

Influence of ICT integration on content delivery by ICT and Non-ICT trained teachers in secondary schools in Machakos County, Kenya

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Abstract

ICT integration in educational pedagogy enhances teachers' content delivery alongside heightening the levels of education. This study was carried out in Machakos County, Kenya to investigate the influence of ICT integration on content delivery by ICT and Non-ICT trained teachers in secondary schools. The study was guided by two objectives; to establish the status of teachers' integration of ICT in content delivery and to determine the influence of

ICT integration on content delivery by teachers. The study embraced descriptive survey design. Ratio proportionate sampling and equal allocation method were employed to get the sample size. Data was collected using questionnaires for the principals, teachers and the students. Test re-test technique was employed to heighten the instruments reliability. Statistical Package for Social Sciences (SPSS) was used to analyse data. Pearson's Product Moment determined the level of the relationship between the variables. Pearson chi test was employed to present, interpret inferential data. The study revealed that ICT trained teachers utilized ICT in content presentations which enriched their delivery, while Non-ICT trained teachers applied their general ICT knowledge inhibiting their technology utilization in content delivery. The study concluded that ICT trained teachers' integration of ICT in content delivery was significantly higher at (p) 0.003 than for Non-ICT trained teachers at (p) 0.047. Hence the null hypothesis was rejected. The study recommended that the Ministry of Education (MOE) should incorporate ICT training in teacher training institutions for application of technology in content delivery.

Keywords: ICT integration, content delivery, ICT trained teachers, Non-ICT trained teachers

1. Introduction

Globally education systems have identified Information Communication Technology (ICT) as a crucial aspect of educational innovation and change, with the aptitude to alter teachers' pedagogical practices (Mbodila, M. & Kikunga, M. (2012). Many developed countries, have evident improvements in their education systems following the integration of ICT in teachers' pedagogical practices. In addition developed and developing countries have acknowledged that ICT must be incorporated in educational pedagogy to improve the quality of teaching and learning. In Africa, a number of countries such as Zimbabwe, South Africa, Morocco, Ghana, and Kenya, among others, have prioritized the adoption of ICT by teachers, despite financial and other logistical constraints (Kayisire, D., & Wei, J. (2016). ICT refers to technological tools and resources used in creating, sharing, and storing information; while, teachers' pedagogical practices are the teachers' actions and discourses that define the interaction between the teacher and the learners (Bett, 2016). The utilization of ICT in education requires the incorporation of Information Communication Technologies (ICTs) in pedagogy to enhance and intensify the acquisition of appropriate competencies within learners, which include; problem solving skills, collaboration, access to variant knowledge, innovation, creativity, attitudes, and values to manage learning effectively (Bett, 2016).

In order to make use of technology in pedagogy effective, educators should be trained on the use and application of modern technologies in their respective fields of education to implement the recommended and proposed changes concerning ICT and education (Bertram, A., & Waldrup, B. (2013). Globally, developed and developing countries in their endeavor to achieve the Sustainable Development Goals (SDGs) have embarked on educational reforms aimed at total inclusion of ICT in their educational practice (UNESCO, 2015). Passi, B K. (2014) argued that, teacher training institutions should incorporate ICT pedagogical training in their curriculum to produce ICT trained teachers for successful application of technology in the educational practice. Countries whose teacher training models lack structured ICT components graduate Non-ICT trained teachers' deficient of the technological competence to integrate ICT in pedagogy. According to Mbodila, M. & Kikunga, M. (2012), teachers need adequate insight into the pedagogical role of ICT to use it meaningfully in their instructional undertakings; they require sufficient knowledge to implement the technological role in education. Notably ICT trained teachers in Canada were reported to be effective in the use of ICT tools in their content delivery as opposed to Non-ICT trained teachers who avoided integrating technology in their teaching and learning due to inability to select appropriate ICT tools and develop content based on their subject matter.

In Netherlands, teacher ICT training programs were conducted in a constructivist manner to ensure that teachers gained confidence on the use of ICT tools in their pedagogical practices. ICT incorporation in innovative pedagogy by ICT trained teachers resulted in the escalation of digital learning environments, which made a commensurate impact on the methods of content delivery and the interaction of teachers and students (Kayisire, D., & Wei, J. 2016). Passi, B K. (2014) observed that the dynamic nature of education and inclusion of innovative technologies had changed the teaching profession and placed demand on educators to

familiarize themselves with ICT to join the global teacher community and improve their pedagogy. According to Wu, D. (2014), China teachers were offered multiple ICT training which addressed technology and its inclusion in pedagogy; they were equipped with both pre-service and in-service ICT training to challenge their pedagogical positions, attitudes, and perceptions towards ICT utilization in their teaching and learning.

To attain international educational standards, African countries have ventured into ICT integration in pedagogy and have adopted cost effective ICT training strategies, in a venture to overhaul their curricula through integration of ICT in pedagogy for critical educational outcomes and preparation of globally competitive learners (Khan, Sh, Hasan, M & Clement, CK 2012). According to Heick, T. (2016), in Zimbabwe, secondary school teacher education institutions have incorporated ICT in their curricula to prepare ICT trained teachers conversant with ICT and e-learning. This has improved content delivery by teachers, upgraded students understanding, thinking skills and motivation, heightening the quality of education. ⁶found out that, East African countries, Tanzania, Uganda, among others had made the teaching profession a centre of focus due to technological advancements, expansion of knowledge, coupled with globalization. Khan, Sh, Hasan, M & Clement, CK (2012) asserted that, despite lack of structured pre-service ICT training, efforts had been made to expose teachers to in-service pedagogical ICT training to promote the incorporation of technology in their classroom operations. This implied that majority of educators in the East African region were dearth of ICT proficiency for full usage of ICT in their pedagogical practices.

Ultimately, while the gains of ICT integration in education may be well-documented, effective use and application of ICT in pedagogy is highly contingent on the teachers' level of training on the pedagogical aspects of ICT integration in the teaching and learning process. Teachers' ICT skills determine their adoption and use of technologies in their pedagogical practices which in turn influences their content delivery (Peeraer, J., & Petegem, P. 2012). In response to the fore discussed, the Kenya government through the Ministry of Education (MOE) has embarked on initiatives to support and promote ICT incorporation in education and utilization in pedagogy. The initiatives focus on the improvement of the quality of education through provision of ICT literacy and its integration in pedagogy (MOE, 2013).

Kenya being a developing country faces numerous challenges towards full ICT integration in the educational process and teachers' pedagogics. The drawbacks include among others; inadequate ICT training of teachers, financial constraints, insufficient ICT infrastructural facilities, and the geographical location of schools. Similarly in Machakos County, the MOE in collaboration with education trainers has organized ICT training programmes to enable the practicing teachers gain knowledge and skills on the implementation of technology in their teaching and learning activities. Many secondary school teachers in Machakos County have not been exposed to such training, which limits the integration of ICT in their pedagogical practices. This in turn justifies the presence of ICT and Non-ICT trained teachers in secondary schools in Machakos County. This study intended to examine how ICT integration influences content delivery of teachers in secondary schools in Machakos County, Kenya.

1.1 Statement of the problem

ICT use in teachers' pedagogical practices enhances teaching and learning as well as teachers methods of content delivery. In Kenya, the Ministry of Education has made efforts to include ICT education in teacher training institutions to ensure the production of teachers who can proficiently incorporate ICTs in their pedagogical practices. Despite the MOEs commitment in introducing, supporting, and implementing ICT integration in education, the pace of ICT utilization in educational pedagogy by teachers in Kenyan classrooms has been low, hence inhibiting the provision of quality education. Contemporary assessment reports by Machakos County Education Quality Assurance and Standards Office (CQASO) showed that ICT application by teachers in pedagogy was still in its neophyte phase and teachers showed considerable variations in their integration of ICT in content delivery within the County which inhibited imparting of quality pedagogical content delivery. Therefore, this study, sought to interrogate how ICT integration has impacted on teachers' content delivery of ICT and Non-ICT trained teachers in secondary schools in Machakos County, Kenya.

1.2 Purpose of the study

The purpose of this study was to investigate the influence of ICT integration on teachers' content delivery by ICT and Non-ICT trained teachers in secondary schools in Machakos County, Kenya.

1.3 Objective of the study

The study was guided by the following objectives:

- i) To establish the status of teachers' integration of ICT in content delivery by ICT and Non-ICT trained teachers in secondary schools in Machakos County, Kenya.
- ii) To determine the influence of ICT integration on content delivery by ICT and Non-ICT trained teachers in secondary schools in Machakos County, Kenya

1.4 Research Hypothesis

The study sought to test the following null hypothesis:

H₁ ICT integration does not significantly influence content delivery by ICT and Non-ICT trained teachers in secondary schools in Machakos County, Kenya.

2. Review of Related Literature

The integration of ICT in pedagogy heightens the modes of content delivery by ICT and Non-ICT trained teachers. Türel, Y. K., & Johnson, T. E. (2012) found that in Europe ICT trained teachers used computers, laptops, and devices like; interactive whiteboards, LCD projectors, mobile devices, and peripheral devices in content delivery which enables demonstration thus impacting on their content coverage efficiency and students' performance. Ertmer, P.A., & Ottenbreit-Leftwich, A.T. (2010) alluded that the use of ICT in content delivery by ICT and Non-ICT trained teachers lead to comprehensive application of classroom technology based games, role play and imagery resources hence more innovative,

collaborative, and productive teaching boosting the learners' curiosity and creativity. Further, a research by Capan, S.A. (2012) found out that ICT trained teachers in Canada employed technology to support their delivery styles through use of variant digital formats like; PowerPoint slides, video and audio/sound clips, simulations, graphics, drawing diagrams, and technological games thus quality demonstrations appealing to the learners.

A study conducted by Lewis, S. (2012) in Saudi Arabia on ICT integration by ICT trained teachers in science education pointed out that, the use of simulations, pictures, graphics, video and audio clips resulted to more demonstrative teaching, question and answer approach, authentic and enquiry based learning, and deeper understanding of abstract concepts. According to Khan, Sh, Hasan, M & Clement, CK (2012), Non-ICT trained secondary school teachers in Morocco didn't embrace technology supported pedagogy such as; multimedia applications, drawing diagrams, animating objects to clarify critical concepts, showing pictures, and playing videos hence less interesting and productive lessons lowering the quality of content delivery. Nkwenti N. M. (2015), argued that Non-ICT trained teachers lacked ICT competence to perform complex technology-based delivery techniques like presenting graphics, simulations, animations, and preparing PowerPoint presentations which made their teaching less innovative, non-creative and unfriendly to learners. Similarly, Wallet, P. & Beatriz (2015) , affirmed that ICT trained teachers possessed relevant ICT training; conducted and integrated role play techniques, technology-based games in content delivery, and matched video and sound/audio clips with subject content; this heightened their delivery proficiency and quality of education compared to Non-ICT trained teachers who were deficient of formal ICT skills, lacked adequate and well-conditioned ICT equipment.

Similarly ICT and Non-ICT trained teachers used the internet to upload recorded video demonstrations, sound clips, and images which upgraded their lectures; this enabled them to clarify and explain educational concepts and ideas through extensive use of description narratives thus improving students' participation and the quality of education (Pruet, P., Ang, C. S. & Farzin, D. 2014). According to Wallet, P. & Beatriz (2015), technology usage in content delivery enabled ICT trained teachers create digital environments through the presentation of simulations, animations, and technology-based games which exposed the students to the real world, enabled them gain practical experience, boosting their creativity and engagement in learning. This study therefore, sought to confirm or disaffirm these findings by examining the extent to which ICT integration influences content delivery by ICT and Non-ICT trained teachers in secondary schools in Machakos County, Kenya.

3. Research Methodology

The study utilized descriptive survey design. The targeted population was 328 principals, 3600 teachers and 95,200 students, thus the total target population was 99,128 respondents. The study sampled; 180 principals, 360 teachers, and 398 students. The study employed ratio proportionate sampling to get the sample size of the principals and teachers in each Sub-County. To choose the teachers and students in the sampled secondary schools equal allocation method was used. Data was collected using questionnaires. Content validity of the research instruments was ascertained through, analysis by experts in comparative education,

comparative studies on the subject, and piloting of the questionnaires. To enhance reliability of the instruments test re-test technique was employed. Data analysis was done by use of the Statistical Package for Social Sciences (SPSS) programme. Pearson's Product Moment was used to determine the level and strength of the relationship between ICT integration and teachers' content delivery. Pearson chi test was used to present and interpret the inferential data. Pearson chi test was employed to determine the levels of significance of the relationship between ICT integration and teachers' content delivery.

4. Research Findings

The study's first objective was to establish the status of teachers' integration of ICT in content delivery by teachers in secondary schools.

4.1 Analysis of Principals', Teachers', and Students' views on the status of teacher's use of ICT skills in content delivery

The principals, teachers, and students were asked to respond to statements related to teachers' use of ICT skills in content delivery. They were requested to indicate their responses as; SA=Strongly Agree, A=Agree, D=Disagree, and SD=Strongly Disagree. The principal's views on their level of agreement with statements regarding teachers' use of ICT skills in content delivery were as summarized in Table 1.

Table 1. Principals views on teachers' status of use of ICT skills in content delivery

Response	ICT trained teachers								Non-ICT trained teachers							
	SA		A		D		SD		SA		A		D		SD	
	n	%	n	%	n	%	N	%	n	%	N	%	n	%	n	%
Teachers use power point in lesson presentation	40	41.	20	20.	22	22.	1	14.	0	0	0	0	26	40.	38	59.
Teachers use ICT to present simulations for fast content delivery	26	27.	53	55.	13	13.	4	4.2	0	0	0	0	26	40.	38	59.
Teachers use ICT to present imagery resources which ensures efficient content delivery	45	46.	41	42.	10	10.	0	0	0	0	20	31.	31	48.	13	20.
Teachers use ICT to present sound/audio clips in content delivery	49	51	47	49	0	0	0	0	0	0	30	47	20	31.	14	21.
Teachers use ICT to present video clips for efficient content delivery	49	51	47	49	0	0	0	0	0	0	21	32.	39	60.	4	6.3
Teachers use ICT to present animations in content delivery	40	41.	41	42.	15	15.	0	0	0	0	20	31.	30	47	14	21.
Teachers use ICT to present graphics that enhance content delivery	26	27.	53	55.	13	13.	4	4.2	0	0	0	0	30	47	34	53
Teachers use ICT to draw diagrams to deliver content	42	43.	50	52.	4	4.1	0	0	0	0	4	6.3	27	42.	33	51.
Teachers use ICT to conduct classroom technology based games	60	62.	20	20.	12	12.	4	4.2	0	0	4	6.3	27	42.	33	51.
Teachers use ICT to conduct role play teaching techniques in content delivery	40	41.	50	52	6	6.3	0	0	0	0	0	0	31	48.	33	51.

Schools with ICT trained teachers (n =96. % =100)

Schools with Non-ICT trained teachers (n =64. % = 100)

The analysis presented in Table 1 indicated that 41.7 percent and 20.8 percent of the principals of schools with ICT trained teachers strongly agreed and agreed with the statement that teachers used power point in lesson presentation respectively, while none of the principals of schools with Non-ICT trained teachers strongly agreed or agreed with the statement. To the

contrary, 40.6 percent and 59.4 percent of the principals of schools with Non-ICT trained teachers disagreed and strongly disagreed with the statement that teachers used power point in lesson presentation respectively, compared to 22.9 percent and 14.6 percent of the principals of schools with ICT trained teachers who had similar views respectively. None of the principals of schools with Non-ICT trained teachers strongly agreed or agreed with the statement that teachers used ICT to present simulations for fast content delivery compared to 27.1 percent and 55.2 percent of the principals of schools with ICT trained teachers who strongly agreed and agreed with the statement respectively. However, 40.6 percent and 59.4 percent of the principals of schools with Non-ICT trained teachers disagreed and strongly disagreed with the statement that teachers used ICT to present simulations for fast content delivery respectively compared to 13.5 percent and 4.2 percent of their counterparts who had similar views respectively.

None of the principals of schools with Non-ICT trained teachers strongly agreed with the statement that teachers used ICT to present imagery resources which ensured efficient content delivery compared to 46.9 percent of the principals of schools with ICT trained teachers who strongly agreed with the statement. Similarly, 42.7 percent of the principals of schools with ICT trained teachers and 31.2 percent of the principals of schools with Non-ICT trained teachers agreed with the statement that teachers used ICT to present imagery resources which ensured efficient content delivery respectively. 48.4 percent of the principals of schools with Non-ICT trained teachers disagreed with the statement teachers used ICT to present imagery resources which ensured efficient content delivery compared to 10.4 percent of their counterparts who also disagreed with the statement. None of the principals of schools with ICT trained teachers strongly disagreed with the statement that teachers used ICT to present imagery resources which ensured efficient content delivery compared to 20.4 percent of their counterparts who strongly disagreed with the statement.

The analysis also showed that 51 percent of the principals of schools with ICT trained teachers strongly agreed with the statement that teachers used ICT to present sound/audio clips in content delivery, while none of the principals of schools with Non-ICT trained teachers indicated similar views. Similarly, 47 percent of the principals of schools with Non-ICT trained teachers and 49 percent of their counterparts agreed with the statement that teachers used ICT to present sound/audio clips in content delivery respectively. None of the principals of schools with ICT trained teachers disagreed or strongly disagreed with the statement that teachers used ICT to present sound/audio clips in content delivery, compared to 31.2 percent and 21.8 percent of the principals of schools with Non-ICT trained teachers who disagreed and strongly disagreed with the statement respectively.

None of the principals of schools with Non-ICT trained teachers strongly agreed with the statement that teachers used ICT to present video clips for efficient content delivery, compared to 51 percent of the principals of schools with ICT trained teachers who strongly agreed with the statement. Likewise, 32.8 percent of the principals of schools with Non-ICT trained teachers and 49 percent of the principals of schools with ICT trained teachers agreed with the statement that teachers used ICT to present video clips for efficient content delivery respectively. To the contrary, 60.9 percent and 6.3 percent of the principals of schools with

Non-ICT trained teachers disagreed and strongly disagreed with the statement that teachers used ICT to present video clips for efficient content delivery respectively, while none of the principals of schools with ICT trained teachers disagreed or strongly disagreed with the statement respectively.

None of the principals of schools with Non-ICT trained teachers strongly agreed with the statement that teachers used ICT to present animations in content delivery compared to 41.7 percent of their counterparts who strongly agreed with the statement. Similarly, 42.7 percent of the principals of schools with ICT trained teachers and 31.2 percent of the principals of schools with Non-ICT trained teachers agreed with the statement that teachers used ICT to present animations in content delivery respectively. To the contrary, 47 percent of the principals of schools with Non-ICT trained teachers disagreed with the statement that teachers used ICT to present animations in content delivery compared to 15.6 percent of their counterparts who disagreed with the statement. None of the principals of schools with ICT trained teachers strongly disagreed with the statement that teachers used ICT to present animations in content delivery compared to 21.8 percent of their counterparts who strongly disagreed with the statement.

Further, the data indicated that 27.1 percent and 55.2 percent of the principals of schools with ICT trained teachers strongly agreed and agreed with the statement that teachers used ICT to present graphics that enhanced content delivery respectively; while none of the principals of schools with Non-ICT trained teachers strongly agreed or disagreed with the statements respectively. However, 47 percent and 53 percent of the principals of schools with Non-ICT trained teachers disagreed and strongly disagreed with the statement that teachers used ICT to present graphics that enhanced content delivery respectively compared to 13.5 percent and 4.2 percent of their counterparts who disagreed and strongly disagreed with the statement respectively.

None of the principals of schools with Non-ICT trained teachers strongly agreed with the statement that teachers used ICT to draw diagrams to deliver content compared to 43.8 percent of the principals of schools with ICT trained teachers who teachers strongly agreed with the statement. 52.1 percent of the principals of schools with ICT trained teachers agreed with the statement that teachers used ICT to draw diagrams to deliver content compared to 6.3 percent of their counterparts who agreed with the statement. To the contrary, 42.2 percent and 51.5 percent of the principals of schools with Non-ICT trained teachers disagreed and strongly disagreed with the statement that teachers used ICT to draw diagrams to deliver content respectively; 4.1 percent of the principals of schools with ICT trained teachers disagreed with the statement that teachers used ICT to draw diagrams to deliver content while none strongly disagreed with the statement.

None of the principals of schools with Non-ICT trained teachers strongly agreed with the statement that teachers used ICT to conduct classroom technology based games compared to 62.5 percent of their counterparts who strongly agreed with the statement. In addition, 20.8 percent of the principals of schools with ICT trained teachers agreed with the statement that teachers used ICT to conduct classroom technology based games compared to 6.3 percent of

their counterparts who agreed with the statement. However, 42.2 percent and 51.5 percent of the principals of schools with Non-ICT trained teachers disagreed and strongly disagreed with the statement that teachers used ICT to conduct classroom technology based games respectively compared 12.5 percent and 4.2 percent of their counterparts who disagreed and strongly disagreed with the statement respectively.

None of the principals of schools with Non-ICT trained teachers strongly agreed or agreed with the statement that teachers used ICT to conduct role play teaching techniques in content delivery, compared to 41.7 percent and 52 percent of their counterparts who strongly agreed and agreed with the statement respectively. However, 48.4 percent and 51.5 percent of the principals of schools with Non-ICT trained teachers disagreed and strongly disagreed with the statement that teachers used ICT to conduct role play teaching techniques in content delivery respectively; 6.3 percent of the principals of schools with ICT trained teachers disagreed with the statement that teachers used ICT to conduct role play teaching techniques in content delivery, while none strongly disagreed with the statement.

This implied that ICT trained teachers employed ICT skills more in content delivery compared to Non-ICT trained teachers. They utilized ICT in preparing PowerPoint slides, video and audio clips, technology-based games, and drawing diagrams which enriched their content delivery. This could be associated with the acquisition of pre-service and in-service ICT skills relevant for the development and adoption of ICTs in pedagogical practices. This findings agree with a research done by Capan, S.A. (2012) which established that ICT trained teachers in Canada employed technology to support their delivery styles through use of variant digital formats like; PowerPoint slides, video and audio/sound clips, simulations, graphics, drawing diagrams, and technological games thus quality demonstrations appealing to the learners.

The study established that none of the Non-ICT trained teachers strongly agreed with any of the statements regarding their use of ICT skills in content delivery. Non-ICT trained teachers were not exposed to formal ICT pedagogical training, thus they applied their general ICT knowledge hence inhibiting their technology utilization in pedagogy and lowering the quality of content delivery. This echoes studies done by Khan, Sh, Hasan, M & Clement, CK (2012), who established that Non-ICT trained secondary school teachers in Morocco didn't embrace technology supported pedagogy such as; multimedia applications, drawing diagrams, animating objects to clarify critical concepts, showing pictures, and playing videos hence less interesting and productive lessons lowering the quality of content delivery.

The study further sought the views of the teachers concerning their status in the use of ICT skills in content delivery. They were requested to indicate their responses as; SA=Strongly Agree, A=Agree, D=Disagree, and SD=Strongly Disagree. The results were as contained in Table 2.

Table 2. Teachers' views on their status of use of ICT skills in content delivery

Response	ICT trained teachers								Non-ICT trained teachers							
	SA		A		D		SD		SA		A		D		SD	
	n	%	N	%	n	%	n	%	n	%	n	%	n	%	n	%
Teachers use power point in lesson presentation	15	71.	47	22.	13	6.2	0	0	0	0	0	0	59	27.	81	57.
Teachers use ICT to present simulations for fast content delivery	11	52.	74	35.	17	8.1	9	4.3	0	0	0	0	68	48.	72	51.
Teachers use ICT to present imagery resources which ensures efficient content delivery	15	72.	31	14.	26	12.	0	0	0	0	26	18.	47	33.	67	47.
Teachers use ICT to present sound/audio clips in content delivery	17	85.	31	14.	0	0	0	0	0	0	10	7.1	63	45	67	47.
Teachers use ICT to present video clips for efficient content delivery	13	64.	74	35.	0	0	0	0	0	0	26	18.	44	31.	70	50
Teachers use ICT to present animations in content delivery	11	55.	48	22.	26	12.	20	9.5	0	0	26	18.	47	33.	67	47.
Teachers use ICT to present graphics that enhance content delivery	12	57.	50	23.	22	10.	18	8.6	0	0	30	21.	45	32.	65	46.
Teachers use ICT to draws diagrams to deliver content	10	51.	63	30	20	9.5	18	8.6	0	0	10	7.1	59	42.	71	50.
Teachers use ICT to conduct classroom technology based games	10	51.	63	30	18	8.6	20	9.5	0	0	10	7.1	61	43.	69	49.
Teachers use ICT to conduct role play teaching techniques in content delivery	10	51.	63	30	20	9.5	18	8.6	0	0	10	7.1	59	42.	71	50.

ICT trained teachers (n = 210. % =100)

Non-ICT trained teachers (n =140. % = 100)

From the findings contained in Table 2 it was evident that ICT trained teachers used PowerPoint in lesson presentation with 71.4 percent strongly agreeing and 22.4 percent agreeing with the statement respectively, while none of the Non-ICT trained teachers strongly agreed or agreed with the statement. However, 27.9 percent of Non-ICT trained teachers disagreed with the statement that they used PowerPoint in lesson presentation compared to 6.2 percent of ICT trained teachers who disagreed with the statement. None of the ICT trained teachers strongly disagreed with the statement that they used PowerPoint in lesson presentation compared to 57.8 percent of Non-ICT trained teachers who strongly disagreed with the statement. None of the Non-ICT trained teachers strongly agreed or agreed with the statement that they used ICT to present simulations for fast content delivery compared to 52.4 percent and 35.2 percent of ICT trained teachers who strongly agreed and agreed with the statement respectively. To the contrary, 48.6 percent and 51.4 percent of Non-ICT trained teachers disagreed and strongly disagreed with the statement that they used ICT to present simulations for fast content delivery respectively compared to 8.1 percent and 4.3 percent of ICT trained teachers who disagreed and strongly disagreed with the statement respectively.

None of the Non-ICT trained teachers strongly agreed with the statement that they used ICT to present imagery resources which ensured efficient content delivery compared to 72.8 percent of ICT trained teachers who strongly agreed with the statement. Similarly 14.8 percent of ICT trained teachers and 18.6 percent of Non-ICT trained teachers agreed with the statement that they used ICT to present imagery resources which ensured efficient content delivery respectively. However, 33.6 percent of Non-ICT trained teachers disagreed with the statement that they used ICT to present imagery resources which ensured efficient content delivery compared to 12.4 percent of ICT trained teachers who disagreed with the statement. None of the ICT trained teachers strongly disagreed with the statement that they used ICT to present imagery resources which ensured efficient content delivery compared to 47.8 percent of Non-ICT trained teachers who strongly disagreed with the statement.

The analysis indicated that 85.2 percent of ICT trained teachers strongly agreed with the statement that they used ICT to present sound/audio clips in content delivery, while none of the Non-ICT trained teachers strongly agreed with the statement. Similarly, 14.8 percent of ICT trained teachers and 7.1 percent of Non-ICT trained teachers agreed with the statement that they used ICT to present sound/audio clips in content delivery respectively. None of the ICT trained teachers disagreed or strongly disagreed with the statement that they used ICT to present sound/audio clips in content delivery compared to 45 percent and 47.9 percent of Non-ICT trained teachers who disagreed and strongly disagreed with the statement respectively.

None of the Non-ICT trained teachers strongly agreed with the statement that they used ICT to present video clips for efficient content delivery compared to 64.8 percent of ICT trained teachers who strongly agreed with the statement. 35.2 percent of ICT trained teachers agreed with the statement that they used ICT to present video clips for efficient content delivery compared to 18.6 percent of Non-ICT trained teachers who felt the same. None of the ICT

trained teachers disagreed or strongly disagreed with the statement that they used ICT to present video clips for efficient content delivery compared to 31.4 percent and 50 percent of Non-ICT trained teachers who disagreed and strongly disagreed with the statement respectively.

None of the Non-ICT trained teachers strongly agreed with the statement that they used ICT to present animations in content delivery compared to 55.2 percent of ICT trained teachers who strongly agreed with the statement. Similarly, 22.9 percent of ICT trained teachers and 18.6 percent of Non-ICT trained teachers agreed with the statement that they used ICT to present animations in content delivery respectively. In addition, 33.6 percent and 47.8 percent of Non-ICT trained teachers disagreed and strongly disagreed with the statement that they used ICT to present animations in content delivery respectively, compared to 12.4 percent and 9.5 percent of ICT trained teachers who disagreed and strongly disagreed with the statement respectively.

The data also showed that 57.1 percent of ICT trained teachers strongly agreed with the statement that they used ICT to present graphics that enhanced content delivery, while none of the Non-ICT trained teachers strongly agreed with the statement. 21.4 of Non-ICT trained teachers agreed with the statement that they used ICT to present graphics that enhanced content delivery compared to 23.8 percent of ICT trained teachers who had similar views. However, 32.1 percent and 46.5 percent of Non-ICT trained teachers disagreed and strongly disagreed with the statement that they used ICT to present graphics that enhanced content delivery respectively, compared to 10.5 percent and 8.6 percent of ICT trained teachers who disagreed and strongly disagreed with the statement respectively

None of the Non-ICT trained teachers strongly agreed with the statements that they used ICT to draw diagrams to deliver content, and to conduct role play teaching techniques in content delivery respectively, compared to 51.9 percent of ICT trained teachers who strongly agreed with the statements respectively. 30 percent of ICT trained teachers agreed with the statements that they used ICT to draw diagrams to deliver content, and to conduct role play teaching techniques in content delivery respectively, compared to 7.1 percent of ICT trained teachers who agreed the statements respectively. To the contrary, 42.2 percent and 50.7 percent of Non-ICT trained teachers disagreed and strongly disagreed with the statements that they used ICT to draw diagrams to deliver content, and to conduct role play teaching techniques in content delivery respectively; compared to 9.5 percent and 8.6 percent of ICT trained teachers who disagreed and strongly disagreed with the statements respectively.

None of the Non-ICT trained teachers strongly agreed with the statement that they used ICT to conduct classroom technology based games compared to 51.9 percent of ICT trained teachers who strongly agreed with the statement. 30 percent of ICT trained teachers agreed with the statement that they used ICT to conduct classroom technology based games compared 7.1 percent of Non-ICT trained teachers who agreed with the statement. However, 43.6 percent and 49.3 percent of Non-ICT trained teachers disagreed and strongly disagreed with the statement that they used ICT to ICT to conduct classroom technology based games respectively;

compared to 8.6 percent and 9.5 percent of ICT trained teachers who disagreed and strongly disagreed with the statement respectively.

This connoted that both ICT and Non-ICT trained teachers applied technology to present imagery resources, video clips, graphics, and present animations for efficient content delivery though with great variations. ICT trained teachers had a notable adoption of ICT in content delivery as a result of relevant training on technology use in pedagogy which elevated their delivery techniques. Non-ICT trained teachers lacked formal ICT training which inhibited their intense technology utilization in presenting animations, graphics, simulations, preparing PowerPoint slides, video, and audio clips thus lowering the quality of content delivery. The findings mirror the study done by Türel, Y. K., & Johnson, T. E. (2012) who found that in Europe ICT trained teachers used computers, laptops, and devices like; interactive whiteboards, LCD projectors, mobile devices, and peripheral devices in content delivery which enabled demonstration thus impacting on their content coverage efficiency and students' performance.

ICT trained teachers were able to apply the use of technology-based games, audio/sound clips, simulations, and draw diagrams for efficient and quality delivery of content. This results proved a study conducted by⁹ in Saudi Arabia on ICT integration by ICT trained teachers in science education which pointed out that, the use of simulations, pictures, graphics, video and audio clips resulted to more demonstrative teaching, question and answer approach, authentic and enquiry based learning, and deeper understanding of abstract concepts.

None of the Non-ICT trained teachers strongly agreed to any of the statements regarding their use of ICT skills in content delivery. All the Non-ICT trained teachers indicated that they did not use PowerPoint and simulations in content delivery. This was an indication that Non-ICT trained teachers were deficient of the technological expertise and competence to intensely apply ICT in their content delivery which influenced their pedagogical practices. Non-ICT trained teachers lacked ICT competence to perform complex technology based delivery techniques like presenting graphics, simulations, animations, and preparing PowerPoint presentations which made their teaching less innovative, non-creative, and unfriendly to learners¹².

In addition to the principals and teachers views, the study further sought to establish the student's views on the status of teachers' usage of ICT skills in content delivery. They were requested to indicate their responses as; SA=Strongly Agree, A=Agree, D=Disagree, and SD=Strongly Disagree. The results were summarized in Table 3.

Table 3. Students views on teachers' status of use of ICT skills in content delivery

Responses	SA		A		D		SD		Total	
	n	%	N	%	n	%	n	%	n	%
Teachers use power point in lesson presentation	90	23.7	80	21.1	103	27.1	107	28.1	380	100
Teachers use ICT to present simulations for fast content delivery	102	26.8	106	27.9	90	23.7	82	21.6	380	100
Teachers use ICT to present imagery resources which ensured efficient content delivery	110	28.9	76	20	95	25	99	26.1	380	100
Teachers use ICT to present sound/audio clips in content delivery	140	36.8	93	24.5	80	21.1	67	17.6	380	100
Teachers use ICT to present video clips for efficient content delivery	97	25.5	91	24	92	24.2	100	26.3	380	100
Teachers use ICT to present animations in content delivery	90	23.7	95	25	92	24.2	103	27.1	380	100
Teachers use ICT to present graphics that enhance content delivery	99	26.1	90	23.7	90	23.7	101	26.5	380	100
Teachers use ICT to draw diagrams to deliver content	90	23.7	95	25	92	24.2	103	27.1	380	100
Teachers use ICT to conduct classroom technology-based games	97	25.5	91	24	92	24.2	100	26.3	380	100
Teachers use ICT to conduct role play teaching techniques in content delivery	90	23.7	95	25	92	24.2	103	27.1	380	100

The information contained in Table 3 showed that 28.1 percent and 27.1 percent of the students strongly disagreed and disagreed with the statement that both ICT and Non-ICT trained teachers used power point in lesson presentation respectively compared to 23.7 percent and 21.1 percent of the students who strongly agreed and agreed with the statement respectively. 26.8 percent of the students strongly agreed with the statement that both ICT and Non-ICT trained teachers used ICT to present simulations for fast content delivery compared to 21.6 percent who strongly disagreed with the statement. In addition, 27.9 percent of the students agreed with the statement that teachers used ICT to present simulations for fast content delivery, while 23.7 percent disagreed with the statement.

The analysis also indicated that 28.9 percent and 20 percent of the students strongly agreed and agreed with the statement that both ICT and Non-ICT trained teachers used ICT to present imagery resources which ensured efficient content delivery respectively compared to 25 percent and 26.1 percent of the students who disagreed and strongly disagreed with the statement respectively. 36.8 percent of the students strongly agreed with the statement that both ICT and Non-ICT trained teachers used ICT to present sound/audio clips in content delivery, compared to 17.6 percent who strongly disagreed with the statement. On the same, 24.5 percent of the students agreed with the statement that both ICT and Non-ICT trained

teachers used ICT to present sound/audio clips in content delivery compared to 21.1 percent who disagreed with the statement.

Similarly, 25.5 percent and 24 percent of the students strongly agreed and agreed with the statements that the teachers used ICT to present video clips for efficient content delivery, and to conduct classroom technology-based games respectively, compared to 24.2 percent and 26.3 percent who disagreed and strongly disagreed with the statements respectively. Further, 24.2 percent and 27.1 percent of the students disagreed and strongly disagreed with the statements that both ICT and Non-ICT trained teachers used ICT to present animations in content delivery, draws diagrams to deliver content, and to conduct role play teaching techniques in content delivery respectively; compared to 23.7 percent and 25 percent of the students who strongly agreed and agreed with the statements respectively. ICT and Non-ICT trained teachers used ICT to present graphics that enhanced content delivery as attested by 26.1 percent and 23.7 percent of the students who strongly agreed and agreed with the statement respectively; however, 23.7 percent and 26.5 percent of the students disagreed and strongly disagreed with the statement respectively.

This implied that ICT and Non-ICT trained teachers employed technology in content delivery variedly which enabled them to clarify and explain complex educational concepts and ideas to the students. The comprehensive application of ICT in content delivery led to the use of technology based games, role play, video clips, and imagery resources thus more interactive and innovative pedagogy. The variations in usage could be associated with the levels of knowhow on the application of ICT skills in pedagogy by ICT and Non-ICT trained teachers, condition of the ICT equipment, adequacy of ICT equipment, inadequate time for preparation, resistance to change, and lack of relevant ICT skills by the Non-ICT trained teachers.

The results of this study mirror studies done by Pruet, P., Ang, C. S. & Farzin, D. (2014) who asserted that ICT and Non-ICT trained teachers used the internet to upload recorded video demonstrations, sound clips, and images which improved their lectures. This enabled them to clarify and explain educational concepts and ideas through extensive use of description narratives thus improving students' participation and the quality of education. The use of ICT in content delivery by ICT and Non-ICT trained teachers lead to comprehensive application of classroom technology based games, role play and imagery resources hence more innovative, collaborative, and productive teaching boosting the learners' curiosity and creativity⁴.

4.5 Hypothesis testing and analysis

The second objective was to determine the influence of ICT integration on content delivery by teachers in secondary schools. This was done through testing and analysis of the study's hypothesis.

H₁ ICT integration does not significantly influence content delivery by ICT and Non-ICT trained teachers in secondary schools in Machakos County, Kenya.

In a bid to establish the relationship between ICT integration and teachers' content delivery, a simple regression test was carried out between teachers' use of ICT skills and responses from

questions on content delivery by both ICT and Non-ICT trained teachers. Correlation level R was calculated to determine the presence and level of correlation. The coefficient of correlation R was squared to obtain the coefficient of determination which was used to determine the degree of association between ICT integration and content delivery by ICT and Non-ICT trained teachers. The results were as illustrated in Table 4.

Table 4. Simple regression model summary on the influence of ICT integration on content delivery by ICT and Non-ICT trained teachers

Model	(r)	(r²)	Sig. (b)
ICT trained teachers	0.851	0.724	0.003
Non-ICT trained teachers	0.568	0.323	0.047

Significant at the 0.05 level (2-tailed) $df= 1$

(5) Constant predictor: ICT integration (b) Dependent variable: Content delivery

The analysis in Table 4. Indicated that the coefficient of correlation (r) for ICT trained teachers was 0.851 implying a very strong relationship between ICT integration and teachers' content delivery. The coefficient of determination (r^2) was 0.724 indicating that about 72.4% of the variation in teachers' content delivery by ICT trained teachers was explained by ICT integration. Similarly (r) value for Non-ICT trained teachers indicated moderate relationship of 0.568 between ICT integration and teachers' content delivery. The value of (r^2) predictor level was at 0.323 implying that about 32.3% of Non-ICT trained teachers integrated ICT in their content delivery.

Further the information presented in Table 4 demonstrated that the significance level of teachers' integration of ICT in content delivery for ICT trained teachers was extremely significant at p level 0.003. The significance demonstrated that ICT integration resulted to high levels of use of ICT in content delivery by ICT trained teachers. Similarly the significance levels for Non-ICT trained teachers were significant at p value 0.047 implying there was moderate significant influence of ICT integration on the teachers' content delivery by Non-ICT trained teachers. This was an indication that ICT integration averagely influenced Non-ICT trained teachers' content delivery.

5.1 Conclusions and Recommendations

The study concluded that ICT integration significantly influenced teachers' content delivery by ICT and Non-ICT trained teachers. ICT trained teachers' integration of ICT in their content delivery was significantly higher at (p) 0.003 than for Non-ICT trained teachers at (p) 0.047. The study concluded that ICT trained teachers integrated ICT in their content delivery greatly than Non-ICT trained teachers in secondary schools in Machakos County, Kenya. Therefore, the alternative hypothesis was adopted.

The study recommended that, the Ministry of Education (MOE) should incorporate ICT training in teacher training institutions to ensure production of teachers with skills to integrate ICT in their pedagogical practices. Further, the Ministry of Education (MOE) and ICT

development partners should ensure that all teachers acquire ICT proficiency for entire application of technology in content delivery.

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