REPUBLIC OF KENYA

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

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 SECONDARY SCHOOLS – A BASELINE



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CEMASTEA (2025). Policy brief from a research titled; **Situational analysis on teachers' efficacy in using digital resources for effective learning of STEM subjects in Kenyan secondary schools.**

The Kenyan Government is integrating Information and Communication Technology (ICT) into education through initiatives like Digital Literacy Program and Computer for schools, EdTech program among others. These programs aim to foster innovation, problem-solving, and prepare learners for a technologically driven world. One of the Competency-Based Education (CBE) core competencies is digital literacy. ICT skills are supposed to be drivers of the CBE curriculum as a mandatory requirement for both teachers and learners in the teaching and learning of all the other subjects. The Ministry of Education and Teacher Service Commission emphasize the importance of ICT integration in teacher professional development, particularly in STEM education. However, effective use of digital tools requires teacher efficacy, which is crucial for the successful adoption of digital resources in CBE.

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 SECONDARY 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 teacher ability to use digital resources effectively
b) To determine the influence of the use of digital resources on the teacher's instructional practices in STEM subjects
c) To establish teachers' awareness of 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 eager to enhance STEM education, which is crucial for its economic and technological advancement. Teachers play a vital role in this endeavour, and their ability to effectively utilise digital resources in teaching and learning can help learners develop the skills needed to drive the Kenyan economy and technology. While there are several studies on ICT integration, few of them have focused on teacher efficacy in using digital resources. This study is, therefore, essential for understanding teacher efficacy in effectively employing digital resources to teach STEM subjects. The results of this research will assist in the planning and development of robust teacher development programmes focusing on digital resource usage.

1.3 Significance of the Study

This study will contribute to evidence-based interventions on teachers' efficacy in using digital resources for improved classroom practices and learner outcomes in STEM subjects. It provides a comprehensive understanding of how teachers in Kenyan secondary schools utilise digital resources for STEM education and how their efficacy can be enhanced for better learning outcomes. Furthermore, the findings will inform policymakers, educators, and other stakeholders in the education sub-sector in achieving broader STEM education goals. Enhanced teachers' efficacy could encourage more learners to pursue STEM careers.

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 secondary schools*:

This report presents the key findings and recommendations from the research on the use of digital resources in STEM instruction in Secondary Schools. The findings are structured according to the four main research questions.

Objective 1: To investigate the relationship between teacher training (TPD) in STEM and their ability to effectively use digital resources

1. *Finding 1:* Teacher Professional Development (TPD) programs positively influence the integration of digital resources. However, less than 40% of the in-serviced teachers were found to actively plan and use digital resources.

Recommendations:

a) CEMASTEA, KEMI and TSC to continually sensitize school leaders to support inclusion of digital resources in schemes of work and lesson plans.

b) CEMASTEA to expand access to focused, practical TPD that incorporates digital pedagogy and make it available to more teachers.

2. *Finding 2*: Teachers trained in the use of digital resources demonstrated higher digital fluency and more effective assessment strategies using digital resources than the those not in serviced.

Recommendation:

a) CEMASTEA to collaborate with KNEC to enhance TPD to include digital assessment practices and real-time feedback strategies.

Objective 2: To establish the influence of the use of digital resources on the teacher's instructional practices in STEM subjects

3. *Finding 1*: Among the learners interviewed, 38.5% of the learner focus groups, reported passive or no interaction with digital resources; barriers include resource gaps, teacher capacity, and inaccessibility.

Recommendations:

a) MoE should equip more schools with digital devices (TVs, tablets, projectors); develop school-level policies for equitable access to digital resources.

b) CEMASTEA to train secondary school teachers on active, learner-centered use of digital resources.

4. *Finding 2:* The study found a statistically significant correlation ($r = 0.589$, $p < 0.01$) between digital resource use and learner engagement. Teachers who used digital tools

more frequently reported higher levels of learner attentiveness, participation, and understanding.

5. *Finding 3:* Only teachers who intentionally planned on digital resource use achieved creative and contextually relevant classroom integration. Lesson planning positively correlated with digital usage ($r = 0.423$) and learner engagement ($r = 0.354$).
6. *Finding 4*: Assessment was among the lowest-rated domains during lesson observation. Teachers rarely provided or collected feedback via digital platforms. Both TPD and non-TPD teachers scored low mean, $\bar{x} = 1.8$ and $\bar{x} = 1.97$ respectively. *(Interpretation criteria* $1 \leq x \leq 1.67$, no feedback collected; $1.67 < x \leq 2.34$, inadequate feedback collected; and $2.34 < x \leq 3$, adequate feedback collected)

Recommendations:

a) CEMASTEA and KICD to support intentional digital lesson planning through training, AI tools, templates, and peer forums.

b) CEMASTEA and MoE through QASOs to monitor integration of interactive digital resources through school-based observations.

7. *Finding 5*: Infrastructure gaps continue to constrain teacher efforts, even among confident users.

Recommendation:

a) MoE to prioritize infrastructure investment; support ICT maintenance plans and digital content repositories.

Objective 3: To establish teachers 'awareness on the available digital resources for STEM subject.

8. *Finding 1*: Slightly above 50% of teachers acknowledged being conversant with digital content creation resources, digital literacy programs, and ICT incentives.

Recommendations:

a) MoE and CEMASTEA to encourage school investment in cloud platforms (e.g., Google Classroom), and train teachers on supporting digital learning.

b) Implement cybersecurity training for teachers and students.

Objective 4: To assess the extent of support provided to teachers for adopting digital resources in teaching STEM subjects

9. Finding 1: 75% of principals reported inadequate digital resources; most schools lack structured maintenance systems.

Recommendation:

a) MoE should deploy ICT officers at sub-counties for school-level technical support, and train internal personnel for basic maintenance.

10. *Finding 2*: Out of the schools sampled, 62.3% of had ICT some policies or guidelines on digital resource use.

Recommendation:

a) CEMASTEA and MoE to support schools in developing and adopting ICT policies tailored to their school needs.

11. *Finding 3*: Among the teachers in-serviced on digital resource use, 81.5% of them appreciated the training but criticized it for being too brief with limited contact time.

Recommendation:

a) CEMASTEA to differentiate and extend TPD, based on teacher skill level; promote sustained, hands-on training and embed a school-based support strategy.

12. *Finding 4*: Teachers struggle to evaluate and select Kenyan curriculum-aligned digital resources.

Recommendation:

a) CEMASTEA to build teacher capacity to evaluate, adapt, and customize digital content, including Augmented Reality (AR), Artificial Intelligence (AI), and real time simulations.