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Teachers' Professional Development on ICT and Implementation of CBE in Primary Schools in Keiyo South Sub County, Elgeyo-Marakwet County, Kenya

Salina Bartilol
School of Education, Moi University
Eldoret, Kenya
Email: sbartilol@gmail.com

Abstract: *The effective implementation of Competency-Based Education (CBE) demands teachers to possess adequate digital competencies supported through continuous professional development. This paper evaluates the relationship between teachers' professional development on Information and Communication Technology (ICT) and the implementation of CBE in public primary schools in Keiyo South Sub-County, Kenya. The paper was anchored on Human Capital Theory and embraced a concurrent embedded mixed methods design, with quantitative data complemented by qualitative evidence. A sample of 297 teachers was selected using proportionate sampling based on the Krejcie and Morgan sample size table, while 26 head of institutions were purposively selected for interviews. Data were collected using teacher questionnaires and head teacher interview schedules. Quantitative data were analysed using descriptive and inferential statistics, while qualitative data were analysed through content analysis. Results revealed a moderate level of ICT professional development among teachers. Teachers reported strong pre-service computer skills and confidence in operating laptops but limited participation in internet-based and in-service ICT training. Qualitative findings indicated that teachers with prior ICT exposure demonstrated greater confidence in integrating technology into classroom instruction, whereas inadequate internet connectivity and limited training opportunities constrained ICT integration. There was a statistically significant positive relationship between teachers' ICT professional development and CBE implementation ($r = 0.403$, $p<0.001$). It is concluded that continuous, practical ICT professional development enhances teachers' capacity to implement CBE effectively. The Ministry of Education and Teachers Service Commission institutionalise regular hands-on ICT training, complemented by school-based mentoring and peer coaching, to strengthen technology integration in competency-based classrooms.*

Keywords: *Teachers, Professional, Development, Technology, Integration, Keiyo.*

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1. Introduction

The integration of Information and Communication Technology (ICT) into education system has become a global priority as education systems aim to enhance e teaching quality and equip students with competencies needed in the 21st century. The digitalisation of education is increasingly recognised as a crucial enabler of student-centred pedagogies and curriculum reforms. In Kenya, the

implementation of Competency-Based Education (CBE) has intensified the need for teachers to have adequate digital competencies which allow them to integrate technology into classroom learning. Therefore, teachers' professional development has emerged as an important factor in improving teaching effectiveness and facilitating successful curriculum implementation (Kithaka & Mutilu, 2024). According to UNESCO (2018), effective integration of ICT requires teachers to adopt new teaching roles, utilise innovative pedagogical approaches, and create collaborative learning environments that promote students' involvement. Rather than merely introducing technological devices into classrooms, ICT integration demands that teachers develop competencies for designing digital learning experiences, facilitating student centred instruction, and effectively utilising educational technologies. Hence, continuous professional development is crucial in equipping teachers with the knowledge, skills, and confidence needed to implement technology-supported teaching.

Recent empirical evidence show that teacher professional development significantly influences classroom technology integration. Sanhueza *et al.* (2025) noted that ICT training improves teachers' professional competencies and teaching capabilities, though evidence on its direct influence on students' classroom outcomes remains limited. Equally, Sowell and McCaughey (2023) indicated that teachers' digital knowledge and skills considerably affects instructional practices, with professional training strengthening teachers' ICT abilities for teaching and learning. These results imply that investment in teachers' digital competencies contributes positively to classroom practice. Despite increasing investment in ICT, research across various contexts continue to report recurrent challenges in technology integration. In Northern California, Layng (2023) found that teachers experienced diverse levels of confidence and readiness when integrating instructional technology into classroom instruction. Similarly, Esfijani and Zamani (2020) found that many teachers showed low proficiency in using ICT for teaching, research, and communication. Similar results were reported in Namibia, where Nghaamua (2022) noted that although schools had introduced innovative ICT practices, technology integration had not progressed to transformational levels. Reviews conducted in Malawi (Szeremley, 2025) and Ethiopia (Gonfa *et al.*, 2024) further established inadequate teacher preparation, infrastructural limitations, and inadequate professional support as crucial challenge to effective technology integration in curriculum implementation.

The Kenyan education system has equally encountered challenges in preparing teachers for effective implementation of CBE. Okello (2022) discovered that school contextual factors affected CBE implementation in public primary schools in Kajiado North Sub-County. In Meru County, Ireri *et al.* (2024) found that teacher professional development positively influenced implementation of CBE in junior secondary schools. Similarly, Omito (2022) noted varying levels of readiness among head of institutions and teachers to implement the Digital Literacy Programme in Homa Bay County, while Oduor (2023) found that science teachers in Rachuonyo South Sub-County faced preparedness challenges in implementing CBE. More recently, Karua *et al.* (2025) established that many teachers had limited awareness of competency-based curriculum principles and inadequate training, leading to continued reliance on traditional instructional approaches. Although previous studies have explored teacher preparedness, digital literacy, and implementation of CBE, limited empirical evidence specifically explored how teachers' ICT-focused professional development influences CBE implementation in public primary schools in Keiyo South Sub-County. Provided that effective implementation of CBE depends on teachers' capacity to integrate digital technologies into student centred instruction, understanding this relationship is important for informing teacher capacity-building programmes and educational policy. This paper evaluates the relationship between teachers' professional development on ICT and the implementation of Competency-Based Education in public primary schools in Keiyo South Sub-County, Kenya.

1.1 Problem Statement

The Government of Kenya has invested substantially in the implementation of CBE) and digital learning initiatives to enhance the quality and relevance of basic education. Effective implementation of CBE requires teachers to possess adequate ICT knowledge, skills, and confidence to facilitate student centred pedagogy. Despite teachers' professional development been recognised as a key determinant of effective technology integration (UNESCO, 2018; Kithaka & Mutilu, 2024), evidence from previous studies reveal that many teachers continue to face challenges in using ICT effectively during classroom learning. Studies have shown that professional development improves teachers' digital competencies (Sowell & McCaughey, 2023), yet many teachers still exhibit low ICT proficiency and limited classroom integration (Esfijani & Zamani, 2020; Nghaamua, 2022). Similar problems have been reported across African education systems, where inadequate training opportunities, infrastructural constraints, and inadequate professional support continue to affect effective technology integration (Gonfa *et al.*, 2024; Szeremley, 2025). Studies in Kenya have concentrated on school readiness, teacher preparedness, Digital Literacy Programme implementation, and CBE implementation in different counties (Okello, 2022; Omito, 2022; Oduor,

2023; Ireri *et al.,* 2024; Karua *et al.,* 2025). But, these studies have either focused on junior secondary schools, specific subject teachers, or general teacher preparedness without specifically exploratory how ICT-focused professional development affects the implementation of CBE in public primary schools. As a result, there is limited empirical evidence on relationship between teachers' professional development in ICT and the implementation of CBE in public primary schools within Keiyo South Sub-County. This knowledge gap restricts the capacity of policymakers and education stakeholders to develop targeted professional development programmes which strengthen teachers' digital competencies for effective curriculum implementation. Hence, this paper sought to assess the relationship between teachers' professional development on ICT and the implementation of CBE in public primary schools in Keiyo South Sub-County, Kenya.

1.2 Objective

The main objective of this paper is to evaluate the relationship between teachers' professional development on ICT and implementation of CBE in primary schools in Keiyo South Sub County

2. Literature Review

2.1 Empirical Literature

Several research studies have been undertaken to determine the degree to which teacher training on ICT influences the integration in classroom under CBE setting across the world. In United States of America, Sowell and McCaughey (2023) analysed teachers' training on technology use. The study found out that teachers' digital knowledge and skills strongly influenced classroom practices and instructional culture. Findings showed that professional training positively enhanced teachers' ICT capabilities in teaching and learning. One of the gaps emerging from this study is that it was conducted in the USA, where educational contexts and curricula differ from Kenya's CBE framework. The applicability of the findings to Kenyan primary schools was therefore limited. The current study addressed this contextual gap by focusing on CBE implementation in Kenyan primary schools. In Northern California, Layng (2023) conducted a narrative inquiry among third- to fifth-grade teachers in Northern California to explore their experiences with instructional technology integration. The research revealed that teacher training provided to teachers was of normally brief and insufficient, regardless of their initial familiarity with digital instructional tools. Even teachers who had attended ICT training struggled to internalise effective technology integration practices. The gap coming out of this research was that it was qualitative and conducted outside Kenya, limiting its generalisability. The current study adopted a mixed-methods approach and focused specifically on technology integration in CBE implementation in Kenyan primary schools. In Spain, Berrocoso-Valverde *et al.* (2022) investigated educational technology and students' performance. Findings indicated improved learner performance in subjects enriched by ICT use, particularly mathematics and science. The gaps coming from this study is that whereas it demonstrated the instructional value of technology, it focused on learner outcomes rather than teacher professional development. Also, it was conducted in a non-CBE context. The current study instead examined how teachers' professional development influences technology integration in CBE implementation.

In Iran, Esfijani and Zamani (2020) examined factors influencing teachers' utilisation of ICT in secondary schools. Their findings revealed that teachers demonstrated low proficiency in using ICT tools for teaching, research, and communication. In-service training was identified as a major determinant of ICT utilisation, though it remained inadequate. The study focused on secondary schools and treated professional development as a dependent variable. The current study repositioned professional development as an independent variable influencing technology integration in CBE implementation in primary schools. In Sukabumi Regency, Indonesia, Adela *et al.* (2025) investigated the implementation of digital education in two elementary schools one rural and one urban using a qualitative comparative case study design. Data were collected through interviews and classroom observations involving teachers, principals, students and parents. The findings revealed significant disparities in infrastructure and access to technology, with the rural school experiencing limited internet connectivity and a high student - computer ratio, while the urban school faced challenges related to insufficient TPACK training and limited instructional time. The study also identified unequal teacher capacity and low parental digital literacy as key barriers to effective technology integration. However, the research was conducted in Indonesia and did not examine ICT integration within a CBE framework, thereby leaving a contextual gap relevant to Kenyan primary schools.

GESCI (2020) baseline report under the African Digital School Distinction Model surveyed ICT competencies of teachers in Côte d'Ivoire and other African countries. The study revealed generally low levels of ICT competence among teachers, even among those who had participated in training programmes. This suggested that existing professional development initiatives were insufficient or ineffective. However, the study was comparative and not curriculum-specific. The current study focused on one context Kenya and examined professional development in

relation to CBE implementation. In Khomas Region Namibia Nghaamua (2022) examined technology integration level in schools. The study was guided by Technology Acceptance Model. It was an exploratory case study design which involved collection of data using semi-structured interviews. Result showed that although some innovative ICT strategies were evident, most classroom integration had not reached transformational levels. Challenges to ICT use involved included limited technical support, negative attitudes, affordability challenges, and inadequate ICT skills among teachers. The study relied on self-reported data limited objective assessment of actual classroom practice, highlighting the need for empirical investigations into how ICT integration supports curriculum implementation in specific educational contexts. In Nigeria, Eze (2021) evaluated ICT skills among French language teachers in selected education zones. The study revealed that most teachers lacked basic ICT skills necessary for effective technology integration. It further found that government-provided training on technology integration was inadequate. The study was subject-specific and conducted outside Kenya. The current study broadened the scope by examining professional development and technology integration across all learning areas within CBE implementation.

In Ethiopian primary schools Gonfa *et al.* (2024) reviewed the challenges facing technology integration as a pedagogical tool in curriculum implementation. The study identified that teachers' lack of technological knowledge and skills as a major obstacle to effective technology use in implementation of curriculum. Results also revealed limited technical proficiency, inadequate understanding of technology-supported pedagogy, and technophobia among some trained teachers influenced curriculum implementation in schools. Gonfa *et al.* research was a literature review of secondary sources of data rather than an empirical investigation through collection pf primary data. Henceforth, the current study empirically examined teachers' technology integration in CBE implementation in Kenyan primary schools. In Rwanda, Nsengimana (2021) assessed the opportunities and challenges in the implementation of CBE. The findings showed that only a small proportion of teachers had attended in-service CBE training, resulting in inadequate pedagogical and subject matter knowledge with respect to CBE implementation. This limitation resulted to incomplete syllabus coverage which negatively affected learner outcomes. This study differs with the present one since it did not examine technology use in teaching and learning. The current study addressed this gap by investigating technology integration as a component of CBE implementation in Kenya. In Uganda, Twabaze (2023) examined ICT skills among post graduate student teachers at Bishop Stuart University. The study revealed that many student teachers rated their ICT skills as low to moderate, especially in the use of ICT for data analysis and academic tasks. Although the findings provided insights into teacher training institutions, the study was limited to a single university. Its scope restricted the generalisability of the findings since it was conducted in tertiary education level. The current study adopted a correlational survey design involving practising primary school teachers in Kenya.

In Kenya, Okello (2022) investigated the influence of school factors on CBE implementation in public primary schools in Kajiado North Sub-County. The study established that both pre-service and in-service teacher training had inadequately equipped teachers with ICT skills for CBE implementation in schools. This deficiency affected effective utilisation of technological tools during classroom instruction. The gap seen from this study is that it focused broadly on school factors influencing CBE implementation. The current study narrowed its focus to teacher-related factors, particularly professional development and technology integration. In Imenti North Sub-County, Meru County, Ireri *et al.* (2024) examined the effects of teacher professional development on CBE implementation in junior secondary schools. The study found minimal integration of technology in teaching, mainly because of insufficient digital literacy training among teachers. Study results also showed that teachers reported difficulties adopting technology in their lessons in classroom. The study gap identified is that Ireri *et al.* research employed an experimental design and focused on junior secondary schools. The current study used a correlational design and targeted primary schools in Keiyo South Sub County. In Homa Bay County, Omito (2022) examined headteachers and teachers' readiness to integrate the Digital Literacy Programme (DLP) in public primary schools. A mixed-method survey design was adopted with data being collected through use of questionnaires and interviews. It was found out that limited digital competence among teachers, low teacher confidence in handling digital devices, and variations in preferred ICT tools for instructional use affected teacher readiness in ICT use. One of the gaps coming from this study is that it focused primarily on readiness rather than on how ICT integration influenced actual implementation of the CBE in classroom practice. This showed a contextual and implementation gap, which the present study in Keiyo South Sub County sought to address. In Rachuonyo South Sub-County, Oduor (2023) explored science teachers' preparedness for CBE implementation in secondary schools. Data were analysed using descriptive statistics and involved science teachers only. The study found that teachers lacked competence in applying CBE pedagogical approaches due to inadequate training. One of the gaps emerging from this study is that it focused on preparedness rather than technology integration in primary school context. The current study broadened the scope by examining technology integration across all learning areas using both descriptive and

inferential statistics. Another research by Karua, Manyasi, and Kara (2025) investigated teachers' preparedness for implementing the CBC) focusing on their awareness of CBC principles and ability to align teaching approaches with the curriculum. The study adopted a descriptive survey design, collecting data via a teacher questionnaire Findings revealed that teachers had low awareness of CBC tenets, with the majority untrained in CBC implementation, leading them to rely on outdated teaching strategies. Teachers' capacity to develop schemes of work, lesson plans, and select appropriate teaching approaches was limited, resulting in underutilisation of recommended learner-centred methods, except for group work and drama, which were moderately applied (Karua *et al.,* 2025). The study highlights a gap in continuous professional development and teacher support, underscoring the need for targeted in-service training to enhance teachers' competence in effectively implementing CBC, a gap this study addressed in Keiyo South Sub-County.

In summary to the review of empirical literature, the reviewed studies consistently indicate that inadequate pre-service and in-service teacher training significantly constrains effective technology integration in CBE implementation. Evidence shows that most professional development initiatives are short, theoretical, and lack hands-on ICT application, leaving teachers with limited confidence and competence to integrate digital tools in classroom practice. While several studies acknowledge the importance of digital skills, few empirically examine how teacher professional development directly influences technology integration during CBE implementation. Moreover, most studies are either review-based, context-specific, or focused on preparedness rather than actual integration. Consequently, a clear gap exists in empirical, context-specific research examining the relationship between teacher professional development and technology integration in CBE implementation in primary schools, particularly in rural Kenyan settings such as Keiyo-South Sub-County.

2.2 Theoretical Framework

This study was grounded on Human Capital Theory, formerly advanced by Theodore Schultz (1961) and later expanded by Gary Becker (1964). This theory contends that investments in education, training, and skills development improves individuals' knowledge, competencies, and productivity, eventually increasing their performance. This theory sees professional development as an investment that enhances employees' ability to perform their responsibilities effectively through equipping them with appropriate knowledge and practical skills. In the context of this paper, teachers' professional development in ICT represents an investment in human capital which improves teachers' digital competencies, confidence, and capacity to integrate technology into instruction. Teachers who receive continuous ICT training are expected to develop the pedagogical and technological skills vital to implement CBE through student centred instructional methods, digital lesson planning, and effective application of educational technologies. This theory offered an appropriate framework in describing how ICT professional development contributed to improved implementation of CBE in public primary schools.

3. Methodology

The study adopted a mixed methods research design, which allows for the integration of quantitative and qualitative approaches within a single inquiry. Specifically, the study employed a concurrent embedded mixed methods design, in which qualitative data were embedded within a predominantly quantitative framework. The study was conducted in Keiyo South Sub-County which is one of the four sub counties of Elgeyo-Marakwet County located in the North Rift Region of Kenya. The study involved participation of teachers and head of institutions from public primary schools. The study targeted all 1,256 teachers teaching in 1256 schools (private and public), distributed as follows: 671 teachers in Chepkorio Division, 186 in Soy Division, and 399 in Metkei Division (Keiyo South Sub-County Education Office, 2024). When using the sample size determination Table by Krejcie and Morgan, given a population of 1,256 teachers, the corresponding sample size resulted to 297 teachers. Schools and teachers were sampled proportionately from each division based on their population sizes. For the qualitative component, head of institutions was selected using purposive sampling, guided by Kerlinger's (1973) recommendation that 10–20 per cent of a population is sufficient for qualitative inquiry (Palinkas *et al.,* 2025). Therefore, 26 head of institutions (20.0% of 129) were selected as the sample for the study. Data for the study was collected using two primary data collection instruments namely, a teachers' questionnaire and a head of institutions' interview schedule. Quantitative data was analysed using descriptive and inferential statistics. Qualitative results were analysed using content analysis method. The research ensured that all respondents voluntarily participated in the study and neither their names nor names of their schools are mentioned in this paper.

4. Results and Discussion

This section presents, analyses, interprets, and discusses findings on the objective of the study which explored relationship between teachers' professional development and the integration of technology in the implementation of CBE in primary schools in Keiyo South Sub County. The analysis is based on teachers' questionnaire responses and

corroborated with qualitative data obtained from head of institutions' interviews. The study findings are presented in a Likert scale as illustrated in Table 1.

Table 1: Teachers' Professional Development on ICT in CBE Implementation

Statement		SD	D	N	A	SA	Mean	Std
I have received computer skills training during my pre-service education	F	5	14	30	135	78	4.02	.89
	%	1.9	5.3	11.5	51.5	29.8		
I have attended workshops on using the internet for teaching and learning	F	85	137	21	10	9	1.94	.93
	%	32.4	52.3	8.0	3.8	3.4		
I have been trained on creating digital lesson plans and lesson notes	F	45	44	35	68	70	3.28	1.45
	%	17.2	16.8	13.4	26.0	26.7		
I have received in-service training on technology integration in teaching	F	66	113	34	39	10	2.29	1.11
	%	25.2	43.1	13.0	14.9	3.8		
I have been trained on how to download and use digital teaching materials	F	70	14	57	110	11	2.92	1.31
	%	26.7	5.3	21.8	42.0	4.2		
I have digital skills to teach learners using tablets	F	73	103	53	21	12	2.22	1.08
	%	27.9	39.3	20.2	8.0	4.6		
I am confident in operating a laptop for teaching purposes	F	6	16	13	169	58	3.98	.85
	%	2.3	6.1	5.0	64.5	22.1		
I am skilled in using educational software such as Excel for recording student assessments	F	98	85	54	11	14	2.08	1.11
	%	37.4	32.4	20.6	4.2	5.3		
My school provides regular training on the use of ICT tools (laptops, tablets, projectors).	F	10	21	46	102	83	3.87	1.07
	%	3.8	8.0	17.6	38.9	31.7		
Professional development programmes have enhanced my ability to integrate technology in CBE lessons	F	71	23	12	146	10	3.00	1.37
	%	27.1	8.8	4.6	55.7	3.8		
Training on ICT has improved my teaching strategies and learner engagement	F	13	11	29	87	122	4.12	1.09
	%	5.0	4.2	11.1	33.2	46.6		
Continuous ICT training increases my confidence in using new teaching technologies	F	99	16	11	123	13	2.75	1.48
	%	37.8	6.1	4.2	46.9	5.0		
Composite							**3.04**	**1.15**

Source: Field Data (2024)

Findings in Table 1 indicated that majority of the teachers had received ICT training during their pre-service education. Specifically, 213 (81.3%) who agreed and strongly agreed that they had acquired computer skills during college training, while only 19 (7.2%) disagreed. The statement recorded a high mean score (M = 4.02, SD = 0.89), indicating a strong presence of foundational ICT skills among teachers. The result implies that pre-service ICT training equips teachers with basic technological competencies that enhance their readiness to integrate technology into CBE lesson delivery and classroom management. During interview, most head of institutions strongly affirmed this finding, observing clear differences in confidence and competence between teachers who had ICT exposure during training and those who had not. One head teacher stated,

> *Teachers who went through college when computers were part of training are more confident; they do not fear using laptops or tablets in class.* (HT7, Personal communication, 2024)

Another head teacher yet observed,

> *You can easily tell those who were trained on ICT during college because they volunteer to use technology even without supervision in school. They have been helpful in assisting other teachers to integrate ICT in their teaching* (HT14, Personal communication, 2024)

These responses show that pre-service ICT training positively shapes teachers' self-efficacy and willingness to adopt technology, forming a critical foundation for CBE implementation. The findings are consistent with Chibisa *et al.* (2021) who established that teachers' pre-service exposure to ICT significantly influences their adoption of technology in teaching. Also, Mooney (2023) found that teachers with ICT background training integrated technology more frequently and effectively than their counterparts without such exposure.

Secondly, despite positive pre-service exposure, the findings revealed limited professional training on internet use for instructional purposes. A substantial proportion of teachers, 222 (84.7%), disagreed that they had attended workshops on internet use for teaching and learning. This statement recorded a low mean score (M = 1.94, SD = 0.93). the finding suggests that most teachers lacked the skills required to utilise online instructional resources, digital repositories, and collaborative learning platforms that support CBE pedagogy. During interview, head of institutions confirmed that training on internet use was minimal or absent in most primary schools in Keiyo South Sub County. One head teacher remarked,

> *We rarely organise internet training because connectivity itself is unreliable, so it becomes difficult to justify such workshops.* (HT3, Personal Communication, 2024)

Another head teacher added:

> *Most teachers use the internet only on their phones, not for teaching, because they have never been trained on how to use it professionally when conducting classroom instruction.* (HT11, Personal Communication, 2024)

Results show that limited internet training restricts teachers' ability to exploit digital resources, reinforcing reliance on traditional teaching approaches. Results agrees with Sithole and Mbukanma (2024) which reported that rural schools had limited ICT training opportunities, particularly in internet-based instruction. Additionally, Ndiangui *et al.* (2025) observed that lack of internet training hindered teachers' capacity to deliver technology-supported learning.

Results showed moderate training in digital lesson preparation with at least 138 (52.7%) of teachers agreeing that they had been trained on creating digital lesson plans and lesson notes, while 89 (34.0%) disagreed. The mean score was moderate (M = 3.28, SD = 1.45) implying that where else some teachers were capable of digitising lesson content, the depth and quality of such training would be insufficient for advanced instructional integration especially under the CBE curriculum. During interview, head of institutions acknowledged that teachers had basic typing skills but lacked pedagogical sophistication in digital lesson design. One head teacher remarked,

> *Most teachers in my school can type schemes of work and lesson plans, but they do not know how to integrate videos, graphics or interactive content.* (HT9, Personal Communication, 2024)

Another head teacher observed,

> *Digital lesson preparation is mostly about typing, not about improving how learners interact with content.* (HT18, Personal Communication, 2024)

Hence, digital lesson preparation skills remain largely mechanical rather than pedagogically transformative. Findings support Salgado and Paglinawan (2025) who discovered that teachers often possessed basic ICT skills but lacked advanced competencies required for meaningful technology-enhanced instruction including preparation of lesson plans and notes through ICT gadgets.

Further findings showed that teachers agreed that there was limited access to in-service training on technology integration in their schools where 179 (68.3%) of the teachers appeared to disagreed that they had received in-service ICT training, while only 49 (18.7%) agreed. This explains why a low mean score (M = 2.29, SD = 1.11) was recorded for the statement. The result meant that inadequate continuous professional development, limited teachers' ability to align technology use with evolving CBE instructional demands in schools. Head of institutions strongly echoed this concern during interview session as one of them explained,

> *Most of the trainings we attend as head of institutions focus on CBE content, not on how technology can support teaching."* (HT2, Personal communication, 2024).

Another headteachers added,

> *"ICT in-service training is rarely organised because funds are limited and the timetable is already congested."* (HT15, Personal Communication, 2024)

It can be seen that systemic constraints undermine sustained ICT capacity building for teachers. The results concur with Twabaze's (2023) research that found out that teachers did not have adequate ICT refresher training programmes, thereby limiting effective technology integration in classrooms. Similarly, research by Omboto *et al.* (2022) identified insufficient professional development as a key barrier to ICT adoption in Kenyan schools.

Findings also revealed low confidence in advanced digital skills possession by teachers. Most 176 (67.2%) teachers disagreed that they had adequate skills to teach learners using tablets (M = 2.22, SD = 1.08), while 183 teachers (69.8%) disagreed that they were skilled in using software such as Excel for assessment recording (M = 2.08, SD = 1.11). The result indicates that teachers struggled with learner-centred digital tools critical for CBE assessment and instructional delivery. During interviews, most head of institutions confirmed that many teachers avoided technology-based assessment due to skill gaps. One of the head of institutions thus stated,

> *"Teacher's fear using digital assessment tools because they think they might make mistakes or lose data."* (HT6, Personal communication, 2024).

Another head teacher observed,

> *Even when tablets are available, teachers avoid them because they are not confident in managing learners digitally.* (HT20, Personal communication, 2024)

Hence, inadequate digital skills contributed to fear, resistance, and underutilisation of available ICT resources in schools. Consistent with the results, Yang *et al.* (2025) found that lack of ICT competence resulted in technology-related stress among teachers. Also, Salgado and Paglinawan (2025) research found out that limited digital skills discouraged teachers from integrating technology.

Findings showed moderate institutional support for ICT professional development in most primary schools in the Sub County. Nearly 185 (70.6%) of teachers agreed that their schools provided some form of ICT training (M = 3.87, SD = 1.07). this means that although school-based initiatives for ICT existed, they were undertaken irregularly and insufficient to address teachers' professional needs comprehensively in light of the demands brought by CBE curriculum. During interview, a number of head of institutions acknowledged making internal efforts to support ICT training in their institutions. One head teacher stated,

> *We organise internal training whenever possible, but it is not frequent due to financial constraints we face fuelled by reduced government capitation and vote for professional development programmes for teachers.* (HT10, Personal communication, 2024)

Another head teacher added,

> *"School-based training helps, but without external support it is not enough to build strong ICT skills."* (HT5, Personal communication, 2024)

These results imply that institution-based interventions alone cannot adequately bridge ICT competency gaps without systemic and policy-level support from the government and stakeholders within the education. The findings agree with Berrucoso *et al.* (2021), who found that limited institutional support reduced teachers' opportunities to develop ICT competence.

In general, the composite mean score (M = 3.04, SD = 1.15) indicates a moderate level of teachers' professional development in ICT in primary schools in Keiyo South Sub County. Whereas teachers possessed foundational ICT skills, gaps remained in continuous training, internet use, advanced digital competencies, and pedagogical integration. Nevertheless, the results show that inadequate and inconsistent professional development constrains effective technology integration in CBE implementation in primary schools in the Sub County. This underscores the need for structured, sustained, and well-funded ICT professional development programmes aligned with curriculum reforms. Pearson's Product Moment Correlation analysis was computed to examine the direction, strength, and significance of the relationship between teachers' professional development on technology integration and implementation of CBE in primary schools in Keiyo South Sub County. The results are presented in Table 2.

Table 2: Correlation

		Teachers' professional development	Implementation of CBE
Teachers' professional development	Pearson Correlation	1	.403**
	Sig. (2-tailed)		.000
	N	262	262
Implementation of CBE	Pearson Correlation	.403**	1
	Sig. (2-tailed)	.000	
	N	262	262

**. Correlation is significant at the 0.01 level (2-tailed).

The correlation statistics on teachers' professional development revealed the existence of moderate positive and statistically significant relationship with CBE implementation (r = 0.403, p=0.001). Hence, teachers who have undergone ICT-related professional development were more likely to implement CBE effectively compared to those who had received less or no training on technology integration in CBE. The relationship was stronger than that of ICT resource availability, denoting the important role of teacher capacity building in ICT for effective CBE implementation in primary schools.

5. Conclusion and Recommendations

5.1 Conclusion

The study concludes that teachers' professional development significantly influenced on CBE implementation in Keiyo South Sub-County. Teachers who had received training related to CBE and ICT integration were more confident and more likely to apply learner-centred and competency-based instructional strategies. Nonetheless, the training provided was often insufficient,

irregular, and largely theoretical. This indicates that sustained, practical professional development remains critical for strengthening CBE implementation in the area.

5.2 Recommendations

From the findings, the following recommendations have been suggested:

1. The study highlights the need for ongoing, hands-on professional development rather than one-off workshops for teachers. The Ministry of Education and Teachers Service Commission should coordinate structured ICT training programmes emphasising practical integration into CBE lessons, digital lesson planning, and confidence-building for teachers.
2. At the school level, administration should implement weekly follow-up sessions to reinforce skills learned, ensuring teachers translate training into classroom practice.
3. Peer mentoring and internal coaching can further enhance the sustainability of skills acquisition. These measures aim to address the knowledge and skill gaps revealed in teachers' responses and supported by head of institutions' observations of inadequate ICT proficiency.

References

Becker, G. S. (1993). *Human capital: A theoretical and empirical analysis, with special reference to education* (3rd ed.). The University of Chicago Press.

Berrocoso-Valverde, J., Fernández-Sánchez, M.R., Revuelta, D. F.I., Sosa-Díaz, M.J. (2021). The educational integration of digital technologies preCovid-19: Lessons for teacher education. PLoS ONE 16(8), e0256283. https://doi.org/10.1371/journal.pone.0256283

Chibisa, A., Tshabalala, M. G., & Maphalala, M. C. (2021). Pre-service teachers' computer self-efficacy and the use of computers. *International Journal of Learning, Teaching and Educational Research*, *20*(11), 325-345.

County. *World Journal of Innovative Research*, *13*(1), 9-9.

Esfijani, A. & Zamani, B.E. (2020). Factors influencing teachers' utilisation of ICT: The role of in-service training courses and access. *Research in Learning Technology, 28*, https://doi.org/10.25304/rlt.v28.2313

GESCI (2020). African Digital Schools Initiative (ADSI): Programme Partners Group (PPG) Meeting Report.

Gonfa, M. H., Birhanu, A. L., & Gendo, K. M. (2024). Review on practice and challenges of ICT integration as pedagogical tools in Ethiopian primary school curriculum implementation. *Discover Education, 3*(1), 88.

Ireri, C., & Njagi, K. & Njati, I. (2024). Effects of teacher professional development on implementation of competency-based curriculum in junior schools in North Imenti Sub-County, Meru County. *International Journal of Research and Innovation in Social Science. VIII.* 2533-2542. 10.47772/IJRISS.2024.8080192.

Karua, G. W., Manyasi, B., & Kara, A. (2025). Teacher Preparedness to Implement Competency-based Curriculum in Public Primary Schools in Kinangop Sub County, Kenya. International Journal of Scientific Research and Management, 13(02), 22 – 41. DOI:10.18535/ijsrm/v13i02.ee01

Kerlinger, F.N. (1973). *Foundations of behavioural research*. Holt, Rinehart and Winston Inc., New York.

Kithaka, A. M. & Mutilu, B.M. (2024). Influence of in-service-teacher training on effective implementation of competence based curriculum in public primary school in Makadara Sub-County, Nairobi County, Kenya. *IOSR Journal of Research & Method in Education, 14*(5), 38 – 45

Layng, E. (2023). *Digital journeys: a narrative inquiry into the experiences of third-grade through fifth-grade general education teachers implementing instructional technology in Northern California*. (Doctoral Dissertation), University of New England.

Mooney, S. G. (2023). *The fast-globalizing gendered construction of teacher education: A critical feminist research policy analysis of the contemporary reform movement*. *Frontiers in Education, 8*, Article 1113011. https://doi.org/10.3389/feduc.2023.1113011

Ndiangui, P., Mwangi, F. K., & Zhang, J. (2025). Enhancing student skills through the integration of online learning in Kenya's competency-based curriculum (CBC). *Research in Social Sciences and Technology*, *10*(2), 1-35.

Nghaamua, N. N. (2022). An exploration of selected Windhoek secondary school teachers' information communication and technology classroom integration. M.Ed. Thesis, University of Namibia.

Nsengimana, V. (2021). Implementation of Competence-based Curriculum in Rwanda: Opportunities and Challenges. Rwandan Journal of Education, 5(1), 129–138.

Oduor, G.O (2023 Exploring science teachers' preparedness for the Implementation of the competency-based curriculum in Secondary schools in Rachuonyo South sub-county, Kenya. Maters Thesis, Aga Khan University Dar es salaam.

Okello, V. (2022). Influence of School-based Factors on Implementation of Competency based Curriculum in Public Primary Schools in Kajiado North-sub County, Kajiado County, Kenya. Doctoral Dissertation. University of Nairobi.

Omboto, C. M., Kanga, A., & Njageh, A. R. K. (2022). Myth or Reality: Digital Literacy Programme Implementation in Primary Special Schools in Nairobi, Kenya. *European Journal of Education (EJED)*, *5*(2), 51-66.

Omito, O. (2021). ICT infrastructure for the uptake of one laptop per child project in Homa Bay county, Kenya. *Journal of Education and Practice, 12*(32), 72-84.

Salgado, J.D.A. & Paglinawan, J. (2025). Teacher's challenges and opportunities in integrating digital technology in the classroom. *International Journal of Scientific and Management Research, 8.* 10.37502/IJSMR.2025.81022.

Sanhueza, M., Sandoval, L., Ormazabal, M., & Zúñiga, M. (2025). Effect of a teacher training program with ICT on university students' learning. *Contemporary Educational Technology, 17*(1), ep556. https://doi.org/10.30935/cedtech/15745

Schultz, T. W. (1961). Investment in human capital. *The American Economic Review, 51*(1), 1–17.

Sithole, V. L., & Mbukanma, I. (2024). Prospects and challenges to ICT adoption in teaching and learning at rural South African universities: A systematic review. *Research in Social Sciences and Technology, 9*(3), 178-193. https://doi.org/10.46303/ressat.2024.54.

Sowell, J., & McCaughey, K. (2023). Contextualizing teacher training through needs analysis and reflexivity. In *English Teaching Forum* (Vol. 61, No. 2, pp. 12-24). US Department of State. Bureau of Educational and Cultural Affairs, Office of English Language Programs, SA-5, 2200 C Street NW 4th Floor, Washington, DC 20037.

Szeremley, C. (2024). Challenges and Opportunities in Malawian Education: Focusing on Teacher Training. *Journal of Central and Eastern European African Studies*, *4*(3-4), 295-305.

Szeremley, C. (2024). Challenges and Opportunities in Malawian Education: Focusing on Teacher Training. *Journal of Central and Eastern European African Studies*, *4*(3-4), 295-305.

UNESCO. (2018). *Teacher professional development with ICT-empowered innovative pedagogy.* UNESCO IITE Week 2018. https://iite.unesco.org/teacher-professional-development-ict-empowered-innovative-pedagogy/

Yang, D., Liu, J., Wang, H., Chen, P., Wang, C., & Metwally, A. H. S. (2025). Technostress among teachers: A systematic literature review and future research agenda. *Computers in Human Behaviour*, 108619.