Student Perceptions of Techno-Pedagogical Approaches in Competency-Based Education Implementation in Kenyan Junior Schools

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Abstract
This study examines junior school learners' perceptions of techno-pedagogical approaches in implementing Competency-Based Education (CBE) in Kenya. Anchored in constructivist learning theory, a descriptive survey design was employed, targeting 384 learners from public and private schools across urban and rural areas in Bungoma County. Data were collected through structured questionnaires and analyzed using descriptive and inferential statistics. Results indicate that most learners view the integration of digital tools positively, citing enhanced engagement, understanding, and classroom participation. However, notable disparities emerged, with students in private and urban schools reporting more favorable experiences than those in public and rural institutions. The findings suggest that while learners are generally receptive to techno-pedagogical approaches, inequities in infrastructure and support limit universal effectiveness. The study recommends targeted investments in ICT infrastructure, teacher training, development of inclusive digital content, and learner-centered policy frameworks to support equitable CBE implementation.

Keywords: Techno-pedagogy, Competency-Based Education, student perception, educational technology, junior schools, Kenya, ICT integration

1. Introduction

The educational landscape in Kenya has undergone significant reforms in recent years, with the most notable being the transition from the traditional 8-4-4 education system to the Competency-Based Education (CBE) framework. This shift aims to nurture learners' competencies across various domains, including critical thinking, collaboration, communication, and digital literacy. Unlike the former content-heavy system, CBE places the learner at the center of the educational process, emphasizing the acquisition of skills and attitudes that can be practically applied in real-life contexts. Central to this reform is the integration of Information and Communication Technology (ICT) into teaching and learning processes, resulting in what is referred to as techno-pedagogical approaches.

Techno-pedagogical approaches combine technological tools and resources with pedagogical strategies to enhance teaching effectiveness and learner engagement. In junior schools, where learners are at a formative stage, the deployment of these approaches is considered crucial for equipping students with the 21st-century skills they require. Kenya's Ministry of Education has taken commendable steps to support this transition, including policy formulations that encourage

ICT integration, provision of digital learning devices through the Digital Literacy Programme, and capacity-building programs for teachers.

However, despite these initiatives, the extent to which techno-pedagogical approaches are embraced and perceived by learners remains a critical area of inquiry. Learners' perceptions play a pivotal role in the success of educational innovations. Positive perceptions are associated with increased motivation, active participation, and improved academic outcomes. Conversely, if learners find the technology confusing, intimidating, or irrelevant, the potential benefits may not be fully realized.

Research globally has underscored the importance of learner-centered technology use in achieving educational goals. Studies in various contexts have shown that when students perceive technology as useful and enjoyable, they are more likely to engage meaningfully with digital learning tools. However, in the Kenyan context, most studies have focused on teacher preparedness, infrastructure challenges, and policy implementation, with limited emphasis on how learners themselves experience and interpret these technological changes in their classrooms.

This study seeks to bridge this gap by exploring junior school learners' perceptions of techno-pedagogical approaches within the framework of CBE implementation. It investigates how students perceive the use of digital tools in their learning processes, the extent to which they feel these tools enhance their understanding and engagement, and the challenges they encounter. The findings are expected to provide valuable insights for educators, policymakers, and curriculum developers aiming to refine and optimize the integration of technology in education.

Furthermore, the study is guided by the constructivist learning theory, which emphasizes active learner participation and knowledge construction through experience and reflection. This theoretical lens is particularly relevant in analyzing learners' perceptions, as it acknowledges that each student interacts with and interprets technological tools differently based on prior knowledge, learning context, and personal experiences. By situating learner perceptions within this framework, the study not only captures what students think about techno-pedagogical approaches but also uncovers how these perceptions influence their learning behaviors and outcomes.

Ultimately, this research contributes to the growing body of knowledge on educational technology integration in the global South. It provides empirical evidence on learner experiences with techno-pedagogical strategies in Kenyan junior schools, offering recommendations for enhancing technology adoption in ways that are both pedagogically sound and responsive to learner needs. As Kenya continues to invest in digital learning infrastructure and pedagogical innovation, understanding the learner perspective becomes not only relevant but essential for achieving equitable and effective education for all.

2. Literature Review

The integration of technology in education has long been considered a catalyst for transformative learning, especially within learner-centered educational models such as Competency-Based Education (CBE). A review of global and local literature highlights the multifaceted nature of techno-pedagogical implementation, encompassing policy, infrastructure, teacher training, and most critically, learner reception and experience. Within the broader scope of educational research,

students' perceptions are increasingly acknowledged as key indicators of the effectiveness and sustainability of technological innovations in classrooms (Akyol et al., 2009).

Bates (2005) asserts that educational technology fosters enhanced interaction, collaboration, and independent learning when implemented effectively. In support of this claim, Sun et al. (2008) emphasize the value of interdisciplinary and problem-solving approaches that integrate technology into everyday learning, allowing students to connect content with real-world applications. The literature generally agrees that such methods enhance student motivation and retention of knowledge. These advantages align with the goals of CBE, which aims to move beyond rote memorization and nurture deeper cognitive and practical skills.

In the African context, however, literature suggests that the implementation of techno-pedagogical strategies faces significant challenges. According to Kubai (2023), Kenyan junior schools continue to grapple with inconsistent ICT access, inadequate teacher training, and infrastructural disparities. These systemic limitations inevitably affect students' exposure to and perception of technology-enhanced learning. Ayere et al. (2010) similarly note that while ICT tools have the potential to revolutionize learning, their actual impact is mediated by contextual variables such as socioeconomic status, teacher readiness, and school leadership support.

One dimension that has received comparatively less scholarly attention is the learners' own voice. Steeples, Jones, and Goodyear (2002) argue for greater consideration of student experiences, noting that educational reforms often overlook how learners interact with and make sense of new pedagogical tools. Wagner (2008) further suggests that students' technological engagement is influenced by their prior experiences, attitudes toward technology, and the support structures available to them within the school environment.

Moreover, the success of techno-pedagogical initiatives depends heavily on whether students feel empowered and capable of using the tools provided. Learners who perceive digital tools as accessible, relevant, and beneficial are more likely to develop positive attitudes toward their usage. Conversely, if students feel overwhelmed or alienated by technology, their motivation and academic engagement may decline (Govindasamy, 2001). In this respect, learners' digital self-efficacy and perceptions of support from teachers are critical enablers of successful implementation.

The literature also points to disparities in how students across different regions and school types experience techno-pedagogical integration. In private schools with better infrastructure, students report more frequent and effective use of digital tools (Ngaruiya, 2023). In contrast, public schools, particularly those in rural areas, often lack basic infrastructure, resulting in minimal use and lower learner engagement with ICT.

In conclusion, the literature confirms the theoretical and empirical importance of learner perceptions in understanding the dynamics of techno-pedagogical implementation in CBE environments. However, there remains a clear research gap regarding the specific experiences of junior school students in Kenya, particularly from a learner-centered perspective. This study aims to fill this gap by providing grounded, context-specific insights into how learners perceive the use of technology in their classrooms, what benefits they derive, and what challenges they face in this evolving educational landscape.

3. Theoretical Framework

This study is grounded in the constructivist learning theory, a widely recognized framework in education that emphasizes the active role of learners in the process of knowledge construction. According to Piaget and Vygotsky, two major proponents of constructivist theory, learners build understanding and meaning based on their interactions with the world around them. Learning, therefore, is not a passive absorption of information but an active, contextualized process of making sense of experience (Vygotsky, 1978).

In the context of Competency-Based Education (CBE), constructivist principles align closely with the pedagogical shift from rote memorization to learner-centered practices. CBE emphasizes real-world application of knowledge, critical thinking, collaboration, and problem-solving—skills that can only be effectively developed through active learner engagement. The use of technology in classrooms provides a rich environment for constructivist learning by enabling exploration, simulation, and communication that transcend traditional teaching methods (Jonassen, 1999).

Techno-pedagogical approaches embody this constructivist ethos. Digital tools such as learning management systems, educational software, multimedia presentations, and interactive platforms facilitate individualized and cooperative learning. They allow learners to pace their own studies, engage with diverse resources, and collaborate with peers in problem-solving activities. This aligns with Vygotsky's idea of the Zone of Proximal Development (ZPD), where learners achieve higher levels of understanding through scaffolded interactions with more knowledgeable others, often facilitated through technology-enhanced learning environments.

Moreover, constructivism stresses the importance of the learner's background, prior knowledge, and context in shaping learning experiences. In evaluating learners' perceptions of techno-pedagogical tools, it is essential to consider how students' prior exposure to technology, their socio-economic backgrounds, and the school environment affect their engagement and attitudes. For example, a student in a well-resourced school may perceive technology positively because they have consistent access and support, whereas a student in a resource-constrained setting might associate technology with frustration or exclusion.

This theoretical framework supports the methodology and interpretation of findings in the study. It provides a lens through which to analyze the complex, subjective experiences of learners as they interact with technological tools in a CBE setting. It justifies the focus on perception, as perception is both shaped by and shapes the learning experience. Constructivist theory, therefore, enables a deeper understanding of not only what learners think about techno-pedagogy but also how these perceptions influence their learning behaviors and academic performance.

In summary, constructivist learning theory offers a robust and contextually relevant foundation for this study. It supports the emphasis on active, technology-mediated learning and the investigation of learner perceptions as central to understanding and improving CBE implementation in junior schools in Kenya.

4. Methodology

This study adopted a descriptive survey research design, which is particularly suitable for collecting data on attitudes, opinions, behaviors, and characteristics of a large population. This design was

appropriate because it allowed for the systematic collection and analysis of data from junior school learners across different regions, thereby providing a comprehensive picture of their perceptions regarding techno-pedagogical approaches in Competency-Based Education (CBE). The survey design also facilitated the use of both quantitative and qualitative data collection techniques, enhancing the validity and richness of the study's findings.

The study was conducted in Bungoma County, Kenya, encompassing a diverse range of public and private junior secondary schools situated in both urban and rural settings. Bungoma County was chosen due to its representative mix of socio-economic and infrastructural conditions, making it a suitable microcosm for evaluating educational reforms like CBE in Kenya. The inclusion of both private and public institutions ensured the study captured varied learner experiences shaped by differences in technological access and institutional support.

The target population comprised junior secondary school learners in Grades 7 to 9. A sample of 384 students was drawn using a combination of stratified, purposive, and random sampling techniques. Stratification ensured proportional representation of learners from public versus private schools, and urban versus rural settings. Within these strata, schools were purposively selected based on whether they had implemented ICT tools in their instruction. Simple random sampling was then used to select student respondents from these schools to avoid bias and ensure the generalizability of the results.

The primary instrument for data collection was a structured questionnaire consisting of both closed-ended and open-ended items. The closed-ended items used a 5-point Likert scale ranging from "Very Small Extent" to "Very Large Extent" to capture learners' perceptions on various aspects of techno-pedagogical integration, including engagement, comprehension, digital access, and support. The open-ended questions provided qualitative insights into learners' attitudes, preferences, and the challenges they encountered when engaging with digital tools in the classroom.

The questionnaire was subjected to pilot testing in two junior schools not included in the final study to ascertain its validity and reliability. Validity was evaluated through expert reviews and feedback from educational technology specialists, ensuring that the questions were aligned with the study objectives. Reliability was tested using Cronbach’s alpha, with a threshold value of 0.7 considered acceptable for internal consistency. Items that failed to meet this standard were revised or omitted.

Data collection was carried out with adherence to ethical guidelines. Informed consent was obtained from school administrators, teachers, and the parents of the learners. The participants were assured of confidentiality and anonymity, and they were informed of their right to withdraw from the study at any time without penalty. Data was collected in-person by trained research assistants and was subsequently coded and analyzed using the Statistical Package for the Social Sciences (SPSS) Version 26.

Quantitative data was analyzed using descriptive statistics such as frequencies, means, and standard deviations to summarize the learners’ responses. Inferential statistics, specifically Chi-square tests, were employed to determine if there were statistically significant differences in perception based on variables such as school type and location. This allowed the researcher to identify patterns and correlations that provided deeper insights into the factors shaping learners’ experiences with techno-pedagogical tools.

In addition to the quantitative data, qualitative responses from the open-ended questionnaire items were analyzed thematically. This involved identifying recurrent themes, patterns, and narratives that enriched the quantitative findings and provided a more holistic understanding of learners' perspectives. The integration of both data types strengthened the study's conclusions and ensured that both the measurable and subjective dimensions of student perception were adequately addressed.

Overall, the chosen methodology provided a robust framework for exploring the nuanced perceptions of learners regarding techno-pedagogical practices within the CBE framework. It allowed the study to gather empirical evidence that is both statistically sound and grounded in the lived experiences of junior school learners in Kenya.

5. Results

This section presents the findings of the study, organized into demographic characteristics of respondents, descriptive statistics on student perceptions, and inferential analyses that examine relationships between perception and demographic variables.

5.1 Demographic Characteristics of Respondents

The study involved a total of 384 junior school learners drawn from 24 schools, encompassing a diverse cross-section of both public and private institutions, as well as urban and rural settings. Among the respondents, 52% identified as female and 48% as male. The majority of students were in Grades 7 to 9, aligning with the junior school level targeted by the Competency-Based Education (CBE) curriculum.

In terms of technology exposure, 87% of the respondents reported having interacted with at least one digital tool during classroom instruction. These tools included projectors, tablets, educational apps, online learning platforms, and multimedia presentations. The remaining 13% indicated minimal or no direct interaction with technology in the learning environment, underscoring the disparities in access and implementation across different schools.

5.2 Descriptive Analysis of Student Perceptions

Student responses to Likert-scale items were analyzed to gauge their perceptions of techno-pedagogical approaches. The results indicated generally positive perceptions across several dimensions. Table 1 summarizes the key findings:

Item	Mean	Std. Dev	% Agree (Large/Very Large Extent)
I enjoy lessons more when technology is used.	4.21	0.84	73%
I understand better when digital tools are used.	4.07	0.92	69%
I am more active in class when technology is involved.	3.98	0.96	65%
I'd like more learning through computers or phones.	4.12	0.88	70%

These findings suggest that a majority of students appreciate the integration of technology in their learning experiences. Learners reported higher engagement, improved comprehension, and a preference for continued or expanded use of digital tools in education.

Qualitative responses further supported these findings, with many students expressing that technology made lessons "more interesting," "easier to understand," and "fun." Some highlighted the usefulness of video content, interactive quizzes, and visual simulations in helping them grasp complex topics. However, a subset of students raised concerns about occasional technical issues, lack of internet connectivity, and limited access to devices, particularly in public schools.

5.3 Inferential Analysis

To determine whether perceptions varied significantly across different school types and localities, a Chi-square test of independence was performed. The analysis revealed a statistically significant association between school type (public or private) and positive student perception of techno-pedagogical use ($\chi^2 = 12.6$, $p = 0.004$). Students in private schools were more likely to report positive experiences with technology, which could be attributed to better infrastructure, more consistent access to devices, and greater teacher support.

In contrast, no significant gender differences were found in the perception scores ($\chi^2 = 1.73$, $p = 0.188$), suggesting that both male and female learners responded similarly to the use of digital tools in the classroom. However, students in urban areas reported slightly more favorable perceptions than their rural counterparts, although the difference was not statistically significant at the 0.05 level ($\chi^2 = 3.41$, $p = 0.065$).

Overall, the results highlight the importance of equitable access to technology and adequate support structures in shaping learner attitudes. The positive reception among most students suggests that, where effectively implemented, techno-pedagogical strategies can significantly enhance the learner experience in CBE environments.

6. Discussion

The findings of this study underscore the critical role of learner perceptions in shaping the successful integration of technology into Competency-Based Education (CBE) in junior schools. The overwhelmingly positive perceptions reported by students regarding engagement, comprehension, and overall classroom experience highlight the potential of techno-pedagogical approaches to enhance learning when appropriately implemented. These outcomes are consistent with the assertions of Bates (2005) and Akyol et al. (2009), who emphasized the transformative power of educational technology in fostering deeper learning and active participation.

A key observation from the study is that students who interacted with digital tools felt more engaged and motivated. The data revealed that 73% of learners enjoyed lessons more with the inclusion of technology, while 69% reported better understanding. This supports existing literature suggesting that technology fosters an interactive learning environment conducive to student agency and personalized learning pathways (Sun et al., 2008; Govindasamy, 2001). Moreover, students expressed a preference for more lessons using devices such as computers and smartphones, indicating an openness to and even demand for digital inclusion in education.

However, disparities in access and implementation emerged as a notable concern. Students from private schools and urban areas reported more favorable experiences compared to their counterparts in public and rural schools. This points to an infrastructural gap that may perpetuate inequality in educational outcomes, even within a system designed to be inclusive and equitable. The statistically significant association between school type and learner perception ($p = 0.004$) reinforces the notion that resource availability directly influences how students perceive and benefit from educational technology.

Qualitative data provided further nuance to these findings. Students cited specific benefits such as multimedia visualizations and interactive exercises that helped demystify complex concepts. These features align with the principles of constructivist learning theory, which emphasizes experiential and contextualized knowledge acquisition. On the flip side, technological limitations—such as intermittent internet, insufficient devices, and inadequate technical support—were mentioned as barriers to effective engagement. These challenges are reflective of those documented in prior studies (Kubai, 2023; Ayere et al., 2010), emphasizing the persistent digital divide in Kenya's education system.

Another important finding is the lack of gender disparity in student perceptions. Both male and female learners reported similar attitudes toward the use of technology in their classrooms. This suggests that, once access is ensured, technological tools can be equally empowering for all students regardless of gender, reinforcing the role of ICT in promoting inclusive education.

While the results are encouraging, they also underscore the need for deliberate policy interventions and investments. The current technological infrastructure in many public schools is insufficient to support full-scale CBE implementation. Without sustained efforts to bridge the digital divide, the positive potential of techno-pedagogical approaches will remain unrealized for a significant portion of learners.

In sum, the discussion confirms that learner perception is a valuable indicator of the success of educational innovations. Students in environments where technology is integrated meaningfully into the learning process tend to have more positive educational experiences. These perceptions not only affect their engagement and comprehension but also influence their long-term attitudes toward learning and school in general. Therefore, understanding and responding to these perceptions is vital for educators and policymakers committed to advancing CBE in Kenya.

7. Conclusion

This study set out to evaluate student perceptions of techno-pedagogical approaches in the implementation of Competency-Based Education (CBE) in Kenyan junior schools. The results demonstrate that learners generally perceive technology integration in education as a positive and transformative force, enhancing their engagement, comprehension, and motivation to learn. The alignment between learners' experiences and constructivist learning principles underscores the value of active, student-centered, and digitally supported instructional models within the CBE framework.

While the study reveals a promising landscape of digital engagement among students, it also brings to the fore significant challenges related to access and equity. Disparities in technology infrastructure between public and private, urban and rural schools affect students' ability to benefit

equally from techno-pedagogical tools. These inequities threaten to widen the educational divide and undermine the goals of CBE if not adequately addressed.

Importantly, the lack of significant gender differences in perception is an encouraging sign that, when access is guaranteed, ICT can serve as an equalizing tool, enabling inclusive educational experiences. However, the need for consistent investment in teacher training, technical support, and infrastructural development remains urgent. Without these supports, the full potential of techno-pedagogical strategies will not be realized, and student enthusiasm may wane in the face of unreliable or unavailable resources.

In conclusion, learner perceptions are not merely reflections of classroom experiences; they are indicators of the health and inclusivity of the education system. As Kenya continues to advance its CBE agenda, it is imperative that policymakers and educational leaders prioritize technology integration that is equitable, sustainable, and learner-centered. Doing so will not only enhance academic outcomes but also empower students to thrive in an increasingly digital and competency-driven world.

8. Recommendations

Based on the findings and conclusions of this study, several recommendations are proposed to enhance the implementation of techno-pedagogical approaches within Competency-Based Education (CBE) in Kenyan junior schools:

1. **Strengthen ICT Infrastructure:** The Ministry of Education, in collaboration with county governments and private sector stakeholders, should prioritize the provision of robust ICT infrastructure in all junior schools. This includes access to internet connectivity, digital devices, projectors, and multimedia content delivery platforms. Special attention should be given to under-resourced public and rural schools to bridge the digital divide.
2. **Professional Development for Teachers:** Regular and targeted in-service training should be provided for teachers to build their capacity in integrating technology into pedagogy. These trainings should focus not only on technical skills but also on instructional strategies that leverage digital tools to support CBE competencies such as critical thinking, collaboration, and creativity.
3. **Learner-Centered Technology Integration:** Techno-pedagogical initiatives should be designed around learner needs and preferences. Schools should involve students in decision-making processes regarding the selection and use of digital tools. Additionally, efforts should be made to ensure content is age-appropriate, culturally relevant, and aligned with CBE goals.
4. **Policy Alignment and Monitoring:** Existing ICT in education policies should be reviewed and aligned with the practical realities of implementing CBE in diverse school environments. A robust monitoring and evaluation framework should be instituted to track the effectiveness of technology integration and address emerging challenges.
5. **Supportive Learning Environments:** Schools should create supportive environments that encourage experimentation and innovation in digital learning. This includes establishing computer labs, multimedia rooms, and collaborative digital workspaces. Peer-to-peer

learning and mentorship programs can also empower students to explore and utilize educational technologies more effectively.

6. **Research and Innovation Hubs:** Education stakeholders, including universities and teacher training colleges, should establish research and innovation hubs focused on techno-pedagogy. These hubs can serve as centers of excellence for piloting new tools, evaluating best practices, and scaling successful models across the education system.
7. **Inclusivity and Equity Initiatives:** Special programs should be developed to support marginalized groups, including girls, learners with disabilities, and students from low-income backgrounds. These initiatives should ensure that all learners have equal opportunities to benefit from techno-pedagogical innovations.

By implementing these recommendations, stakeholders can ensure that the integration of technology in junior school education is not only effective but also inclusive, sustainable, and aligned with the broader goals of Competency-Based Education in Kenya.

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