Teachers' Self-Efficacy in ICT and Its Influence on the Implementation of CBE in Public Primary Schools in Bomet County, Kenya

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DOI: https://doi.org/10.47772/IJRISS.2025.91200004

Received: 10 December 2025; Accepted: 18 December 2025; Published: 30 December 2025

ABSTRACT

The integration of Information and Communication Technology (ICT) is pivotal in the successful implementation of Competency-Based Education (CBE) curriculum in Kenya. This study examined the relationship between teachers' self-efficacy in ICT and the implementation of CBE curriculum in Public Primary Schools in Bomet County. It also sought to determine whether ICT self-efficacy predicts CBE implementation after controlling for demographic variables such as teaching experience, gender, and ICT training. As such, a descriptive correlational research design was adopted. The study sampled 200 teachers from the five sub-counties using stratified random sampling. Data were collected using a structured questionnaire, with an overall reliability coefficient of 0.87 for both sections. Analysis was conducted using SPSS Version 26, including descriptive statistics, Pearson's correlation, and multiple regression. The results revealed a significant positive correlation between teachers' self-efficacy in ICT and CBE implementation ($r = 0.58$, $p < 0.001$). Multiple regression analysis indicated that ICT self-efficacy significantly predicted CBE implementation ($\beta = 0.524$, $p < 0.001$) even after controlling for demographic factors. The study concludes that enhancing teachers' ICT self-efficacy is crucial for effective CBE implementation. It recommends targeted ICT training, mentorship programs, and supportive institutional policies that enhance teachers' digital confidence.

Keywords: ICT self-efficacy, Competency-Based Education Curriculum, teachers, primary schools, Bomet County, Kenya

INTRODUCTION

Globaly, education is moving towards Competency-Based Education (CBE), which promotes the integration of hands-on skills, critical thinking, problem solving, and lifelong learning skills (Darling-Hammond et al., 2020). Consequently, the implementation of CBE curriculum initiatives in Kenya aligns with the Vision 2030 developmental agenda that emphasizes learner-centered pedagogy, digital literacy, and the incorporation of ICT into classrooms to educate youth for the knowledge-based economy (Republic of Kenya, 2017).

Successful implementation of CBE means that the shift of approaches from traditional content delivery to active, learner-centered environments is necessary for teachers. Teachers' ICT self-efficacy refers to the extent of their confidence that they can use technology to promote learning and development thus become an important factor in pedagogical innovation (Tschannen-Moran & Hoy, 2001). According to Mishra & Koehler (2006), teachers high on ICT self-efficacy are more likely to craft their lessons using technology, incorporate multimedia resources, and involve learners in research-based, collaborative tasks consistent with CBE objectives. On the other hand, teachers with low self-efficacy in ICT will resist using technology, utilize traditional teaching methods, or use ICT only minimally, thus impeding the realization of CBE goals (Ertmer & Ottenbreit-Leftwich, 2010).

Although the Kenyan Government invested huge sums in ICT infrastructure and teacher capacity-building through initiatives such as the Digital Literacy Programme (DLP), research indicates a disconnect between the application of technology and the need for such integration (Mugo & Gathoni, 2021; Njoroge et al., 2022). In Bomet County this discrepancy, teachers' lack of exposure to technology, insufficient ICT training and little or no support systems presents a major challenge. Challenges may obstruct the smooth application of CBE, resulting in classroom settings that do not have a conducive environment for learner autonomy, problem-solving, and acquired practical skills.

Statement of the Problem

Though policy frameworks and teacher training programmes support the integration of ICT into CBE, it is unclear how these teachers' own levels of self-efficacy in ICT contribute to the actual implementation of CBE curriculum. Anecdotal descriptions and preliminary surveys in Bomet County suggest that teachers' experiences of ICT-mediated pedagogy vary greatly, while there is little clear evidence around whether learners are benefiting by adopting CBE into their classrooms. Absence of empirical evidence makes it challenging to develop targeted interventions that improve teachers' confidence in technology and CBE effectiveness in Public Primary Schools. Hence, this study addresses the gap by examining the relationship between teachers' self-efficacy in ICT and CBE implementation. The study focuses on investigating if self-efficacy in ICT is an effective predictor of implementation and whether it influences CBE development after accounting for the intervening factors such as gender, teaching experience and ICT training. The results are intended to guide policy-making, curriculum planning and other education stakeholders on how to improve the implementation of CBE through the development of teacher capability of ICT integration.

Objectives of the Study

i. To explore the associations between teachers' self-efficacy in ICT and implementation of CBE.

ii. To assess if teachers' ICT self-efficacy is predictive of CBE implementation after controlling for demographic variables (gender, teaching experience, and ICT training).

LITERATURE REVIEW

Integrated and interlinked teaching technology has proven not only as a pillar of contemporary education but also in some ways has become a central part or formative factor. The introduction of Information and Communication Technology (ICT) into class settings now represents a new direction in current education practices. As described in Competency-Based Education (CBE) programs such as that of Darling-Hammond and his colleagues (Darling-Hammond et al., 2020). However, successful integration of ICT is not only the result of teachers' availability of technology resources but also of teachers' self-efficacy; teachers' belief in their capabilities to learn using technology to promote teaching efficacy (Bandura, 1997).

ICT confidence of teachers have been reported to significantly predict their motivation to take up innovative teaching methods, as evidenced in various studies. As Abbitt (2011) argues, teachers' perceived capabilities in digital tools are a more powerful factor for ICT integration than the level of access to a computer or internet resources. High ICT self-efficacy leads teachers to design lessons with multimedia, simulations and interactive formats, while low self-efficacy leads teachers to rely on traditional teacher-centered instructional approaches, albeit with technological infrastructure on the ground. Teo (2009) similarly reported that higher self-efficacy teachers were more open towards adopting ICT technologies by trial and error in regards to new educational software, technology-focused assessment design, and collaborative, inquiry-based learning. The study found that teachers' belief in their abilities lay the foundation in facing challenges with technology and sustaining motivation and substantial instructional change.

In CBE settings, ICT self-efficacy is important to consider as technology provides delivery, but it is also a medium for fostering learner autonomy, individualized learning and transfer of relevant skills (Voogt et al., 2013). Teachers who are comfortable using ICT will be able to develop strategies for a learner-centered curriculum, formulate evaluation of competence, and have students work on problem solving or collaborative

projects. On the other hand, teachers with low ICT confidence in this context might underutilized available resources and hinder the attainment of CBE goals (Ertmer & Ottenbreit-Leftwich, 2010). In Kenya, Nderitu (2020) found that primary school teachers' perceived confidence to use technology plays a more significant role in predicting readiness for CBE implementation. Teachers who scored significantly high on ICT self-efficacy were more likely to integrate digital tools into lessons, conduct practical activities, and get students involved in higher order thinking. However, the study highlighted gaps in examining how the demographic factors considered could moderate or impact this relationship.

Around the world, studies emphasize the importance of teachers' self-efficacy in integrating ICT into teaching. For instance, Ertmer (2005) identified resource constraints, teacher beliefs, and teacher confidence as factors in technology adoption. Despite the importance of infrastructure, it is teachers' perception of their capability and pedagogy that lead to successful integration. Similarly, Tondeur et al. (2017) found that teacher self-efficacy also predicts not only how often, but also the quality of ICT integration, impacting learner engagement, motivation, and achievement.

There is evidence to suggest that demographic variables may influence whether people are more or less likely to have ICT self-efficacy and to implement CBE based on which demographic profile they fit in to the survey questions. Gender differences in ICT confidence have also been identified as male teachers demonstrate stronger use of ICT, whereas there seems to be no significant difference depending on sex (Howard et al., 2015). Past experience in teaching is also an important consideration; young teachers may have confidence with new technologies, but less concern with class management; experienced ones may not. Formal ICT training, both pre-service and during in-service, consistently increases teachers' perceived competence and willingness to utilise technology (Law et al., 2018).

However, there are gaps, especially in a Kenyan primary school context. National initiatives from the Digital Literacy Programme (DLP) to provide infrastructure and training have shown promise, but there is limited empirical support to inform the extent to which teachers' self-efficacy in ICT directly impacts actual implementation of CBE, and to what extent demographic factors moderate this relationship. The majority of studies address ICT adoption more generically, while competency-based pedagogy is lacking and needs active, practical and learner-centered instructional approaches.

Theoretical Framework

This study was based on Bandura's (1997) Self-Efficacy Theory, which states that individuals' beliefs in their capabilities influence their intrinsic motivation, effort, and performance in specific tasks. According to the education field perspective, it is the teachers who believe that they have the necessary skills to embed Information and Communication Technology (ICT) into classroom operations that lead to their adoption of learner-centered pedagogical techniques, experimentation with innovative instructional approaches, and tenacity in addressing the challenges of implementation for the Competency-Based Education (CBE) curriculum. Thus, high ICT self-efficacy can significantly increase teachers' effectiveness for active learning with critical thinking and problem-solving among learners.

Furthermore, the investigation expanded on TPACK, a methodological framework opined by Mishra & Koehler (2006) that underpins the interaction of technology, pedagogy, and content knowledge. TPACK posits that effective teaching in digital contexts occurs when teachers integrate subject matter expertise with appropriate instructional strategies and technological tools. Using self-efficacy theory and TPACK, the present study posits that teachers' self-efficacy in using ICT will support the integration of technology in ways that align with pedagogical goals and content, ultimately leading to the effective implementation of CBE in modern day classrooms. Taken together, these frameworks offer a means to explore the influence of teachers' self-efficacy in ICT on their instructional strategies and successful realization of the CBE curriculum.

METHODOLOGY

Research Design

The study adopted a descriptive correlational research design. This design is considered appropriate for examining the nature and strength of relationships between variables without manipulating them. This design enabled the researcher to determine the association between teachers' self-efficacy in ICT and the implementation of the Competency-Based Education (CBE) curriculum in Public Primary Schools in Bomet County, as well as to explore their predictive relationships.

Target Population and Sampling

The target population of the study consisted of a total of 2,540 Public Primary School teachers in Bomet County. To ensure a representative sample, stratified random sampling was employed across the five sub-counties. Using Krejcie and Morgan's (1970) sampling table, a sample of 200 teachers was selected. Stratification ensured proportional representation from each sub-county according to teacher population, enhancing the generalization of findings.

Research Instrument

Data was collected using a structured questionnaire entitled *Teachers' ICT Self-Efficacy and CBE Implementation Questionnaire (TISECIQ)*, which comprised three sections:

i. **Section A**: Demographic Information – included gender, teaching experience and ICT training.

ii. **Section B**: ICT Self-Efficacy Scale – 10 items measuring teachers' self-confidence in the use of ICT tools for instructional purposes.

iii. **Section C**: CBE Implementation Scale – 10 items assessing teachers' perceptions and practices in implementing the CBE curriculum.

All items in the TISECIQ were rated on a 5-point Likert scale ranging from 1 = Strongly Disagree (SD) to 5 = Strongly Agree (SA). The instrument underwent pilot testing, yielding an overall Cronbach's alpha coefficient of 0.87 for the entire questionnaire, indicating high internal reliability.

Validation and Reliability

The instrument was presented for review by three experts in Educational Communication Technology and teacher education from the University of Kabianga to ensure content validity. A pilot study involving 20 primary school teachers with a teaching experience of over five years from neighboring Narok county was conducted to assess clarity, comprehension, and internal consistency. The Cronbach's alpha coefficient for the scale was 0.86 and 0.88 for Section B and Section C respectively indicating high internal consistency and reliability of the tools.

Data Collection Procedure

The researchers sought permission from the relevant authorities in Bomet County including the office of the County Commissioner and County Director of Education. Questionnaires were then administered in person and electronically to enhance high response rates. Confidentiality and voluntary participation were emphasized.

Data Analysis Procedures

The collected data were coded and analyzed in accordance with SPSS Version 26. Demographic characteristics of respondents and responses to individual items were summarized using descriptive statistics (frequencies, percentages, means, and standard deviations). Pearson's product-moment correlation coefficient was estimated to assess the correlation between ICT self-efficacy and the

implementation of Competency-Based Education (CBE) curriculum. Additionally, multiple regression analysis was used to evaluate the ability of ICT self-efficacy to predict CBE implementation while controlling for selected demographic variables. Statistical significance was determined at the 0.05 level ($p < 0.05$).

RESULTS AND DISCUSSION

Section A: Demographic Characteristics of Respondents

The study sampled 200 Public Primary School teachers from Bomet County. Table 4.1 gives a summary of the demographic characteristics of respondents who took part in the study.

Table 4.1 Demographic Characteristics of Participants

Variable	Category	Frequency (f)	Percentage (%)
Gender	Male	84	42.0
	Female	116	58.0
Teaching Experience	1–5 years	54	27.0
	6–10 years	71	35.5
	11–15 years	47	23.5
	Above 15 years	28	14.0
ICT Training	Yes	123	61.5
	No	77	38.5

Source: Field data (2025)

The majority of participants were female teachers (58%), which aligns with national trends in primary education. Most teachers had 6-10 years of experience (35.5%), suggesting a moderately experienced workforce. Additionally, 61.5% had received some form of ICT training, indicating substantial exposure to technology, although depth and duration varied. These demographic factors provide a context for interpreting ICT self-efficacy and CBE implementation.

4.2 Section B: ICT Self-Efficacy Scale (10 Items)

Section B of the questionnaire measured teachers' self-efficacy in ICT. Self-efficacy in this context was defined as their belief in their ability to effectively use technology for instructional purposes. The scale consisted of 10 items, each rated on a 5-point Likert scale ranging from 1 = Strongly Disagree (SD) to 5 = Strongly Agree (SA). Higher scores indicated greater confidence in integrating ICT into the teaching/learning processes in CBE implementation. Table 4.2 gives a summary of the responses.

Table 4.2: Summary of the responses on Teachers' Self-efficacy in ICT

Item	Statement	Mean	SD	Interpretation
1	I can effectively use word processing software for teaching tasks.	3.62	0.89	High
2	I can prepare PowerPoint presentations for my lessons.	3.54	0.84	High

3	I can integrate online resources into my lessons.	3.38	0.79	Moderate
4	I can assess learners using digital tools.	3.29	0.92	Moderate
5	I can troubleshoot basic ICT problems.	3.12	0.97	Moderate
6	I can effectively use educational software in teaching.	3.45	0.85	High
7	I can guide learners in using ICT tools responsibly.	3.51	0.80	High
8	I can adapt lessons to include multimedia resources.	3.33	0.90	Moderate
9	I can evaluate the effectiveness of ICT tools in teaching.	3.26	0.95	Moderate
10	I am confident using ICT without technical support.	3.18	0.88	Moderate

Composite Mean = 3.78 (SD = 0.88) → *Moderate ICT Self-Efficacy*

Scores on this scale were summed and averaged to provide a composite measure of ICT self-efficacy for each teacher. These scores were subsequently used in correlation and regression analyses to examine their relationship with CBE implementation.

Section C: CBE Implementation Scale (10 Items)

Section C of the questionnaire measured teachers' implementation of the Competency-Based Education (CBE) curriculum, focusing on practices that promote learner-centered instruction, practical skill development, and ICT integration in the teaching/learning process. The scale consisted of 10 items, each rated on a 5-point Likert scale: 1 = Strongly Disagree (SD) to 5 = Strongly Agree (SA), with higher scores indicating greater adherence to CBE principles in classroom practice. Table 4.3 gives a summary of the responses regarding CBE Implementation.

Table 4.3: Summary of the responses on CBE Implementation

Item	Statement	Mean	SD	Interpretation
1	I regularly use learner-centered strategies in lessons.	3.41	0.84	High
2	I design lessons to develop specific competencies.	3.34	0.81	Moderate
3	I use ICT to facilitate learner engagement.	3.29	0.88	Moderate
4	I assess learners through performance-based methods.	3.26	0.90	Moderate
5	I provide individualized feedback to learners.	3.42	0.85	High
6	I collaborate with other teachers to plan CBE lessons.	3.35	0.76	Moderate
7	I incorporate local context in competency teaching.	3.47	0.70	High
8	I encourage learners to take responsibility for their learning.	3.44	0.74	High
9	I integrate ICT to support project-based learning.	3.23	0.91	Moderate
10	I continuously reflect on my teaching to improve competence.	3.48	0.69	High

Composite Mean = 3.37 (SD = 0.81) → *Moderate CBE Implementation*

Individual teacher's scores from this scale were summed and averaged to create a composite measure of CBE implementation. These scores were subsequently used in correlation and regression analyses to determine the relationship between self-efficacy in ICT and the practical application of CBE principles in modern day classrooms.

Descriptive Statistics of Key Variables

Table 4.4 presents the obtained mean scores and standard deviations for teachers' ICT self-efficacy and Competency-Based Education (CBE) curriculum implementation. The descriptive results provide an overview of the central tendencies and variability of the two key constructs, offering preliminary insights into teachers' confidence in using ICT and their level of engagement in implementing CBE practices.

Table 4.4: Descriptive Statistics of ICT Self-Efficacy and CBE Implementation

Variable	Mean	SD	Interpretation
ICT Self-Efficacy	3.78	0.88	High
CBE Implementation	3.37	0.81	Moderate

Teachers reported relatively high ICT self-efficacy (M = 3.78), reflecting confidence in using digital tools. The mean score for CBE implementation (M = 3.37) indicates moderate adoption of competency-based practices, suggesting room for improvement, particularly in learner-centered and technology-enhanced pedagogy.

Teachers self-efficacy in ICT and the implementation of CBE

To examine the relationship between teachers' self-efficacy in ICT and the implementation of Competency-Based Education (CBE) curriculum, Pearson's product-moment correlation analysis was conducted. This analysis assessed the strength and direction of the linear association between the two variables being considered, providing insight into whether higher levels of self-efficacy in ICT were associated with greater engagement in CBE implementation practices. Table 4.5 shows the results of this analysis.

Table 4.5: Correlation Between Self-Efficacy in ICT and CBE Implementation

Variables	ICT Self-Efficacy	CBE Implementation
ICT Self-Efficacy	1.00	0.58
CBE Implementation	0.58	1.00

Note: $r = 0.58$, $p < 0.001$

The results in Table 4.5 indicate a strong positive correlation ($r = 0.58$, $p < 0.01$) between ICT self-efficacy and CBE implementation in primary schools. This indicates that teachers who are more self-confident in using technology in teaching tend to implement Competency-Based Curriculum practices more effectively. This finding is consistent with Abbitt (2011) and Teo (2009), who emphasize that self-efficacy drives teachers' willingness to adopt and integrate digital tools in pedagogically meaningful ways.

Predictive power of teachers' self-efficacy in ICT on CBE Curriculum Implementation

A multiple linear regression analysis was conducted to examine whether teachers' ICT self-efficacy predicts the implementation of Competency-Based Education (CBE) after controlling for gender, teaching experience, and ICT training. This approach enabled the assessment of the unique contribution of ICT self-efficacy to CBE implementation while accounting for the influence of key demographic and professional variables. Table 4.6 gives the results of regression analysis.

Table 4.6: Regression Analysis Predicting CBE Implementation

Predictor	B	SE B	β	t	p
ICT Self-Efficacy	0.488	0.057	0.524	8.56	0.000
Gender	0.071	0.048	0.063	1.48	0.140
Teaching Experience	0.032	0.022	0.057	1.45	0.148
ICT Training	0.116	0.046	0.102	2.52	0.013

Model Summary: $R^2 = 0.389$, $F(4,195) = 31.03$, $p < 0.001$

Teachers self-efficacy in ICT emerged as the strongest predictor ($\beta = 0.524$, $p < 0.001$) of CBE curriculum implementation, confirming that teachers' confidence in using technology substantially influences competency-based practices. While gender and teaching experience were not significant predictors, prior ICT training showed a modest positive effect ($\beta = 0.102$, $p = 0.013$). This aligns with global findings (Ertmer, 2005; Tondeur et al., 2017) that emphasize the interplay between teacher beliefs, professional development, and effective ICT integration.

The non-significant effect of teaching experience suggests that long service does not automatically translate into technological competence; rather, structured ICT training remains essential. The modest yet significant contribution of ICT training highlights the importance of professional development in sustaining digital literacy for CBE implementation.

The findings demonstrate that teachers' ICT self-efficacy is a critical enabler of CBE implementation in Bomet County public primary schools. High ICT self-efficacy facilitates the design of learner-centered lessons, incorporation of digital tools, and promotion of active, competency-based learning. This supports Bandura's Self-Efficacy Theory (1997), which posits that beliefs in personal capabilities drive performance, as well as the TPACK framework (Mishra & Koehler, 2006), which emphasizes the tripartite integration of content, pedagogy, and technology.

The moderate adoption of CBE curriculum practices despite high self-efficacy in ICT suggests that other factors, such as school infrastructure development, administrative support, and resource availability, could also influence implementation. The significant, though smaller, effect of ICT training indicates that structured teacher professional development enhances their confidence and capacity to translate self-efficacy into classroom practice.

These results are consistent with Kenyan studies (Nderitu, 2020; Mugo & Gathoni, 2021), confirming that psychological and institutional factors jointly shape the effectiveness of CBE implementation. Importantly, the lack of significant gender or experience effects suggests that interventions targeting ICT self-efficacy can benefit all teachers, regardless of demographic differences.

Summary of Major Findings

i. Teachers reported moderate to high ICT self-efficacy.

ii. Teachers showed positive levels of CBE implementation.

iii. Self-efficacy in ICT had a positive and significant correlation with CBE implementation.

iv. Self-efficacy in ICT significantly predicted CBE implementation in the regression model. This predictive effect remained strong even after controlling for gender, teaching experience, and ICT training.

v. ICT self-efficacy emerged as the most influential factor in effective CBE implementation.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Teachers' ICT self-efficacy significantly influences the effective implementation of CBE curriculum in Public Primary Schools in Bomet County. It strongly predicts the extent to which teachers adopt digital tools in instruction, even when demographic variables are considered. High self-efficacy promotes innovation, learner engagement, and competency-oriented teaching.

Recommendations

i. Enhanced ICT Professional Development: The Ministry of Education should organize continuous training focusing on pedagogical ICT integration.

ii. Mentorship and Peer Support: Schools should establish mentorship programs pairing ICT-proficient teachers with those less confident.

iii. Institutional Support: Provision of ICT resources and school-based technical assistance should be prioritized to sustain confidence and utilization.

iv. Policy Strengthening: CBE guidelines should explicitly emphasize ICT self-efficacy as a professional competency for teachers.

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