

# E-Learning System Features Usability Framework for Competency-Based Curriculum Education in Kenya

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**Abstract-** *This study investigates the usability of e-learning platforms for Competency-Based Curriculum (CBC) implementation in Kenyan junior secondary schools. The research employed a survey design, collecting data from 74 junior secondary school teachers using snowball sampling. The study aimed to establish e-learning platforms used in junior schools, evaluate CBC core competencies, analyze e-learning system usability, and develop a usability framework. Findings revealed limited usage of e-learning platforms, with Kenya Education Cloud, Wavumbuzi, and Zeraki being the most commonly used for learning purposes. Teachers generally perceived e-learning platforms as supportive of CBC core competencies, particularly digital literacy and critical thinking. Usability analysis showed that platforms were considered user-friendly and useful, but improvements were needed in user satisfaction and support. Based on factor analysis, an E-Learning System Features Usability Framework (ESFUF) was developed, prioritizing ease of use, usefulness, fault tolerance, satisfaction, and support. The study recommends increased teacher training, integration of gamification, enhancement of platform features to support CBC competencies, and customization of e-learning platforms for CBC implementation. This research contributes to the effective implementation of CBC in Kenya by providing a framework for evaluating and designing e-learning platforms tailored to the needs of junior secondary education.*

**Indexed Terms-** *E-learning platforms, Competency-Based Curriculum, Usability, Junior Secondary Schools, Kenya*

## I. INTRODUCTION

Kenya introduced the Competency-Based Curriculum (CBC) in 2016, gradually replacing the content-based 8-4-4 system that had been criticized for producing

graduates with inadequate skills for the job market (Mwang'ombe, 2021). The CBC (2-6-3-3-3) system aims to develop Kenyans who can creatively solve problems through critical thinking and using locally available resources (Akala, 2021). It emphasizes practical skills, collaborative learning, and digital literacy.

To effectively implement CBC, there is a growing need for e-learning platforms that can support the curriculum's core competencies: communication and collaboration, critical thinking and problem-solving, creativity and imagination, and digital literacy (KICD, 2019). E-learning, when fully integrated into CBC, can help address issues of understaffing in basic education institutions and expose learners to subject experts (Abenge et al., 2021).

However, there is a lack of suitable e-learning platforms specifically designed for CBC implementation in junior secondary schools in Kenya. Most existing platforms were developed for the previous 8-4-4 system or for higher education, and may not adequately support the unique requirements of CBC for younger learners (Kariuki, 2022).

This study aims to address this gap by investigating the usability of e-learning platforms used in junior secondary schools and their system features for CBC in Kenya. The specific objectives are:

1. To establish e-learning platforms used in junior schools for Competency-Based Curriculum in Kenya
2. To evaluate the Competency Based Curriculum core competencies that are to be achieved in Competency-Based curriculum in Kenya
3. To analyze e-learning systems usability for Competency-Based curriculum in Kenya
4. To develop an e-learning system features usability framework for Competency-Based curriculum in Kenya

By achieving these objectives, this research seeks to contribute to the effective implementation of CBC in Kenya through the development of a framework that can guide the design and selection of appropriate e-learning platforms for junior secondary education.

## II. LITERATURE REVIEW

### Overview of E-Learning Platforms

E-learning platforms are digital systems that facilitate online teaching and learning. They offer various tools for content delivery, student engagement, and assessment (Cole & Foster, 2008). These platforms have gained prominence globally, especially in higher education, with their use escalating during the COVID-19 pandemic (Priyadashini, 2022). E-learning offers benefits such as flexibility, accessibility, and the ability to provide diverse learning resources (Abenge, 2021).

### E-Learning Approaches: Synchronous vs Asynchronous

E-learning approaches can be broadly categorized into synchronous and asynchronous methods (Mahoney & Hall, 2020).

Synchronous e-learning occurs in real-time, mimicking traditional classroom interactions. It involves direct, simultaneous communication among participants, often through video conferencing, live chats, or virtual classrooms (Lim, 2017). This approach fosters immediate feedback and a sense of community but requires all participants to be available at the same time.

Asynchronous e-learning allows learners to access materials and complete activities at their own pace. It utilizes tools such as discussion forums, email, and pre-recorded lectures (Maslov, 2021). This approach offers greater flexibility but may lack the immediacy of synchronous interactions.

**E-Learning Platforms Adopted in Kenyan Curriculum**  
Several e-learning platforms have been adopted in Kenyan schools, including:

1. Kenya Education Cloud: Used for learning in primary and secondary schools (Hyde, 2023).
2. Zeraki: Used for learning and exam analysis in secondary schools.

3. Kytabu: Provides access to digital learning materials for primary and secondary students.
4. E-Soma Ke: Offers CBC-aligned content for various education levels.
5. Wavumbuzi: Used for learning and student competitions.
6. Scratch and Minecraft: Primarily used for coding education and interactive learning.

### Competency-Based Curriculum in Kenya

The CBC in Kenya focuses on developing seven core competencies: communication and collaboration, critical thinking and problem-solving, creativity and imagination, citizenship, learning to learn, self-efficacy, and digital literacy (KICD, 2019). It emphasizes practical skills, project-based learning, and continuous assessment rather than exam-oriented education (Wanjiku, 2022).

### Features of E-Learning Systems

E-learning systems typically include features such as:

1. Communication tools: Forums, chat, messaging systems (Michael & Symeon, 2019).
2. Collaboration tools: Wikis, shared documents, group projects (Hullet, 2019).
3. Content delivery: File sharing, multimedia integration, e-books (Mtebe, 2015).
4. Assessment tools: Quizzes, assignments, peer evaluation (Cole & Foster, 2008).
5. Interactive elements: Gamification, virtual reality, digital storytelling (Hernandez-de-Menendez et al., 2020).

### E-Learning Usability Frameworks

Several frameworks have been developed to evaluate e-learning system usability:

1. Nielsen's Usability Attributes: Learnability, efficiency, memorability, errors, and satisfaction (Nielsen, 2012).
2. E-learning readiness model for Iranian universities (Kampa & Kaushik, 2015).
3. E-learning framework by Aparicio et al. (2015) focusing on people, technologies, and services.
4. E-learning framework for Saudi Arabia universities (Alqahtani, 2019).
5. E-learning quality evaluation model by Hadullo et al. (2017).

### Knowledge Gap

While extensive research has been conducted on e-learning platforms and their usability, there is a lack of studies specifically focusing on e-learning for CBC in Kenyan junior secondary schools. Most existing research and frameworks have been developed for higher education or different educational contexts (Deepak, 2017; Mtebe, 2015). Additionally, the unique requirements of CBC, such as fostering creativity, critical thinking, and digital literacy in younger learners, have not been adequately addressed in existing e-learning usability frameworks (Kariuki, 2022).

This study aims to bridge this gap by developing an e-learning system features usability framework specifically tailored to the needs of CBC implementation in Kenyan junior secondary schools.

## III. METHODOLOGY

### Research Design

This study employed a survey research design to investigate the usability of e-learning platforms used in junior secondary schools for Competency-Based Curriculum (CBC) in Kenya. This design was chosen for its ability to gather both qualitative and quantitative data from a large sample of respondents across different geographical areas within a minimum period of time (Dangal, 2021). The survey approach also offers flexibility in data analysis and can be conducted remotely, reducing geographical dependence (Creswell, 2021).

### Target Population

The target population for this study consisted of teachers in junior secondary schools in Kenya who were using e-learning platforms for teaching and learning activities. This population was chosen because they are directly involved in implementing CBC using e-learning tools and can provide valuable insights into the usability and effectiveness of these platforms.

### Sampling Technique

The study used a combination of purposive and snowball sampling techniques. Purposive sampling was used to select a number of relevant participants to represent the entire population (Nyimbili & Nyimbili,

2024). Snowball sampling was then employed to identify additional participants, as it was difficult to establish the subjects with the target characteristics in advance (Hazari, 2024). This method allowed the researcher to reach schools that were using e-learning platforms for CBC, which might otherwise have been difficult to identify.

The process began with initially identified subjects who then referred other subjects with the required characteristics. This continued until saturation was reached, i.e., when subjects began to refer to already referred subjects (Naderifar et al., 2017). The final sample size was determined by the end of the snowballing exercise.

### Data Collection

Data was collected using structured questionnaires. The questionnaire was designed to gather information on:

1. Demographic information of respondents
2. Awareness and usage of e-learning platforms
3. E-learning system features and their frequency of use
4. Usability aspects of e-learning systems
5. CBC core competencies

The questionnaire used a combination of multiple-choice questions and Likert scale items to capture both factual information and respondents' perceptions and experiences.

### Data Analysis

The collected data was analyzed using both descriptive and inferential statistics.

Descriptive statistics were used to summarize and present data on e-learning platform usage, system features, and respondents' perceptions of usability and CBC competencies. This included frequency distributions, percentages, means, and standard deviations.

Inferential statistics were employed to examine relationships between variables and to test the significance of findings. Specifically:

1. Correlation analysis was used to examine relationships between usability factors and CBC competencies.

2. Factor analysis was conducted to identify underlying constructs in the usability assessment and to inform the development of the e-learning system features usability framework.

The Statistical Package for Social Sciences (SPSS) software was used for data analysis. Non-parametric tests were employed as the data was found to be not normally distributed based on normality tests (Kolmogorov-Smirnov and Shapiro-Wilk).

**Validity and Reliability**

The validity of the research instrument was established through expert review by IT and education specialists. The reliability was determined using Cronbach's alpha coefficient after conducting a pilot study.

**Ethical Considerations**

The study adhered to ethical research principles, including obtaining informed consent from participants, ensuring confidentiality and anonymity of responses, and seeking necessary permissions from relevant authorities, including the National Commission for Science, Technology and Innovation (NACOSTI).

This methodology was designed to ensure a comprehensive and rigorous investigation of e-learning platform usability for CBC in Kenyan junior secondary schools, with the ultimate goal of developing a usability framework to guide future implementations.

**IV. RESULTS AND DISCUSSION**

**E-learning Platforms Used in Junior Schools**

The study found that while teachers were aware of various e-learning platforms, actual usage was limited. The most commonly used platforms were:

1. Kenya Education Cloud (35% usage)
2. Wavumbuzi (25% usage)
3. Zeraki (20.5% usage)

Table 1: E-Learning Platform Usage in Junior Schools

Platform	Used (%)	Not Used (%)	Primary Purpose
Kenya Education Cloud	35.0	65.0	Learning

Platform	Used (%)	Not Used (%)	Primary Purpose
Wavumbuzi	25.0	75.0	Learning, Competitions
Zeraki	20.5	79.5	Learning, Exam Analysis
Kytabu	18.5	82.5	Learning
Cloud paging	15.0	85.0	Learning
I mlango	9.1	90.9	Learning
E-Soma Ke	5.1	94.9	Learning
Dawati	5.7	94.3	Learning
M-shule	3.0	97.0	Exam Analysis
Scratch	88.0	11.2	Games and Fun
Minecraft	90.0	10.0	Games and Fun

Notably, while Scratch and Minecraft had high usage rates, they were primarily used for games and fun rather than direct curriculum support.

**Evaluation of CBC Core Competencies**

The study evaluated teachers' perceptions of how well e-learning platforms supported CBC core competencies:

Table 2: Teachers' Perceptions of CBC Core Competencies Support

Core Competency	Agreement (%)
Communication and Collaboration	64.8
Critical Thinking and Problem Solving	65.8
Creativity and Imagination	61.8
Digital Literacy	66.2

Overall, 64.6% of respondents agreed that e-learning platforms promoted CBC core competencies. This suggests that the platforms are generally supportive of CBC goals, but there is room for improvement.

**Analysis of E-learning System Usability**

The study analyzed e-learning system usability based on five key attributes:

Table 3: E-Learning System Usability Attributes

Usability Attribute	Agreement (%)
Ease of Use	70.66

Usability Attribute	Agreement (%)
Usefulness	72.50
Fault Tolerance	64.90
Satisfaction	53.00
Support	61.02

Overall, 64.57% of respondents agreed that the e-learning platforms met usability standards. The highest-rated attributes were usefulness and ease of use, while satisfaction scored the lowest.

Correlation analysis revealed strong positive relationships between all usability attributes, suggesting that improvements in one area are likely to positively impact others.

#### Development of E-learning System Features Usability Framework

Based on factor analysis of the usability attributes, an E-Learning System Features Usability Framework (ESFUF) was developed:

Table 4: ESFUF Construct Weights

Construct	Weight
Ease of Use	0.281
Usefulness	0.240
Fault Tolerance	0.208
Satisfaction	0.193
Support	0.166

This framework suggests that to effectively support CBC, e-learning platforms should prioritize ease of use and usefulness, while also ensuring adequate fault tolerance, user satisfaction, and support.

#### Discussion

The findings reveal a gap between awareness and actual usage of e-learning platforms in junior schools. While teachers are aware of various platforms, usage is limited to a few, primarily for learning and exam analysis. This suggests a need for more targeted training and support to increase adoption of e-learning tools for CBC.

The high usage of Scratch and Minecraft for games and fun indicates potential for integrating more

gamified learning experiences into CBC-focused platforms to increase engagement.

Teachers generally perceive e-learning platforms as supportive of CBC core competencies, particularly in promoting digital literacy and critical thinking. However, there's room for improvement in fostering creativity and imagination.

The usability analysis suggests that current platforms are reasonably user-friendly and useful, but could be improved in terms of user satisfaction and support. The strong correlations between usability attributes underscore the importance of a holistic approach to improving e-learning platforms.

The developed ESFUF provides a framework for evaluating and designing e-learning platforms specifically for CBC in Kenyan junior schools. By prioritizing ease of use and usefulness, while also addressing fault tolerance, satisfaction, and support, developers can create more effective tools to support CBC implementation.

## CONCLUSION

### Summary of Key Findings

This study investigated the usability of e-learning platforms for Competency-Based Curriculum (CBC) in Kenyan junior secondary schools. The key findings are:

1. E-learning platform usage: While teachers are aware of various e-learning platforms, actual usage is limited. Kenya Education Cloud, Wavumbuzi, and Zeraki were the most commonly used platforms for learning purposes. Scratch and Minecraft were widely used, but primarily for games and fun rather than direct curriculum support.
2. CBC core competencies: Teachers generally perceive e-learning platforms as supportive of CBC core competencies. Digital literacy (66.2% agreement) and critical thinking and problem-solving (65.8% agreement) were seen as the most well-supported competencies.
3. E-learning system usability: Overall, 64.57% of respondents agreed that the e-learning platforms met usability standards. Usefulness (72.50% agreement) and ease of use (70.66% agreement)

were rated highest, while satisfaction (53.00% agreement) scored lowest.

4. E-learning System Features Usability Framework (ESFUF): A framework was developed based on factor analysis, prioritizing ease of use (0.281), usefulness (0.240), fault tolerance (0.208), satisfaction (0.193), and support (0.166).

#### Implications for CBC Implementation

These findings have several implications for CBC implementation:

1. There is a need to bridge the gap between awareness and actual usage of e-learning platforms in junior schools. This may require more targeted training and support for teachers.
2. The high usage of platforms like Scratch and Minecraft for games suggests potential for integrating more gamified learning experiences into CBC-focused platforms to increase engagement.
3. While e-learning platforms are generally perceived as supportive of CBC core competencies, there is room for improvement, particularly in fostering creativity and imagination.
4. The usability of current platforms, while generally acceptable, could be enhanced, particularly in terms of user satisfaction and support.
5. The ESFUF provides a framework for evaluating and designing e-learning platforms specifically for CBC in Kenyan junior schools, emphasizing the importance of ease of use and usefulness.

#### Recommendations

Based on the findings, the following recommendations are made:

1. Increase teacher training: Implement comprehensive training programs to enhance teachers' skills in using e-learning platforms effectively for CBC implementation.
2. Integrate gamification: Incorporate more game-based learning elements into CBC-focused e-learning platforms to increase student engagement and support learning objectives.
3. Enhance platform features: Develop and improve e-learning platform features that specifically support CBC core competencies, particularly creativity and imagination.

4. Improve usability: Focus on enhancing user satisfaction and support features of e-learning platforms, guided by the ESFUF.
5. Customization for CBC: Encourage the development of e-learning platforms tailored specifically for CBC in Kenyan junior secondary schools, using the ESFUF as a guide.
6. Regular assessment: Conduct periodic assessments of e-learning platform usage and effectiveness in supporting CBC, using the ESFUF as an evaluation tool.
7. Collaborative development: Foster collaboration between educators, e-learning platform developers, and policymakers to ensure that platforms meet the specific needs of CBC implementation in Kenya.

By implementing these recommendations, Kenya can enhance the effectiveness of e-learning platforms in supporting CBC implementation, ultimately improving the quality of education and better preparing students for the challenges of the 21st century.

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