WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 9, Issue 13, 1-15. Review Article ISSN 2277– 7105

THE CORRELATION IN ACADEMIC PERFORMANCE OF PUBLIC PRIMARY SCHOOLS USING ICTS IN TEACHING AND LEARNING AND THOSE THAT DO NOT: A CASE OF MATETE SUB-COUNTY, KENYA

Jacob Wambasi Kitari*

Masinde Muliro University of Science and Technology P.O Box 190-50100, Kakamega, Kenya.

Article Received on
23 August 2020,

Revised on 13 Sept. 2020,
Accepted on 03 October 2020

DOI: 10.20959/wjpr202013-18879

***Corresponding Author**
Jacob Wambasi Kitari
Masinde Muliro University of Science and Technology
P.O Box 190-50100,
Kakamega, Kenya.

ABSTRACT

This study investigated the correlation in academic performance of public primary schools using ICTs in teaching and learning and those that do not, with a view to provide quality education through the use of ICTs to impart knowledge and skills to the primary school learners. The researcher adopted both parametric and non-parametric research methods. The study targeted all public primary schools that benefitted from World Vision ICT project and a similar number of schools that did not get the support for comparison purposes. Purposive sampling technique was used to identify18 head teachers and 18 teachers as key respondents in this study. Structured questionnaires were used to collect data from head teachers and teachers. Reliability of data collection instruments was established through split half test technique whereby reliability coefficient score of 0.72 for the head teachers and 0.78 for the regular teachers' questionnaires attained were appropriate since these indices were above the minimum recommended value of 0.7. The research experts from the department of Educational Planning and Management of Masinde Muliro University of Science and Technology provided technical support in the clarification of the contents of the test items in the study instruments. The data collected was analyzed inferentially using Stata analytical programme. The findings of the study (s41a4, P=0.043; s424a4, P=0.015) showed that there was a statistically significant correlation between ICT use and performance of public primary schools, hence, the researcher recommended improved digital content including the use of local languages to enhance effective interaction.

KEYWORDS: ICT, Digital content, IT, Lesson instruction.

INTRODUCTION

To change performance dynamics in educational institutions, there is need to employ innovative and niche approaches to educate and encourage people to solve problems in their community and enhance decision-making and communication skills. Good quality education can offer creative support and improved academic performance which can protect learners from psychological harm, exploitation and impoverished academic achievement. World Vision ICT project was meant to help in the improvement of academic Performance in public primary schools in Matete Sub-County using Information Technology (IT). This study was designed to interrogate the extent to which the project has impacted on students' academic achievement in order to draw relevant recommendations on how best to utilize Information Communication Technology during the practical classroom activities in public learning institutions offering basic education in Kenya.

Furthermore, owing to the multiple roles that Information Communication Technology (ICT) play in and out of school, there is every need to investigate the effect of World Vision ICT-Project as perceived by teachers and come up with informed knowledge on how to promote Information Technology through the teachers' activities in and out of school.

1.8 Limitations to the study

i) The research study was limited to Matete Sub-County, Kakamega County only because this was the area which had a successful World Vision ICT Project in public primary schools in Kenya. However, the study findings may be generalized to other Counties which have similar characteristics.

ii) Limited availability of Kenyan and African literature in connection with the effective use of ICTs especially in public primary schools yielded a sparse research context. However, a review of literature borrowed from Western Countries provided adequate backdrop for this research study.

iii) The participants in the study were purposely sampled. Biases that could have emanated from this sampling method were overcome by the objectivity of data collection methods used by the researcher.

Related literature

Global investment in ICT to improve teaching and learning in schools have been initiated by

many governments. For example Jordan as a resource, poor country seeks to build a strong ICT sector hub. In terms of integrating ICT in education, Jordan MOE in conjunction with the support of the Canada International Development Agency (CIDA) has developed a comprehensive e-learning strategy (Al-zaidiyeen, Mei & Fook, 2010).

According to Baver and Kenton (2005) teachers who are highly educated and skilled with technology were innovative and adapt at overcoming obstacles but they did not integrate technology on a consistent basis both as a teaching and learning tool. Results indicated that schools have not yet achieved true technology integration. Furthermore, Gulbahar (2007) reported lack of guidelines that would lead to successful integration of ICT in classroom instruction creatively.

A study by Becker and Ravita (2001) showed that computer use among teachers is related to constructivist views and practices and to chances in practice in a more constructivist – compatible direction. Other researchers suggest that there is a relationship between a teacher's child centred beliefs about instruction and the nature of teacher's technology – integrated experiences (Tottr *et al* 2006). A study by Chanlin, Anderson and Maninger (2007) investigated the changes in and factors related to learners perceived abilities, beliefs and intentions. Statistically significant changes were found in students' perceived abilities, self-efficacy beliefs and intentions to use ICT in their classrooms. Flores (2002) observes that teachers face a myriad barrier in their quest to incorporate technology in classroom instruction. In addition to time scheduling for technology use and administrative support, equity is another important issue. The introduction of ICT use in public schools is particularly hampered by inadequacy of resources. Eagle (2002) pointed out some barriers to the integration of technology in the classroom inclusive of both restraining forces that are extrinsic to teachers the like of access, time, support, resources and training that are intrinsic forces such as attitude, beliefs, practices and resistance. Brinkerhof (2006) further notes that barriers are grouped into four main categories namely resources institutional, administrative support, training and experience or personality factors.

According to ITG (2012), a number of comprehensive tools and learning resources are provided in Eduwave to help students track their progress, improve their performance and enjoy their learning experiences. With Eduwave, learners can access their learning materials, the like of textbooks, personalised and in rich media format, from any computer, anytime and anywhere. Students can interact with their teachers and with each other through multiple

communication and collaboration tools. Eduwave provides an extensive collection of instructional design, authority and professional development tools and resources to support the role of educators. In addition to the ability to manage learning content and curricula, teachers can easily create their own teaching material. They are also able to interact with students through the systems various communication channels.

Abuhmaid, (2011) notes that ICT is increasingly having pervasive role and presence in the educational milieu as it continues to shape all aspects of human lives. Teachers are widely believed to be the key agents of any educational change. Globalisation and the knowledge based economy have forced education systems worldwide to adopt ICT and weave it into their educational Millieus (Gulbahar & Guven, 2008). The system has adopted several ICT related education initiatives are adopted and implemented by education systems with greater appreciation of their complexity involving technological side which include access to computers, technical support and the e-materials (Abuhmaid, 2010).

In general, there is a high demand on educational institutions to use ICT to teach the skills and knowledge students need for the 21st century. There is need for every educational institution to restructure their educational curricula and classroom facilities to realise the effect of using ICT in their workplace in order to bridge the existing technology gap in teaching and learning (Baubeng, 2012). This restructuring process requires effective adoption of technologies into existing environment in order to provide learners with knowledge of specific subject areas to promote meaningful learning and enhance professional productivity (Tomec, 2005).

Looking at the literature available, the researcher noted with concern the pertinent role that ICT play in relation to the academic performance in schools. It was realized that most of the literature emanated from the Western Countries. None of the citation came from a Kenyan public primary school perspective. This triggered the researcher to formulate a study to correlate the academic performance of public primary schools that make use of ICT in teaching and learning processes against those which did not between the years 2008 and 2016 in Matete Sub-County.

METHODOLOGY

This study was exploratory in nature. Buhere (2013) observed that exploration yields useful information concerning the nature of the phenomenon. The study adopted mixed methods

approach that incorporated both qualitative and quantitative approaches in which data collected was analyzed descriptively using mean scores, percentages, and a non- parametric test statistic of Pearson's Product-Moment Correlation Coefficient. A survey of **s**chools covered by world vision ICT project and those not covered was done in which correlation of the research findings was done for both the WV-ICT and the non WV-ICT public primary schools. This is because according to Kothari, (2008) correlation research facilitates collection of data from an accessible population in order to determine the current status and relationship between the issues under investigation. In this case, correlations facilitated collection of data related to the trends in KCPE performance of public primary schools using ICTs against those that did not. Correlation design was considered appropriate for this study because according to Kasomo, (2007) and Rubin *et al*., (2010), it ensured fair assessment of relationships of all sections of the targeted population.

Questionnaire was the main instrument designed and administered to the selected sample to collect the desired data. The collected data was collated; coded and analyzed using the descriptive and inferential statistics specifically Pearson Product-moment correlation coefficient test statistic was used to compare school KCPE mean scores for the World Vision-ICT project and non World Vision-ICT project schools. Pearson's Moment Correlation Coefficient helped in determining the correlation between the Independent variables and the outcome variable within public primary schools in Matete Sub- County.

Study findings

The study was to determine the correlation in academic performance of public primary schools using ICTs in teaching and learning against those which did not. After subjecting collected data to the Pearson correlation coefficient statistical test with a significant level of 0.05, the outcome results are shown in Table 1.

Correlation matrix for the study

Table 1: Correlation matrix between the outcome variable (z_s2tm), the explanatory variable (t23a3) and the covariates for school academic achievement.

Variable		z_s2tm	s41a4	s424a4	s45a2	s45a3	s49a2	s411a4
z_s2tm		1						
s41a4	a	0.339	1					
	b	0.043						
s424a4	a	0.402	0.257	1				
	b	0.015	0.131					

s45a2	a	-0.354	0.122	-0.033	1			
	b	0.034	0.478	0.851				
s45a3	a	0.428	0.081	0.172	-0.711	1		
	b	0.009	0.640	0.317	<.001			
s49a2	a	0.380	0.215	0.257	0.122	-0.065	1	
	b	0.022	0.209	0.131	0.478	0.709		
s411a4	a	0.505	0.257	0.303	-0.200	0.172	0.257	1
	b	0.002	0.131	0.072	0.243	0.317	0.131	
s412a4	a	0.332	0.226	0.365	0.124	0.036	0.226	0.365
	b	0.048	0.186	0.029	0.473	0.836	0.186	0.029
s416a4	a	0.393	0.226	0.365	-0.016	0.196	0.226	0.365
	b	0.018	0.186	0.029	0.929	0.251	0.186	0.029
s428a2	a	-0.370	-0.142	-0.070	0.337	-0.182	0.127	-0.249
	b	0.027	0.408	0.686	0.044	0.287	0.460	0.143
s428a3	a	0.337	0.178	0.092	-0.248	0.210	-0.084	0.266
	b	0.045	0.299	0.594	0.145	0.220	0.628	0.116
t31a1	a	-0.341	-0.265	-0.058	0.132	-0.238	-0.144	-0.380
	b	0.042	0.118	0.736	0.443	0.162	0.401	0.022
t31a2	a	0.341	0.265	0.058	-0.132	0.238	0.144	0.380
	b	0.042	0.118	0.736	0.443	0.162	0.401	0.022
t323a1	a	0.451	-0.284	0.197	-0.223	0.263	0.021	0.197
	b	0.006	0.094	0.249	0.191	0.122	0.903	0.249
t323a2	a	-0.451	0.284	-0.197	0.223	-0.263	-0.021	-0.197
	b	0.006	0.094	0.249	0.191	0.122	0.903	0.249
t325a3	a	0.384	0.027	0.251	-0.440	0.478	0.189	0.467
	b	0.021	0.876	0.139	0.007	0.003	0.270	0.004

Note: a=Pearson correlation coefficient; b=p-values (α=0.05); Pair-wise correlation: ≤0.35 = Weak correlation; 0.36-0.67 = Moderate correlation; 0.68-0.89=Strong correlation; ≥0.90 = Very strong correlation; Adapted from "Interpretation of correlation coefficient, " by R. Taylor, 1990, Journal of Diagnostic Medical ; Sonography, 6(1), p. 37.

Source: Stata output, 2019

The study objective was to correlate academic performance of public primary schools using ICT in the teaching and learning processes and those which did not. The hypothesis on this objective was that there is no statistically significant difference in academic performance of public primary schools using ICT in teaching and learning and those which did not. The Pearson product- moment Correlation Coefficient results in Table 1 indicate that there is statistically significant correlation between the academic performance of schools using ICT in teaching as compared to those which do not. The results show that the schools making use of ICT (b) have lower p-values as compared to those schools which did not use ICT in teaching and learning processes whose p-values (a) in the model are relatively higher.

Multiple regression of the effect of ICT Use in Teaching and Learning on academic achievement of public primary schools in matete Sub-County

In this study the researcher ran a multiple linear regression model of the effect of ICT Use in Teaching and Learning on Academic Achievement of Public Primary Schools In Matete Sub-County Between 2008 And 2016. The results are indicated in Table 2.

Table 2: Multiple linear regression coefficients of the effect of ICT use in Teaching and Learning on school KCPE mean scores (z_s2tm).

Variable	Variable label	Model 1 (z_s2tm)		
		U.Coef	*P*	B
_Is41a4_1	Strongly agree: Teachers use ICT for instructional purpose	0.629	0.043	-0.368
_Is424a4_1	Strongly agree: Communicate effectively with families and involving them in student learning and the school community	0.285	0.504	0.294
_Is45a2_1	Agree: Computers create awareness and raise learning opportunities	-0.159	0.660	0.100
_Is45a3_1	Strongly agree: Computers create awareness and raise learning opportunities	0.439	0.267	-0.078
_Is49a2_1	Undecided: Teachers believe ICT initiative is a health hazard	0.640	0.033	0.185
_Is411a4_1	Strongly agree: Support all students to learn what is planned for them through IT	0.429	0.448	0.299
_Is412a4_1	Strongly agree: Build on students prior knowledge experience to use IT	-0.117	0.766	0.151
_Is416a4_1	Strongly agree: Creating physical environments that engage all students in purposeful learning activities	0.016	0.963	-0.050
_Is428a2_1	Strongly agree: Display practical ICT skills in various subject content	-1.009	0.026	0.007
_It31a2_1	Strongly agree: Teachers use ICT for instructional purpose	0.143	0.577	-0.295
_It323a2_1	Strongly agree: Learn about and work with local communities to improve teacher professional practice to promote IT	-0.970	0.008	0.072
_It325a3_1	Strongly agree: Work collegially with all school staff to promote IT skills	0.000	0.999	-0.389
Constant		0.372	<.001	n/a
N			36	
R^2			0.6927	
Root Mean Squared Error (RMSE)			0.6993	

Note. U.Coef=Unstandardized Coefficient; RMSE=Standard deviation of the regression model (the closer to zero better the fit)

Source: Stata Output, 2019

In the model shown in Table 2, multiple linear regression coefficients of the effect of ICT use in teaching and learning on school KCPE mean scores while holding other factors constant was run to determine the correlation between the covariates. The results indicated that head teachers strongly agreeing with the statement "Teachers use ICT for instructional purpose

(_Is41a4_1)" are associated with up to .6288277 standard deviation units above the mean, p<.043. These results mean that there is a strong association between Teachers who use ICT for instructional purpose and improved performance of their schools as compared to those who did not. The findings are in agreement with those of ITG (2012), who holds that a number of comprehensive tools and learning resources are provided in Eduwave to help students track their progress, improve their performance and enjoy their learning experiences. With Eduwave, learners can access their learning materials, the like of textbooks, personalised and in rich media format, from any computer, anytime and anywhere. Students can interact with their teachers and with each other through multiple communication and collaboration tools. For teachers, the administrative and educational tools provided on Eduwave, help teachers to better manage and utilize their time allowing for higher efficiency and more room for innovation and creativity. Eduwave provides an extensive collection of instructional design, authority and professional development tools and resources to support the role of educators. In addition to the ability to manage learning content and curricula, teachers can easily create their own teaching material. They are also able to interact with students through the systems various communication channels. Teachers are also provided with a variety of assessment and evaluation tools that help them measure individual student performance and progress (ITG, 2012).

The headteachers agreeing with the statement "Teachers believe ICT initiative is a health hazard (_Is49a2_1)" are associated with up to .6395121 standard deviation units above the mean, p<.033. This result is associated to the individual teacher's beliefs. This is because it is a new finding which is not backed by scientific evidence. So far we don't have concrete evidence to substantiate this kind of arguments.

Headteachers agreeing with the statement "Display practical ICT skills in various subject content (_Is42 8a2_1)" are associated with up to -1.008899 standard deviation units below the mean, p<.026. The learners' abilities in relation to ICT use in a classroom setting promote hands on otherwise practical manipulation of materials which positively impact on the ability to grasp and subsequently retain the learned knowledge and skills. This is in line with the findings by Becker and Ravita (2001) whose study showed that computer use among teachers is related to constructivist views and practices and to chances in practice in a more constructivist – compatible direction. Other researchers suggest that there is a relationship between a teacher's child centred beliefs about instruction and the nature of teacher's

technology – integrated experiences (Tottr *et al* 2006). Alongside these observation it important to note that as the learners' engage actively in making use of computers, they may develop positivity, hence, improved self efficacy in the utilization of technology to learn.

Teachers strongly agreeing with the statement "Learn about and work with local communities to improve teacher professional practice to promote IT (_It323a2_1)" are associated with up to -.9700028 standard deviation units below the mean, p<.008. This significant view implies that technology will be used even out school setting. This is supported by the findings of Baver and Kenton (2005) who noted that teachers who are highly educated and skilled with technology were innovative and adapt to overcoming obstacles but they did not integrate technology on a consistent basis both as a teaching and learning tool. Results indicated that schools have not yet achieved true technology integration.

This model's constant is statistically significant, .3717451, p<.001;
The overall model is statistically significant, p<.001 and explains 69.27% of the variation in school KCPE mean scores between the years 2008-2016. Numerous studies have been conducted to identify factors facilitating or prohibiting technology integration in the classroom more so the use of computers. Some researchers focused on the availability of computers in classrooms as one of the many factors influencing the utilization of ICT in the process of teaching and learning. The final result of this model gives strength to people with open mind to embrace the use of ICT for instruction during curriculum implementation. In spite of the hitches experienced during the initial stages of ICT integration especially in public primary schools, it is worth trying.

Hypothesis testing

since _Is49a2_1 = 0 F(1, 22) = 5.18 Prob > F = 0.0330
_Is41a4_1 = 0 F (1, 22) = 4.60 Prob > F = 0.0433
_Is428a2_1 = 0 F (1, 22) = 5.66 Prob > F = 0.0265
_Is428a3_1 = 0 F (1, 22) = 4.52 Prob > F = 0.0449
_It323a2_1 = 0 F (1, 22) = 8.48 Prob > F = 0.0081
are statistically significant at the 95% significance level, we reject the null hypothesis that the use of ICT in teaching and learning has no statistically significant relationship with overall school mean scores in KCPE performance.

CONCLUSION

The Pearson Product-moment correlation coefficient test statistic was conducted to compare the KCPE mean scores of public primary schools that use ICT in teaching and learning against those schools which did not use ICT. The results from dummy responses showed *p*-values which were lower than the 0.05 at 95% significance level. For example, variable s41a4 had a value of p=0.043; s424a4 had a value of *p*=0.015, among others.

Since the results were statistically significant, the researcher concluded that there was a correlation between academic performance of public primary schools that use ICT in teaching and learning to improve their KCPE mean scores in Matete Sub-County.

Recommendation

The findings on the correlation of academic performance of public primary schools using ICT in teaching and learning and those which did not, indicated that there was a statistically significant correlation (s41a4, *P*=0.043; s424a4, *P*=0.015). Based on these results, the researcher recommended improved digital content including the use of local languages to enhance effective interaction through information Communication Technologies inside and outside school.

REFERENCES

1. Abuhmaid, A. *Centralization and reform: Information technologies in large scale education reform*, 2010. Retrieved from http://eloxforum.hbmen.ac.ae/proceeding/PDF/centralization%20 and %20reform pdf
2. Abuhmaid, A. *ICT training courses for teacher professional development in Jordan*. The Turkish online Journal of educational technology, 2011; 10(4): 195-2010.
3. Al-zaidiyeen, N.T, Mei L.L & Foo, F.S. *Teachers' attitudes and levels of technology in use in classrooms: The case of Jordan schools*. International education studies, 2010; 3(2): 211-218.
4. Anderson, S. & Maninger R. *Pre-service teachers' abilities, beliefs and intentions regarding technology integration.* Journal of educational computing research, 2007; 37(2): 151-172.
5. Bauer, J. & Kenton, J. *Toward Technology Integration in the schools: Why it isn't happening. Journal of Technology and Teacher Education*, 2005; 13(4): 519-546.
6. Balanskat A. Blamire, R. & Kefalla S. *The ICT impact report – A review of studies of ICT impact on schools in Europe.* European Schoolnet, 2006. Education and culture Retrieved

from http://insight.eun.org/shared/data/pdf/impact-study.pdf.

7. Baubeng – Andoh *Factors influencing teachers' adoption and integration of information and communication technology into teaching*: A review of the literature. International Journal of Education and development using ICT, 2012; 8(1): 136-155.
8. Becta Harnessing technology: *Schools survey 2008*, Retrieved October, 2008; 20: 2011. from http://www.becta.org.uk/research.
9. Brinkerhof J. *Effects of a long duration, professional development academy or technology skills, computer self efficacy and technology integration beliefs and practices. Journal on Technology in Education*, 2006; 39(1): 22-44.
10. Chanlin, L., Chu, H., Chang S. & Horng, J. Factors influencing Technology integration in teaching. A Toiwanese perspective. Innovations in education and teaching international, 2006; 43(1): 57-68.
11. Cheung, A.C and Slavin R. E The effectiveness of Educational technology applications for enhancing mathematics achievement in 10-12 classrooms; A meta- analysis. Educational research Review, 2013; 9: 88-113.
12. Ejakait, E., Olel, M., Othuon, L., & Khasenye, O. A hierarchical Modelling of Teacher Effects on Academic Achievement in the Kenya Certificate of Primary Education Examination. American Journal of Education Research, Ekundayo H.T., AlongeH.O., Kolawalo K.S., (2014). Teaching, 2016; 4(14): 1030-1040.
13. European schoolnet The ICT impact report: A review of Studies of ICT impact on schools in Europe. European commission, 2006.
14. Fessakis, G. and Karakiza T. Pedagogical beliefs and attitudes of ICT teachers, 2010.
15. Proceedings, 5th Panhellenic conference, "ICT teaching". Attiens, 9-11/4/2010 Flores A. Learning and teaching mathematics with technology teaching children mathematics, 2002; 8(6): 308-325.
16. Gulbahar Y. Technology Planning A Roadmap to successful Technology integration in schools. Computers and education, 2007; 49(4): 943-956.
17. Gulbahar Y. & Guven J. A survey on ICT usage and the perception of social studies teachers in Turkey. Educational technology & society, 2008; 11(3): 37-51.
18. Haelermans, L. and De Wittc K. The role of innovations in Secondary School efficiency-Evidence from a conditional efficiency model. European journal of operational research, 2012; 223: 541-549.
19. Irish Council for science technology and innovation Technology foresight report. Dublin:

Irish council for science, technology and innovation, 1999.

20. Jacob Cohen; Patricia Cohen; Stephen G. West; Leona S. Aiken Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences (3rd ed.), New Jersey: Lawrence Erlbaum Associates, ISBN 978-0-8058-2223-6, 2010; 10.
21. Jamieson – proctor, R. Development of TTFT pack survey instrument. Australian educational computing, 2013; 27(3): 26-35.
22. Kothari, C. R. *Research Methodology, Methods and Techniques* (Second Revised Edition). New Delhi: New age international (Ltd, Publishers), 2010.
23. Ministry of Education and Sports, Uganda Education Statistics Abstract, 2008, Kampala, MoES, 2008.
24. Ministry of Education, New Zealand Best Practice in Classroom Design, AC Neilsen, 2004.
25. Mkuwa C. W. Integration of Educational Technology in Teacher Education; Eldoret, Kenya, Moi University Press, 2015.
26. M.O.E National Information and Communication Technology (ICT) Strategy for Education and Training: Nairobi Government Printer, 2010.
27. Nakayima J.K. Perceived usefulness, perceived ease of use, behavioral intention to use and actual system usage in centenary bank (Doctoral dissertation, Makerere University, 2011.
28. National Association of Advisors for Computers in Education (NAACE): www.naace.co.uk
29. Nannyonjo, H. Effective Use of Education Inputs in Uganda: An Analysis of Factors Influencing Learning Achievements in Grade Six, African Human Development Series,Working Paper No.98, Washington, The World Bank, 2007.
30. NCTE – National centre for technology in Education Engaging learners – mobile technology, literacy and inclusion. Dublin: Brunswick Press Ltd, 2006.
31. Ndiku L. The problems encountered by school personnel in the implementation of computer use in secondary schools in Uasin Gishu District, unpublished Thesis. Moi University Press, 2003.
32. Neyland, E. Integrating online learning in new secondary schools: Three schools perspectives on ICT adoption. Australian Journal of Educational Technology, 2011; 27, 1: 152-173.
33. Nish, M. Development and Implementation of Pathways (on line), 2000. Available: http://www.ihsc.on ca/research/innovation/pathways/.

34. Nut J. Professional educators and the evolving role of ICT in schools: perspective, 2010; 12: 2012. from http://www.ictliteracy.info/rf.pdf/ict in schools.pdf.
35. OECD – Organization for Economic Cooperation and Development PISA 2009 Results: Students on line Digital Technologies and performance. Paris: OECD Publishing, 2011.
36. Onderwijsraad Advies document: Onderwijs en open Leermiddlen. Uitgave Van de onderwiJsraad, Den Haag, Nr 20080212/912, 2008.
37. Orodho, J.A. Techniques of writing research proposals and reports in education and social sciences, second edition, Maseno, Karezja HP Enterprises, 2008.
38. Oso, Y. W. & Onen, D. Writing Research Proposal and Report. Nairobi: Prints Arts Limited, 2011.
39. Papageorgakis P., Pliassa S. and Georgakouda, E. The introduction and teaching of N.T in the "New School" First approaches and conclusions proceedings 2nd panhellenic conference: Integration and use of ICT in Educational process, 2011; 643-654, 28-30.
40. Republic of Kenya (2005b). Sessional paper No. 1 of on a policy Framework for Education, Training and Research. Nairobi: Government Printer, 2005.
41. R.O.K National ICT master plan towards digital Kenya. Government printers, Nairobi, 2014.
42. Sang, G., Valike M., Van Braak, J. and Tondeur J. et al 'Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviors with education technology; computers and education, 2010; 54(1): 103- 112.
43. Serin O. The effects of the computer-based instruction on the achievement and problem solving skills of the science and technology students. Turkish online journal of educational technology, 2011; 10(1): 183-201.
44. Shoretsqnitou P. & Vekyri I. ICT Integration into education; factors of anticipation of Educational use in A Tzimoyiannis (Ed), Proceedings, 2010; 7.
45. Conference with international participation in Education University of the Peloponese, Korinthos, 2010; 23-26, 617-624.
46. Sionou-kyrgiou E. Information and communication technologies in Education and "digital gap". In A Tzimoyians (Ed) Proceedings, Panhellenic Conference with International Participation in ICT Education University of Peloponese, Korinthos, 2010; 23-26, 601-605.
47. Somekh B. Pedagogy and learning with ICT. Researching the Art of innovation, London: Routledge, 2007.

48. Telecommunication union – ITU, 2013. International Telecommunications Union database: Geneva: ITU. http://www.itu.int/ITU-D/ict/statistics/gender/index.html.
49. The importance of ICT: Information and Communication technology in primary and secondary schools, 2005, 2008; 070035: 2009. www.ofsted.gov.uk/resources/070035.
50. Tokonakidou E. (2010). Kaloyiannidou, A and Tsitouridou, M. (2010). The Internet in Primary Education: Teachers' approaches. In a Tzimoyiannis (Ed). Proceedings, Panhellenic Conferences with International Participation "ICT in Education," University of the Peloponese, Korinthos, 2010; 23-26: 609-616.
51. Tomasegoric T. Elias S.P. Baracic, M & Mrvac, N. Elementary Science teachers' perceptions of educations of educational reform in relation to science teaching in Jordan. Jordanian Journal of Educational Sciences, 2011; 6(2): 161-173.
52. Turel, Y.K. Johnson T.E Teachers' belief and use of interactive white board for teaching and learning educational technology and society, 2012; 15(1): 381-394.
53. Unachukwu, G. O. and Nwankwo C. A. Principals' readiness for the use ICT in Educational administration in Anambra State of Nigeria. Research Journal in Organizational Psychology & Educational Studies, 2012; 1(2): 114-120.
54. UNESCO, *Moving Towards Universal Primary Education and Literacy*. New York: UNESCO, 2007.
55. UNESCO, ICT Competency Standards for Teachers. Published by United Nations Educational, Scientific and Cultural Organisation, 2008; 8(7): 2009. from http://unesdoc.unesco.org/images/0015/001562/156207e.pdf.
56. UNESCO Bangok Case studies on integrating ICT into teacher education curriculum in Asia. Bangok. UNESCO Bangok, 2013.
57. UNESCO A comprehensive analysis of ICT integration and readiness in schools across Asia, Canada, UNESCO institute for statistics UIS, 2014.
58. UNESCO Institute for statistics Information and communication Technology (ICT) in five Arab states. A comparative analysis of ICT integration and e-readiness in schools in Egypt, Jordan, Oman, Palestine and Qatar. Montreal: UIS, 2013.
59. UNESCO. Bangkok Case studies on integrating ICT into teacher education curriculum in Asia. Bangkok: UNESCO Bangkok, 2013.
60. United Nations Millennium Development Goals, 2012. http://www.un-org./milleniumgoals/global.shtml.
61. Un population division Un population division database. New York: Un population division, 2014. http://www.un.org/en/development/desa/population.

62. Vaggelatos, A. (2011). Foskdos, F. and Komninos, Th. (2011). ICT introduction to schools; the factor "teaching practitioners' proceedings, panhellenic conference; integration and use of ICT in educational process. Patra, 2011; 2: 28-30, 95- 104.
63. Van Braak, J. et al Student teachers' thinking processes and ICT predictors of prospective teaching behaviors with education technology; integration; computers and education, 2010; 54(1): 103-112.
64. Winseried A. Dalgarno B. and Tinkler, J. The interactive white board: A transitional technology supporting diverse teaching practices. Austrian Journal of Educational Technology, 2010; 26(4): 534-552.
65. Wood, R. and Ashfield J. The use of interactive white board for creative teaching and learning in literacy and mathematics; a case study. British Journal of Educational Technology, 2008; 39(1): 84-96.
66. World Bank Information and Communication Technology for Education in India and South Asia Extend summary. Washington D.C: InfoDev/Price Water house coopers, 2010; 1.
67. Zhang, C. A study of Internet use in EFL Teaching and Learning in Northwest China, Asian Social Science, 2013; 9(2): 48-52.