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Influence of Technology in Curriculum Development: Evidence from Meru University of Science and Technology, Kenya

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ABSTRACT

The integration of Information and Communication Technology (ICT) has become a pivotal driver of educational transformation worldwide. Despite its recognized potential, the extent to which universities in Kenya embed technology into curriculum development processes remains inadequately explored. This study investigates the influence of technological factors on curriculum design at Meru University of Science and Technology (MUST). Employing a correlational research design, data were collected from 69 respondents comprising departmental chairpersons and lecturers through structured questionnaires, supplemented by document analysis of Senate Board minutes. Findings indicate that technology significantly influences curriculum development at MUST, with 52.3% of respondents reporting high levels of adoption. However, persistent challenges such as insufficient funding (81.2%) and limited training impede effective implementation. The study concludes that embedding ICT into curricula enhances student exposure to global knowledge and improves pedagogical outcomes. Recommendations include increased institutional investment in ICT infrastructure, mandatory capacity-building workshops for academic staff, and national policy reforms to prioritize digital integration in higher education. These insights contribute to the ongoing discourse on technology-enhanced education in resource-constrained contexts.

Introduction

The 21st century has been characterized by rapid technological advancements that have fundamentally reshaped global education systems. Digital tools—including computers, mobile devices, and online learning platforms—have revolutionized knowledge dissemination, teaching methodologies, and student–teacher interactions (Selwyn, 2016). In Kenya, universities are increasingly pressured to integrate technology into their curricula to remain competitive within an evolving digital educational landscape (Mtebe & Raisamo, 2014). Despite governmental initiatives such as the Digital Literacy Programme and the Kenya Education Cloud, substantial gaps persist between policy aspirations and on-ground implementation (Kozma & Vota, 2014).

While existing literature acknowledges the transformative potential of ICT in education, few studies have critically examined its operational integration into curriculum development within Kenyan universities, particularly from the perspectives of academic leaders and lecturers. Prior research highlights chal-

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lenges such as inadequate infrastructure, limited funding, and insufficient pedagogical training (Hennessy *et al*., 2010; Buabeng-Andoh, 2012). However, a nuanced understanding of how these factors interact to shape curriculum design in science and technology-oriented institutions remains underexplored. This study addresses this gap by examining the influence of technology on curriculum development at Meru University of Science and Technology (MUST), a representative public university in Kenya.

The study was guided by the following objectives:

To assess the extent of technology adoption in curriculum development at MUST.

To identify institutional and resource-related challenges in implementing technology-enhanced curricula.

To examine the perceived role of ICT in expanding student access to global knowledge.

To analyze the correlation between technological integration and curriculum design quality.

By addressing these objectives, this research contributes empirical evidence to inform policy and practice in technology-driven higher education reform.

Literature Review

The integration of ICT in education has been widely studied in diverse global contexts. Internationally, technology-enhanced curricula have been shown to improve student engagement, conceptual understanding, and collaborative learning (Hegedus *et al*., 2015). In the United States, for instance, interactive algebra software significantly boosted student performance and motivation (Roschelle *et al*., 2010). Similarly, in the United Kingdom, the widespread adoption of virtual learning environments (VLEs) has transformed pedagogical delivery and administrative efficiency (Kirkwood & Price, 2014).

Within Sub-Saharan Africa, however, the picture is more heterogeneous. While countries such as South Africa and Ghana have made notable strides in ICT integration, many institutions face systemic barriers including unreliable electricity, limited internet access, and high costs of digital devices (Trucano, 2016). In Kenya, studies such as the Kenya Education Sector Support Program (KESSP, 2005) identified critical gaps in teacher ICT competencies, which hinder effective curriculum implementation. More recent work by Mwalongo (2019) highlights that despite increased availability of ICT tools, pedagogical integration remains superficial in many Kenyan universities.

Theoretical frameworks such as the Technological Pedagogical Content Knowledge (TPACK) model (Mishra & Koehler, 2006) emphasize that effective technology integration requires synergy between technological knowledge, pedagogical approaches, and subject matter expertise. Yet, in practice, many educators in developing contexts lack training in aligning technology with curriculum goals (Baylor & Ritchie, 2002). Furthermore, institutional factors—such leadership support, funding mechanisms, and policy coherence—play a decisive role in sustaining ICT initiatives (Zhao & Frank, 2003).

This study builds upon and extends this literature by providing a granular analysis of technology-curriculum interplay within a specific Kenyan university, thereby offering context-sensitive insights that bridge global trends and local realities.

Methodology

Study Locale

This study was conducted at Meru University of Science and Technology (MUST), located in Tigania East, Meru County, Kenya. MUST was selected as a case study due to its explicit orientation toward science and technology education, its growing ICT infrastructure, and its representative status as a mid-sized public university facing typical resource constraints and innovation aspirations common in Kenyan higher education.

Research Design

A correlational research design was employed to examine relationships between technological factors and curriculum development outcomes. This design allowed for the assessment of both the degree and direction of associations among key variables.

Population and Sampling

The target population comprised all 18 departmental chairpersons and 108 full-time lecturers across eight schools at MUST. Using a combination of purposive and stratified random sampling, a total of 69 respondents participated, ensuring representation from each academic unit. Purposive sampling was used for chairpersons to capture leadership

Category of Respondents	School/Faculty	Target Population	Sample Size	Percentage
Chairpersons	All 18 departments	18	18	100%
Full-Time Lecturers	School of Agriculture & Food Sci.	18	9	50%
	School of Business & Economics	24	12	50%
	School of Computing & IT	12	6	50%
	School of Engineering & Arch.	11	6	55%
	School of Education	6	3	50%
	School of Health Sciences	14	7	50%
	School of Nursing	4	2	50%
	School of Pure & Applied Sciences	27	14	52%
Total		**126**	**69**	**54.8%**

Table 1: *Category of Respondents and Sample Distribution*
Source: Human Resource Office, MUST (2018)

perspectives, while lecturers were selected through stratified random sampling to maintain disciplinary balance.

Data Collection Instruments and Procedures

Data were collected using two primary methods:

Structured Questionnaires: Administered to chairpersons and lecturers, the questionnaire comprised Likert-scale items, multiple-choice questions, and open-ended sections. It gathered data on:

Level of technology use in curriculum design.

Perceived challenges in ICT integration.

Attitudes toward ICT training workshops.

Impact of ICT on student learning and global exposure.

Document Analysis: Reviewed Senate Board meeting minutes (2016–2018) and departmental curriculum review reports to triangulate self-reported data with institutional records. This provided insights into policy directives, resource allocation, and implementation tracking.

Data collection was conducted over a four-week period with prior appointments and informed consent obtained from all participants.

Validity and Reliability

The research instruments were validated through expert review by two senior academics in curriculum studies and ICT in education. A pilot study involving 10 lecturers from a neighboring university ensured clarity and relevance. Cronbach's alpha for the questionnaire scales was 0.82, indicating acceptable internal consistency.

Ethical Considerations

Ethical approval was obtained from the MUST Institutional Research Ethics Committee. Participants provided written informed consent, were assured of confidentiality and anonymity, and were informed of their right to withdraw at any time. Institutional documents were accessed with official permission and used solely for academic purposes.

Data Analysis

Quantitative data were analyzed using SPSS version 25. Descriptive statistics (frequencies, percentages, means) summarized the data, while inferential statistics (Pearson correlation, linear regression) examined relationships. Qualitative data from open-ended questions and documents were analyzed thematically to enrich and contextualize quantitative findings.

Level of Adoption	Frequency	Percent	Valid Percent	Cumulative Percent
To a very large extent	36	52.3	52.3	52.3
To a large extent	7	10.1	10.1	62.4
To a moderate extent	19	27.5	27.5	89.9
To a small extent	7	10.1	10.1	100.0
Total	**69**	**100.0**	**100.0**	

Table 2: *Extent of Technology Adoption in MUST Programs*

Response	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	40	58.0	58.0	58.0
No	29	42.0	42.0	100.0
Total	**69**	**100.0**	**100.0**	

Table 3: Support for Regular ICT Sensitization Workshops

Results & Discussion

Extent of Technology Adoption in Curriculum Development

A majority of respondents (52.3%) indicated that MUST programs integrate technology to a "very large extent," while 27.5% reported "moderate" integration. Only 10.1% perceived adoption as minimal.

Perceived Need for Sensitization Workshops

Approximately 58% of respondents affirmed the need for regular sensitization workshops on modern educational technologies, underscoring a demand for continuous professional development.

Challenges in Technology Integration

Lack of funding emerged as the most critical barrier, cited by 81.2% of respondents. Time constraints (18.8%) were also noted, reflecting workload pressures and competing priorities.

ICT and Student Exposure to Global Knowledge

A strong majority (91.3%) agreed or strongly agreed that ICT integration broadens students' access to global knowledge resources, highlighting its perceived value in enriching learning.

Document Analysis Findings

Analysis of Senate Board minutes (n=22) revealed that 81.8% explicitly emphasized ICT integration in curriculum discussions, reflecting institutional policy support. However, departmental-level reports showed inconsistent implementation, often due to resource limitations.

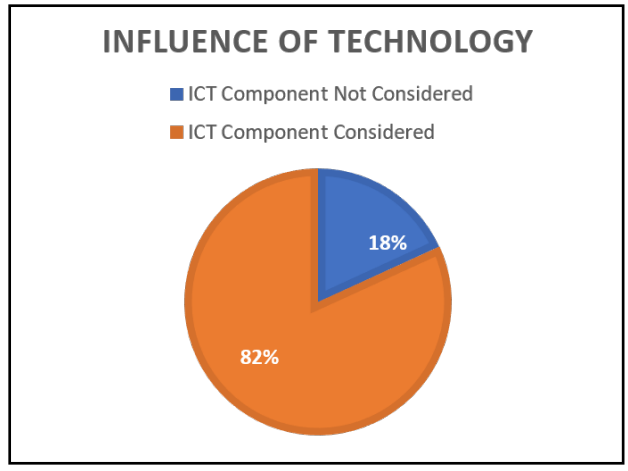

Figure 1: *Influence of ICT in Curriculum Development*

Challenge	Frequency	Percent	Valid Percent	Cumulative Percent
Lack of funding	56	81.2	81.2	81.2
Inadequate time	13	18.8	18.8	100.0
Total	**69**	**100.0**	**100.0**	

Table 4: *Challenges in Integrating Technology into Curriculum Development*

Response	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	42	60.9	60.9	60.9
Agree	21	30.4	30.4	91.3
Disagree	6	8.7	8.7	100.0
Total	**69**	**100.0**	**100.0**	

Table 5: *ICT and Student Exposure to Global Knowledge*

Inferential Analysis

A strong positive correlation was found between technology integration and perceived curriculum quality ($r = 0.839$, $p < 0.01$). Regression analysis confirmed technology as a significant predictor of curriculum development outcomes ($\beta = 0.812$, $p < 0.001$).

Variable	Technology Integration	Curriculum Development
Technology Integration	1	0.839**
Curriculum Development	0.839**	1
N	69	69

*** p < 0.01*

Table 6: *Correlation Between Technology Integration and Curriculum Development*

Discussion

The findings indicate that technology is a significant enabler of curriculum development at MUST, consistent with global studies (Hegedus *et al*., 2015; Kirkwood & Price, 2014). The high level of reported adoption reflects a positive institutional orientation toward digital transformation. However, the predominance of funding-related challenges aligns with prior research in resource-constrained settings (Buabeng-Andoh, 2012; Mtebe & Raisamo, 2014).

The strong correlation between technology and curriculum quality underscores the potential of ICT to enhance pedagogical relevance and currency. Yet, the gap between policy intent (evidenced in Senate minutes) and departmental practice points to operational and logistical hurdles—a phenomenon noted in similar contexts by Zhao and Frank (2003).

The demand for ongoing training echoes the TPACK framework's emphasis on teacher readiness (Mishra & Koehler, 2006). Without systematic professional development, technology adoption risks remaining tokenistic rather than transformative.

Conclusion

This study set out to assess the influence of technology on curriculum development at Meru University of Science and Technology. The findings reveal that while technology is widely recognized as crucial to curriculum design and student learning, its effective integration is hampered by persistent financial, infrastructural, and training-related challenges. The study confirms a strong positive relationship between technological integration and curriculum quality, highlighting ICT's role in fostering globally relevant education. However, without addressed constraints, the full potential of technology-en-

hanced curricula may remain unrealized.

Recommendation

Based on the study's thematic findings, the following recommendations are proposed:

Institutional Level: MUST should establish a dedicated ICT-in-Curriculum fund to support infrastructure upgrades, software acquisition, and maintenance. A phased implementation plan with clear milestones should be developed and monitored by a cross-functional committee.

Professional Development: Regular, mandatory ICT-pedagogy workshops should be institutionalized, focusing on practical integration into discipline-specific curricula. Peer-mentoring programs and communities of practice could sustain ongoing learning.

Policy Alignment: National higher education bodies, such as the Commission for University Education, should integrate ICT competency standards into accreditation criteria and provide targeted grants for technology integration in public universities.

Future Research: Comparative studies across Kenyan universities are needed to identify contextual success factors. Longitudinal research tracking the impact of ICT integration on graduate employability and academic performance would provide valuable evidence for policy refinement.

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