



Centre for Mathematics,
Science and Technology
Education in Africa
(CEMASTE)

STEM RESEARCH AND INNOVATION

Research & Development Knowledge Management (R&D KM)

POLICY BRIEF FROM

A SITUATIONAL ANALYSIS ON TEACHERS' EFFICACY IN USING DIGITAL RESOURCES FOR EFFECTIVE LEARNING OF STEM SUBJECTS IN KENYAN JUNIOR SCHOOLS



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ISO 9001:2015 CERTIFIED

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CEO, CEMASTEА



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Introduction

Digital resources are increasingly vital in strengthening STEM education under Kenya's Competency-Based Education. Teachers' ability and confidence to effectively integrate digital resources directly influence classroom practices, learner engagement, and STEM learning outcomes. This situational analysis explores the current state of teachers' efficacy in using digital resources for STEM in junior schools, identifying strengths, gaps, and opportunities for improvement.

The findings aim to guide evidence-based interventions that enhance teachers' digital competency, support effective pedagogy, and inspire more learners to pursue STEM careers. By informing policy and practice, the study contributes to achieving Kenya's STEM education goals and aligns with African Union's Agenda 2063 and the United Nations Sustainable Development Goals; SDG 4: Quality Education and SDG 9: Industry, Innovation, and Infrastructure.

1.1 What was the issue?

This policy brief has been developed for '**A SITUATIONAL ANALYSIS ON TEACHERS' EFFICACY IN USING DIGITAL RESOURCES FOR EFFECTIVE LEARNING OF STEM SUBJECTS IN KENYAN JUNIOR SCHOOLS**'. The focus of the study was to address the following research objectives:

- a) To investigate the relationship between teacher professional development (TPD) in STEM education and their ability to effectively use digital resources.
- b) To establish the influence of the use of digital resources on the teacher's instructional practices in STEM subjects
- c) To establish teachers' awareness on the available digital resources for STEM subjects
- d) To assess the extent of support provided to teachers for adopting digital resources in learning STEM subjects

The objective of this policy brief is to position the research work and findings within the broader policy context, including policy strategies and inform decision-making processes.



1.2 Justification of the study

Kenya is keen to improve STEM education, which is central to its economic and technological development. Teachers are pivotal to this effort, and their efficacy to effectively use digital resources in teaching can help learners develop the relevant skills to drive Kenyan economy. While there are several studies on ICT integration, a few have focused on teacher efficacy on use of digital resources. This study was essential in understanding teacher efficacy in effectively using digital resources to teach STEM subjects. The result would help in the planning and development of robust teacher development programmes in ICT.

1.3 Significance of the Study

This study would contribute to evidence-based interventions on teacher's efficacy to utilise digital resources for improved classroom practices and learner outcomes in STEM. The study would provide a comprehensive understanding of how teachers in Kenyan schools use digital resources for STEM education and how their efficacy could be enhanced to improve teaching and learning outcomes using digital resources. This could encourage more students to pursue STEM careers and would benefit policymakers, educators, and stakeholders in the education sub-sector in achieving the broader STEM education goals

1.4 Key Findings and Recommendations

Key Findings and Recommendations from research on *Situational analysis on teachers' efficacy in using digital resources for effective learning of STEM subjects in Kenyan junior schools*:

This report presents the key findings and corresponding recommendations from the research conducted on the integration of digital resources in STEM education in Junior School. The findings are organized according to the four research objectives.



Objective 1: Influence of digital resources on teachers' instructional practices in STEM subjects

1. *Finding 1:* Among the teachers observed, 58.51% of lesson plans and 53.68% of schemes of work reviewed included digital resources. Digital resources such as simulations, animations, virtual labs and videos enhance conceptual understanding and learner engagement in STEM but are inconsistently used across schools.

Recommendation:

- MoE should promote equitable integration of digital resources by improving infrastructure (devices, internet) and ensuring consistent use through targeted school-level support and regular monitoring.
2. *Finding 2:* Trained teachers scored higher in digital fluency with a mean of $\bar{x} = 2.35$ than untrained teachers, $\bar{x} = 1.95$. The trained teachers showed a stronger innovation in contextualizing digital tools, $\bar{x} = 2.20$, compared to untrained teachers $\bar{x} = 1.97$.
(*Interpretation criteria* $1 \leq x \leq 1.67$, no digital literacy; $1.67 < x \leq 2.34$, inadequate digital literacy; and $2.34 < x \leq 3$, adequate digital literacy)

Recommendation:

- CEMASTEIA should intensify professional development programs focused on digital creativity, troubleshooting, and real-time problem-solving during STEM training.
3. *Finding 3:* Despite the instructional value associated to TPD with 94.7% of trained teachers acknowledging enhanced digital resource teaching skills, only 50.53% of these teachers' lessons, provided timely feedback. Moreover, 39.18% of the trained teachers facilitated learner's feedback through digital resources. Generally, teachers regardless of their training status, faced difficulty aligning lesson objectives, classroom transitions, and assessment practices through digital resources.

Recommendation:

- CEMASTEIA in collaboration with Field officers (QASOs and CSOs) should continually design continuous, hands-on TPDs that emphasize lesson planning, classroom management, and digital assessment strategies.



Objective 2: Influence of digital resources on learner engagement in STEM subjects

4. *Finding 1:* Use of digital tools by ICT trained teachers led to more active learner participation with a mean rating of $\bar{x} = 4.1$ against the untrained teachers with $\bar{x} = 3.9$ out of 5.0. This shows a higher lesson interactivity by trained teachers compared to lessons by untrained teachers. Additionally, 57.63% of trained teachers reported that they always conduct group discussions around digital tools during their lessons.

(Interpretation criteria; $1 \leq x \leq 1.8$, never use; $1.8 < x \leq 2.6$, rarely use; $2.6 < x \leq 3.4$ use sometimes; $3.4 < x \leq 4.2$, often use; and $4.2 < x \leq 5$ use always)

Recommendation:

- CEMASTEА should enhance training on learner-centered digital strategies and promote active learning approaches using ICT.
5. *Finding 2:* Teachers trained more than twice on digital resource use, showed higher impact on learner engagement, indicating that one-time training is insufficient.

Recommendation:

- CEMASTEА should increase the frequency and reach of TPD programs on digital pedagogy through school-based INSETs and blended learning approaches.

Objective 3: Teacher awareness of digital resources for STEM instruction

6. *Finding 1:* Over 50% of teachers included digital resources in schemes of work and lesson plans, but overall awareness remains moderate.

Recommendation:

- CEMASTEА trainings/workshops should shift TPD focus from basic digital awareness to subject-specific pedagogical training using the TPACK framework.
- CEMASTEА should expand teacher's exposure to specialized STEM digital tools e.g., coding platforms, CEMASTEА virtual labs.

Finding 2: Teachers' awareness of digital tools is shaped by their access and location, with public and rural schools facing significant exposure gaps. Teachers in urban areas and private schools reported higher confidence in using digital tools and had greater access.



Recommendation:

- MoE in collaboration with ICT authority should improve connectivity and digital access across all school types.
- CEMASTEAs should tailor support and training programs to reflect contextual differences between urban and rural or private and public schools.

Objective 4: Extent of support provided to teachers for adopting digital resources in learning STEM subjects

7. *Finding 1:* Out of all teachers interviewed, 74.0% acknowledged having received some form of TPD either from CEMASTEAs, TSC or MoE. Teachers indicated that these TPD programs are infrequent, often generic and that they do not address integration of digital resources in STEM-specific contexts.

Recommendation:

- TSC, MoE, and CEMASTEAs should institutionalize structured and termly TPD programs focusing on digital content creation, pedagogical use, and software tools aligned with STEM.
8. *Finding 2:* Disparities in access to digital resources are evident, with 24.49% of lessons showing adequate learner interaction with digital resources. Inadequate infrastructure and lack of essential ICT resources was a major barrier to digital resource use in rural schools.

Recommendation:

- MoE should increase budget allocation and mobilize support for procurement of ICT tools in underserved schools.
9. *Finding 3:* Though 74.5% of Heads of institutions reported monitoring digital resource use, 93.0% of schools lacked clear policies and formal structures for monitoring digital resource use, leading to inconsistent digital resource use practices.

Recommendation:

- Heads of Institutions (HoIs) should develop written ICT integration policies that include M&E protocols, acceptable use, and digital access provisions at school level.



- CEMASTEPA and MoE should support schools in building institutional capacity for implementing and sustaining these policies.

