology.

Hypothesis 1: There is no statistically significant relationship between teachers' technological knowledge in ICT integration and performance in Mathematics

Table 5: Relationship between Teachers' Technological Knowledge in ICT and Performance in Mathematics.

		Performance	Technological Knowledge
Performance	Pearson Correlation	1	.369*
	Sig. (2-tailed)		.034
	N	33	33
Technological Knowledge	Pearson Correlation	.369*	1
	Sig. (2-tailed)	.034	
	N	33	33

**Correlation is Significant at the 0.05 Level (2 tailed).

The findings in Table 5 show the measure of the strength and direction of association that existed between the two variables. The findings revealed that there was a positive correlation between teachers' technological knowledge in ICT and performance, r (33) =.369, p<.034) with 33 degrees of freedom at 95% confidence level with statistical significance. A p-value (probability value) of (.034) was below the 0.05 alpha, hence had statistical significance. That meant that results from the two variables, that is, teachers' technological knowledge in ICT integration and performance in Mathematics did not occur due to chance. According to Handal, Cavanagh, Wood and Petocz (2011), teachers' integration of technological skills into teaching and learning needs to be appraised for upholding high-quality teaching standards in schools and ensuring that students are exposed to a curriculum that takes into account instructional affordances brought about by technologies.

DISCUSSIONS

The study revealed that for every unit increase in teachers' technological knowledge in ICT integration, there was a very high increase of 81.0% performance in Mathematics. This implied that the integration of teachers' technological knowledge in ICT was effective enough to enhance performance in Mathematics. This is confirmed from the research results of Tamim et al. (2011) who performed a second order meta-analysis drawing on 25 meta-analyses over a 40-year period and drew the conclusion that "the average students in classrooms where technology is used will perform 12 percentile points higher" than a student in a more traditional classroom where technology is not used.

Thompson and Mishra (2009) agree that Technological Knowledge (TK**)** requires that teachers apply computer literacy productively at work and in their everyday lives, to recognize when information technology can assist or impede the achievement of a learning goal, and to continually adapt to changes in information technology. Hegedus, Tapper and Dalton (2016) concur that teacher integration of technology of ICT into Mathematics classroom has an impact on student outcomes. From the above findings it can be pointed out clearly that indeed ICTs, do impact positively on students' performance.

The qualitative findings from the interviews conducted with principals and focused group discussions held with the students corroborate the results in Table 2.

During interviews with the principals, one of them had this to say:

> *Majority of teachers are able to design a learning management system (LMS) with the ability to give marks immediately (immediate feedback) which can be given individually or as a group* (Principal, Kibwezi Sub-county). *Assessments are at times not hand marked (this saves time and makes results more reliable) marks go directly to the grade centre (meaning students can track their performance in that subject). The Learning Management System (LMS) can therefore save the questions from various tests to form a question bank* (Principal, Mbooni Sub-county).
>
> *Majority of teachers' ICT competency is at the ENTRY LEVEL where students only listen or watch content delivered through technology with no or little access to technology being used by the teacher. At this level, decisions about how and when to use technology tools as well as which tool to use are made by the teacher* (Principal, Makindu Sub-county).

Principals were asked to give their opinion as to whether technological content knowledge of teachers has any relationship with performance of Mathematics in secondary schools in Makueni County and one principal had this to say:

> *Whether frequent use of technology is related to academic performance is unclear to me because my school does not teach with technology after all due to challenges related to lack of the required ICT infrastructure* (Principal, Nzaui Sub-county).
>
> *In my view, technology usage can and might produce comparatively more significant increases in academic achievement than would non-usage (traditional learning)* (Principal, Mbooni Sub-county).
>
> *Combination of both words and images (which technology enables) makes learners learn considerably better as technology increases their comprehension of content and development of skills in such areas as analytical reasoning, problem-solving, information evaluation and creative thinking* (Principal, Mukaa Sub-county).

> *Using technology would support the active learning of students in an educational environment designed to help learners achieve meaningful skills which in turn would result in positive, cumulatively progressive gains in learning outcomes* (Principal Makindu Sub-county).

During focus group discussions, the students were asked to state whether they agreed with the assertion that: 'schools are not interested in integrating ICT in Mathematics curriculum because they lacked competent and confidence teachers'. In response, most students differed with that assertion and pointed out that challenges such as lack of enough computers, lack of internet connectivity, weak schools' ICT policies, among others as major reasons limiting the ability of schools to integrate ICT in teaching and learning of Mathematics. This finding confirms the remarks by Oyelekan and Aderogba (2011) that effective integration of ICT in education is an important factor in determining which country will succeed in the future. Cheng and Leung (2015) also indicated that technology-enriched learning environments empower students by enhancing their ability to explore, re-construct (or re-invent) and explain mathematical concepts by promoting connections between graphic representations and formal definitions. According to Swarts and Wachira (2010), the low uptake of technology by teachers is caused by the limited knowledge and skills of teachers on technology integration in teaching.

CONCLUSION

Technological Knowledge (TK) requires teachers to use computer literacy in a constructive manner at work and in their daily lives, to understand when information technology can help or hinder the accomplishment of a learning target, and to respond to developments in information technology on a regular basis. The use of ICT by teachers in the Mathematics classroom influences students' outcomes in examinations. Based on the above findings, the study concludes that majority of the schools that integrated ICT in the teaching and learning of Mathematics exhibited better performance as opposed to their counterparts who used conventional methods in teaching. In terms of teacher perceptions, teachers believed that integrating ICT was academically beneficial in fostering students' passion for Mathematics, but they firmly disagreed that it was beneficial in assisting students in acquiring the basic computing education needed for their future careers. Teachers' views on the utility of ICTs for classroom teaching, as well as their assessments of their own technological capabilities, proved to be important predictors of planned and implemented use of these instruments. Despite the fact that technology has the ability to improve learning and instruction in Mathematics classrooms, ICT technologies are often used for low-level activities such as online practice that have little impact on student learning outcomes.

RECOMMENDATIONS

The study makes the following recommendations:

1. Mathematics teachers should familiarize themselves with the tools that are used to teach Mathematics, as well as the technologies that they should use to teach Mathematics and should also be able to troubleshoot their own technological issues.
2. The government should ensure that all schools have access to reliable and sufficient source of power such as electricity to actualize digitized curriculum. Teachers should be included in the decision-making process when it comes to implementing emerging technologies and be trained in the interrelatedness between Technological, Pedagogical and Content knowledge (TPACK).
3. Secondary schools should invest in various innovations used in Mathematics instruction, as well as ensure that Mathematics instructors have the technological expertise required to use technology and have opportunities to work with various technologies.

Conflict of Interest: The authors declare no conflict of interest.

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Disclaimer Statement

The journal article has been generated from 1 objective of the author's Thesis, currently under examination, as a prerequisite for graduation. The title of the Thesis is "Relationship between Teachers' Integration of ICT and Students' Performance in Mathematics in Public Secondary Schools in Makueni County, Kenya", presented to the Department of Educational Management, Policy and Curriculum Studies in Kenyatta University, Kenya.

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Authorship and Level of Contribution

Francis Nzoka drafted the manuscript, collected, analyzed and interpreted data.
Ephantus Kaugi validated the data collection instruments and proof read the manuscript. Moreover, he assisted in the interpretation and discussion of the study findings.
Elizabeth Katam formulated the items in the instruments and assisted in the interpretation and discussion of results.

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