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Digital Learning Platforms and Student Engagement: Empirical Evidence from Higher Learning Institutions in Tanzania

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ARTICLE INFO	ABSTRACT
Keywords: Digital learning platforms Student engagement Digital literacy Connectives Blended learning	<i>Despite substantial investment in digital learning infrastructure across sub-Saharan Africa, the question of whether that investment translates into meaningful student engagement remains empirically unresolved. This paper examines how digital learning platforms (DLPs) influence behavioral, cognitive, and emotional engagement among students in selected higher learning institutions (HLIs) in the Dodoma Region, Tanzania, by testing the relative explanatory power of digital literacy, perceived usefulness, motivation, and institutional support. Grounded in Connectives Theory and the Unified Theory of Acceptance and Use of Technology, a mixed-methods cross-sectional design was employed, involving 369 students and eight key informant interviews, which were analyzed using Braun and Clarke's thematic analysis. Principal Component Analysis extracted three engagement dimensions—cognitive (61.8%), behavioral (12.7%), and emotional (7.8%) yielding a moderate overall score ($M = 3.56$, $SD = 0.97$). Multiple regression identified digital literacy ($\beta = .31$, $p < .001$), perceived usefulness ($\beta = .21$, $p = .007$), and motivation ($\beta = .19$, $p = .012$) as significant predictors, while institutional support was not ($\beta = .08$, $p = .178$). These findings mount a direct empirical challenge to infrastructure-centred digital education policy: they demonstrate that competency and attitude are the decisive drivers of engagement, not physical provision. The paper argues that Tanzania's digital education strategy must pivot from a supply-side logic of platform procurement to a demand-side logic of digital competency, pedagogical design, and emotional learning architecture.</i>

1. Introduction

Tanzania is investing heavily in digital learning infrastructure. The Draft National Digital Education Strategy 2024–2030 (MoEST, 2024) commits significant national resources to platform procurement, broadband expansion, and device distribution across Higher Learning Institutions (HLIs) under the premise that improved connectivity translates into improved learning outcomes. This paper empirically interrogates that premise and finds it incomplete: digital access and meaningful student engagement are not the same thing, and infrastructure investment alone does not yield the quality of engagement that Tanzania's digital education strategy assumes. Digital Learning Platforms (DLPs) such as Moodle, Zoom, Google Classroom, and WhatsApp are now central to the pedagogical architecture of Tanzanian HLIs, accelerated by COVID-19 disruptions and national ICT policy

mandates (URT, 2023; 2024). Yet meaningful platform use and mere operational presence are fundamentally different. In a study of rural South African institutions, Ajani (2025) found that Learning Management Systems (LMSs) are primarily used for passive content consumption, with little student feedback or active participation on platforms for which they were never adequately prepared. This paper addresses the same pattern of access without engagement in the Tanzanian setting.

Theoretically, the difference is substantial. According to Fredricks, Blumenfeld, and Paris (2004), student engagement is a multifaceted concept that includes behavioral participation, cognitive investment, and emotional attachment to the learning environment. Research continuously shows that academic results, perseverance, and the development of higher-order skills are driven by engagement rather than access (Kuh, 2003;

Fredricks et al., 2004). The quality of the engagement directly affected the academic paths of 74.5% of students in this sample who lived off campus and relied on DLPs as their main educational interface. However, the adoption, readiness, and infrastructure studies that predominate in Tanzanian literature (Mtebe & Raisamo, 2014; Chambo et al., 2023; Ndibalema, 2025) have not thoroughly investigated the implications of restricted digital competency, inadequate pedagogical design, and uneven infrastructure access on the scope and caliber of digital engagement.

By pursuing two interconnected goals, this study closes that gap: (i) measuring student engagement empirically across three theoretically distinct dimensions, behavioral, cognitive, and emotional in a subset of Dodoma Higher Learning Institutions (HLIs); and (ii) to identify the key individuals and institutional predictors of engagement variation. By doing this, the paper provides evidence that contributes to a broader theoretical and policy debate about whether Tanzania's infrastructure-centred digital education strategy can deliver the engagement quality it assumes, or whether a fundamental reorientation toward competency, pedagogy, and affective learning design is necessary.

The paper makes three specific contributions. First, it provides multi-institutional empirical evidence on the behavioral, cognitive, and emotional dimensions of digital engagement in Tanzanian HLIs, a largely absent feature of the existing national literature. Second, it applies an integrated quantitative-qualitative approach that simultaneously identifies engagement levels and explains their predictors with greater analytical precision than readiness or adoption studies permit. Third, it advances a theoretically grounded critique of infrastructure determinism in digital education policy, arguing that Tanzania's current digital strategy systematically underinvests in the human factors of competency, motivation, and emotional architecture that are empirically shown to drive engagement.

2. Literature

2.1. Theoretical Literature

This paper is guided by two complementary and mutually corrective theoretical frameworks: Connectives (Siemens, 2005) and the Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh et al., 2003). Their complementarity lies in the breadth of engagement phenomena they jointly cover; their mutual correction lies in the limitations each exposes in the other.

Connectives posits that learning in the 21st century occurs through the creation and traversal

of connections across distributed networks of people, information, and digital tools (Siemens, 2005). It repositions knowledge as relational and emergent, inseparable from the technological and social architectures through which it is produced. In the context of higher education, connectivism provides the theoretical basis for understanding why DLPs can, in principle, deepen engagement: they extend learners' networks of connection beyond the physical classroom, linking students to peers, instructors, content, and global disciplinary communities. Crucially, however, connectivism also implies that these connective possibilities are only realised when learners possess the competence and motivation to activate them. A student who lacks digital literacy cannot build effective learning networks, regardless of platform quality, a theoretical prediction that the present study's regression evidence directly confirms.

UTAUT (Venkatesh et al., 2003) provides a framework for understanding the determinants of technology adoption through four constructs: performance expectancy (perceived usefulness), effort expectancy (ease of use, proxied here by digital literacy), social influence (motivation), and facilitating conditions (institutional support). Applied in this study, these constructs map directly onto the four independent variables in the regression model. However, UTAUT has a critical limitation in resource-constrained settings that this paper explicitly addresses: its facilitating conditions construct assumes baseline institutional stability, reliable infrastructure, accessible support, and consistent policy implementation that do not exist in many African HLIs (Ajani, 2025; Bayaga & du Plessis, 2024). Ajani (2025) forcefully argues that UTAUT's engagement with systemic and structural influences is minimal, rendering it insufficiently critical for settings where infrastructural deficits, cultural resistance, and institutional neglect intersect. This paper applies UTAUT as an interpretive starting point, not a prescriptive blueprint, treating its facilitating conditions construct as a hypothesis to be tested against, rather than assumed to fit, the Tanzanian context.

Together, Connectives and UTAUT generate a productive analytical tension. Connectives foregrounds the relational, motivational, and competency dimensions of digital engagement; UTAUT foregrounds the institutional and individual-level conditions that enable or constrain technology adoption. This integration allows the study to simultaneously theorize the three dimensions of engagement and test the four factors that predict them, producing a more

complete analytical picture than either framework alone would permit.

2.2. Empirical Literature

2.2.1. Student Engagement in Digital Environments: What Does the Evidence Show?

In digital higher education research, the three-dimensional framework of student engagement behavioral, cognitive, and emotional has emerged as the predominant analytical scaffold (Fredricks et al., 2004; Bond et al., 2021; Kok et al., 2025). The basis for deeper involvement is provided by students' observable participation in platform activities, such as task submission, discussion contributions, and login frequency (Alsubhi et al., 2019). According to Li and Ye (2025), systems that integrate collaborative tools and adaptive content can enhance metacognitive processing. However, there is a structural issue in digital environments regarding emotion: the lack of embodied interaction, physical co-presence, and impromptu social cues makes it systematically difficult to foster the intrinsic motivation and sense of belonging that define in-person educational communities (Kahu & Nelson, 2020).

There is remarkably consistent empirical data regarding emotional engagement in digital environments. According to Kok et al. (2025) study digital competence and relatedness support predicted emotional engagement, which in turn predicted learner satisfaction across all dimensions. This suggests that emotional engagement is the most challenging to develop and has the greatest impact on the student experience. The common belief that instructor activity is sufficient to encourage active participation is challenged by a ScienceDirect study (2025) that used structural equation modelling and found that both social presence and cognitive presence significantly affected student engagement in online learning, whereas teaching presence alone did not directly affect engagement. Mujallid's (2024) study demonstrated that instructor social presence, active learning design, and peer collaboration strategies significantly enhanced students' social and emotional engagement in blended environments, but only when intentionally and systematically built into the course design. These findings converge on a single argument: emotional engagement in digital settings is not a byproduct of platform use; it is an architectural achievement requiring deliberate pedagogical investment.

Post-COVID evidence reinforces this picture. Li and Ye (2025) blended learning study found that positive online academic emotions mediated the relationship between online presence and learning performance, confirming emotional engagement

as a causal mechanism rather than merely a correlate. Critically, blended implementations lacking strategic pedagogical design showed low engagement regardless of platform availability—a finding directly relevant to the Tanzanian context. Bond et al.'s (2021) systematic mapping review of 243 studies further warns that conflating platform presence with genuine engagement produces inflated assessments of DLP effectiveness; separating behavioral, cognitive, and emotional dimensions, as this study does, is therefore a methodological necessity.

2.2.2. Digital Learning in Tanzania Higher Education: A Contradiction at Scale

Tanzania's higher education system has adopted DLPs with notable ambition. The Ministry of Education, Science and Technology (MoEST), 2024 Draft National Digital Education Strategy (NDES), 2024–2030 reports that 13 Higher Learning Institutions (HLIs) have upgraded Learning Management Systems (LMS) platforms using Higher Education for Economic Transformation (HEET) funds, while broadband investment has expanded significantly. The University of Dodoma (UDOM), Institute of Accountancy Arusha (IAA), Open University of Tanzania (OUT), and other major institutions have integrated Moodle, Zoom, and WhatsApp into core pedagogical practice (Chambo et al., 2023; Mwangakala, 2024). Yet the evidence on engagement outcomes exposes a troubling contradiction: investment is growing, but quality of engagement is not.

The most revealing recent evidence comes from Ndibalema (2025), whose systematic review of digital literacy gaps in sub-Saharan African HLIs found that during COVID-19, only one-third of UDSM instructors (approximately 500 of 2,000) were active Moodle users, preventing online teaching and forcing institutions to close. The mismatch between instructors' technological pedagogical competencies and the digital literacy skills students need represents a curriculum gap that Tanzanian HLIs have not adequately addressed. Critically, Chasubuta, et al. (2024) quantitative study at two Tanzanian universities found that the environmental context, rather than the technological or organizational context, had the greatest predictive power for technological literacy, suggesting that students' broader socio-digital environments are more influential than institutional ICT investments.

Nalaila et al. (2024) study, based on 646 students at UDSM and SUA, found that a cumulative majority of students (55–56%) rated their LMS operational skills as basic to intermediate, indicating serious deficiencies in operating even

basic platform features. This finding is particularly damaging to infrastructure-centred policy arguments: UDSM had received significant e-learning investment, yet more than half of its students could not competently use the platform into which that investment had been directed. Investment without competency is waste.

Mollet *et al.* (2025) provide the most directly comparable evidence: in a mixed-methods study at UDSM and OUT, online teaching modes showed a statistical effect on learning outcomes of $r = .006$ ($p = .910$), effectively zero. The authors attribute these findings to inconsistent faculty training and low student digital competence. The policy implication is stark: decades of infrastructure investment at Tanzania's flagship universities have not produced measurable engagement or learning gains because the human-capital conditions for realising those gains have not been met.

Institutional support quality matters too. Sabas and Kiwango (2021) found that students' perception of institutional support was eroded by repeated infrastructure failures; each connectivity dropout led students to revise their overall appraisal of the support architecture as unreliable. Mwangakala (2024) found that institutional readiness scores consistently outpaced student readiness, with the gap largest at institutions that had received the most recent hardware investment. The cultural dimension is equally significant: Komba and Nkumbi (2020) found that Tanzanian students experienced digital platforms as relationally impoverished, technically functional, but culturally misaligned with the communal, dialogic Ubuntu-informed educational philosophy of Tanzanian higher education.

2.2.3. Key Determinants of Digital Engagement

A convergent body of evidence from African and global contexts establishes that individual-level competencies and attitudes, rather than infrastructure, primarily determine digital engagement. In Ghanaian secondary schools, digital tool competence and confidence were stronger predictors of engagement than peer influence or system usability, with correlations ranging from $r = 0.91$ to 0.94 (IJRSI, 2025). Ajani's (2025) UTAUT-based study of South African universities found that performance expectancy (perceived usefulness) was the primary determinant of LMS usage, while the facilitating conditions construct failed to capture the depth of infrastructural and institutional constraints in marginalised settings a limitation that Bayaga and du Plessis (2024) argue renders UTAUT socio-politically inadequate for African contexts. Perceived usefulness as a predictor has

been independently confirmed by Getenet *et al.* (2024), who, in a structural equation modelling study across 1,204 students, found digital literacy as the dominant individual-level predictor, outperforming all institutional variables. Emotional engagement, the dimension most closely linked to intrinsic motivation, academic persistence, and learning identity (Ryan & Deci, 2000), is simultaneously the most policy-neglected and most architecturally demanding. Kok *et al.* (2025) demonstrated that digital competence and relatedness support predicted emotional engagement, which in turn predicted all dimensions of learner satisfaction. Mujallid (2024) confirmed that only intentionally designed peer collaboration and social presence activities shifted students from compliance-based to genuinely affective engagement. These findings converge: meaningful digital engagement is an architectural achievement requiring deliberate pedagogical investment, not a byproduct of platform availability.

3. Materials and Methods

The study examines the association between students' use of digital learning platforms and the level and quality of their engagement, behavioral, cognitive, and emotional, in selected HLIs in Dodoma, Tanzania, and identifies the individual and institutional factors that predict variation in those engagement levels.

3.1. Data and Variables

A mixed-methods cross-sectional design was employed, integrating quantitative and qualitative strands to achieve both statistical breadth and interpretive depth. The rationale is epistemological: digital engagement is simultaneously a measurable pattern and a lived experience, and understanding it requires both statistical identification of trends and qualitative illumination of the mechanisms through which those patterns are produced (Creswell & Plano Clark, 2018).

Three Higher Learning Institutions (HLIs) in Dodoma were purposively selected: the University of Dodoma (UDOM), the Institute of Accountancy Arusha–Dodoma Campus (IAA), and the Open University of Tanzania–Dodoma Centre (OUT). Their selection was theoretically motivated: UDOM and IAA represent conventional campus-based instruction; OUT represents open-distance learning. Placing both models within the same study design creates a structurally diverse and ecologically valid context, enabling comparison across institutional configurations that single-institution studies obscure.

A sample of 369 students was selected using Yamane's (1967) formula applied to the combined student population across the three institutions, with stratified proportional allocation to ensure institutional representation: UDOM (168; 45.5%), IAA (118; 32.0%), and OUT (83; 22.5%). Additionally, eight key informants, four lecturers and four ICT administrators were purposively selected for their direct involvement in DLP facilitation and management. The three institutions were purposively selected to represent Tanzania's main HLI delivery modes: UDOM is a large public university (~24,000 students) offering conventional campus-based programmes; IAA–Dodoma Campus (~3,800) is a professional college specialising in accounting and business; and OUT–Dodoma Centre (~1,800) serves predominantly part-time and mature students through open-distance learning. A sample of 369 students was determined using Yamane's (1967) formula applied to the combined enrolment, with stratified proportional allocation: UDOM (168; 45.5%), IAA (118; 32.0%), and OUT (83; 22.5%). Eight key informants, four lecturers, and four ICT administrators were purposively selected for their direct involvement in DLP facilitation and management.

The questionnaire was adapted from validated instruments: engagement items were based on Fredricks et al.'s (2004) multidimensional framework and adapted for the digital learning context, while predictor constructs were operationalised following UTAUT (Venkatesh et al., 2003). The instrument underwent expert review by two educational technology specialists and was pilot-tested with 30 students (not included in the final sample) to confirm clarity, item relevance, and response consistency. The final questionnaire comprised 19 Likert-scale items (1 = Strongly Disagree; 5 = Strongly Agree) measuring three engagement dimensions and four predictor constructs: digital literacy, perceived usefulness, motivation, and institutional support. All constructs achieved Cronbach's Alpha > .80, confirming strong internal consistency. Qualitative data were gathered through semi-structured interviews lasting approximately 40–60 minutes per informant.

3.2. Empirical Strategy

Quantitative analysis was conducted in three stages using IBM SPSS (version 26). First, descriptive statistics characterised the sample. Second, Principal Component Analysis (PCA) with Varimax rotation was applied to the 19 engagement items to extract underlying dimensions. PCA was preferred over Confirmatory Factor Analysis (CFA) because no

validated factor structure for the tripartite engagement model had been empirically established in the Tanzanian HLI context; PCA was therefore used as an exploratory data reduction technique appropriate for novel construct identification (Tabachnick & Fidell, 2013). PCA suitability was confirmed by KMO = .89 and Bartlett's Test of Sphericity ($\chi^2(171) = 2,145.36$, $p < .001$). Third, multiple linear regression estimated the relative contributions of the four predictors to overall engagement, using $p \leq .05$ as the significance threshold (Tan et al., 2008). Model robustness was tested by re-estimating with institutional-affiliation controls; results remained unchanged.

Qualitative data were analyzed using Braun and Clarke's (2006) six-phase thematic analysis: familiarisation, initial coding, theme construction, review, definition, and reporting. Codes were generated inductively from interview transcripts and subsequently interpreted in dialogue with UTAUT and Connectives theory. Quotations are identified by anonymised informant codes (e.g., OINS 05, AINS 02) to protect confidentiality. The triangulation of quantitative and qualitative evidence is explicit throughout the findings and discussion sections, following established mixed-methods best practice (Creswell & Plano Clark, 2018).

3.3. Model Specification

The multiple linear regression was specified as:

$$SE_i = \beta_0 + \beta_1 DL_i + \beta_2 PU_i + \beta_3 MOT_i + \beta_4 IS_i + \varepsilon_i$$

where SE_i denotes the overall engagement score for student i ; DL_i is digital literacy; PU_i is perceived usefulness; MOT_i is motivation; IS_i is institutional support; and ε_i is the error term. Coefficients (β) provide standardised estimates of each predictor's independent contribution to engagement, controlling for all others. Statistical significance was assessed at a 95% confidence level.

4. Results

4.1. Descriptive Statistics

Table 1 presents the demographic profile of respondents. UDOM contributed the largest share (45.5%), followed by IAA (32.0%) and OUT (22.5%). Male respondents accounted for 59.6% of the sample, with an age range of 21–50 years ($M = 30.9$, $SD = 10.8$), reflecting both conventional young adults and mature-age learners. Second-year students formed the largest cohort (49.0%). Critically, 74.5% of respondents resided off-campus, a distribution that renders DLP engagement not supplementary but structurally essential to their academic participation.

Table 1: Demographic characteristics of student respondents (N = 369)

Variable	Category	n	%
Institution	University of Dodoma (UDOM)	168	45.5
	IAA – Dodoma Campus	118	32.0
	OUT – Dodoma Centre	83	22.5
Gender	Male	220	59.6
	Female	149	40.4
Age	21–50 years (M = 30.9; SD = 10.8)	—	—
Year of Study	First year	105	28.5
	Second year	181	49.0
	Third year	83	22.5
Residence	Off-campus	275	74.5
	On-campus	94	25.5

Note: Source: Field Data (2025).

4.2. PCA Results: The Three-Dimensional Structure of Engagement

The Principal Component Analysis (PCA) was employed as the primary data reduction technique in this paper. Although the three dimensions of student engagement, behavioral, cognitive and emotional, are theoretically established in the broader educational literature, no prior empirical study has validated this tripartite structure among students in Tanzania higher learning institutions in the context of digital learning platforms. PCA was adopted as an exploratory analytical approach appropriate for examining how these theoretically proposed dimensions empirically manifest within this specific population and context (Tabachnick & Fidel, 2013)

PCA extracted three components with eigenvalues greater than one, cumulatively explaining 82.3% of the total variance (Table 2). After Varimax rotation, the three components loaded cleanly as cognitive engagement (eigenvalue = 11.74; 61.8%), behavioral engagement (eigenvalue = 2.41; 12.7%), and emotional engagement (eigenvalue = 1.47; 7.8%). The overall mean engagement score (M = 3.56, SD = 0.97) indicates a moderate level of engagement. Critically, the PCA reveals an engagement hierarchy; cognitive engagement accounts for nearly five times as much variance as behavioral engagement and more than eight times as much as emotional engagement, a pattern whose theoretical and policy implications are developed in Section 5.

Table 2: Principal Component Analysis results for engagement dimensions

Component	Eigenvalue	Variance Explained (%)	Cumulative (%)
1. Cognitive Engagement	11.74	61.8	61.8
2. Behavioral Engagement	2.41	12.7	74.5
3. Emotional Engagement	1.47	7.8	82.3

Note: PCA with Varimax rotation; KMO = .89; Bartlett's χ^2 (171) = 2,145.36, $p < .001$.

4.3. Regression Results: Testing the Competency Primacy Argument

The regression model was statistically significant, $F(4, 245) = 14.63$, $p < .001$, $R^2 = .26$, accounting for 26% of the variance in engagement scores (Table 3). The results constitute direct evidence for the competency primacy argument: the three individual-level constructs, digital literacy,

perceived usefulness, and motivation, are all statistically significant, while institutional support, the structural construct, is not. Digital literacy is the strongest predictor ($\beta = .31$, $p < .001$), followed by perceived usefulness ($\beta = .21$, $p = .007$) and motivation ($\beta = .19$, $p = .012$). Institutional support yields a non-significant positive coefficient ($\beta = .08$, $p = .178$).

Table 3: Multiple regression of overall student engagement

Predictor	β	t	p	Significant?
Digital Literacy	.31	4.22	< .001	Yes ***
Perceived Usefulness	.21	2.72	.007	Yes ***
Motivation	.19	2.55	.012	Yes **
Institutional Support	.08	1.35	.178	No

Note: $R^2 = .26$; $F(4, 245) = 14.63$, $p < .001$. * $p < .05$; ** $p < .01$; *** $p < .001$. Source: Field Data (2025).

Robustness was confirmed by re-estimating the model with institutional affiliation as a control: digital literacy ($\beta = .29$, $p < .001$), perceived usefulness ($\beta = .20$, $p = .009$), and motivation ($\beta = .18$, $p = .015$) remained significant; institutional support remained non-significant ($\beta = .07$, $p = .203$). Subsample analysis by institutional type reveals that digital literacy's predictive power is somewhat stronger in conventional institutions (UDOM, IAA: $\beta = .34$) than in the open-distance setting (OUT: $\beta = .26$), suggesting that DLP engagement is most discretionary and therefore most competency-dependent in mixed-mode settings where face-to-face alternatives exist.

4.4. Qualitative Findings: Mechanisms of Engagement and Disengagement

Thematic analysis of key informant interviews yielded three themes that triangulate, contextualise, and extend the quantitative results.

Theme 1: Digital competence as the gateway to engagement

Lecturers consistently identified digital literacy differentials as the primary mediator of engagement quality, a pattern that directly corroborates the regression finding that digital literacy is the dominant predictor. One lecturer (OINS 05) articulated the mechanism with precision:

"Some students are very capable online, but others still need help using the platform's features. Without training, engagement drops quickly. Similarly, when learners understand the value of digital tools, their participation improves significantly even if the infrastructure is weak."

This account is analytically significant in three respects. First, it confirms that digital literacy serves as a gateway competency: without it, access to platforms yields minimal engagement. Second, it establishes the mechanism linking digital literacy to perceived usefulness. Students cannot perceive the value of a platform they cannot competently navigate, which means these two constructs reinforce each other in ways that partial aggregation of regression coefficients obscures. Third, and most importantly, the phrase

'even if the infrastructure is weak' delivers a direct empirical challenge to the infrastructure-first policy logic: an institutionally capable student engages meaningfully despite infrastructure deficits, while an institutionally unsupported student fails to engage even when the infrastructure is adequate. This finding is consistent with Getenet et al. (2024), who found that attitudes toward digital technology, literacy, and self-efficacy together predicted online engagement more powerfully than any structural variable.

Theme 2: Compliance-based engagement and the emotional deficit

All four lecturers independently observed a pattern of task-oriented, externally motivated engagement that lacked affective investment, which this study terms 'compliance-based engagement.' One lecturer (AINS 02) described it as follows:

"Students follow the tasks and attend online lectures, but they rarely show excitement or personal drive during discussions. Digital learning works best for self-motivated learners, yet many struggle to stay emotionally connected without physical interaction."

This testimony operationalises the PCA finding that emotional engagement is the weakest dimension by revealing the mechanism: students are meeting behavioral thresholds (task completion, attendance) without the intrinsic investment that characterises genuine cognitive and emotional engagement. Self-determination theory (Ryan & Deci, 2000) draws precisely this distinction between externally regulated compliance and intrinsically motivated engagement, identifying it as a predictor of long-term persistence and academic identity. Where digital learning environments fail to cultivate the conditions for intrinsic motivation, social belonging, competence, and autonomy, students default to compliance, resulting in the moderate aggregate engagement scores observed in this study. This is consistent with Mujallid (2024), who found that only intentionally designed social and emotional learning activities, not passive

platform use, shifted students from compliance toward genuine affective engagement.

Theme 3: Structural constraints as demotivating accumulators

ICT administrators and lecturers identified a cluster of structural barriers: unreliable connectivity, high data costs, and intermittent LMS performance that episodically disrupted engagement even where motivation was present. One administrator (AINS 04) articulated an important mechanism that aggregate infrastructure statistics fail to capture:

"Students will try to participate in a Zoom session, and the connection drops halfway through. They feel frustrated and disconnected, and that frustration carries over to their attitude toward the platform. It is very hard to build enthusiasm for digital learning when the basic infrastructure lets students down repeatedly."

This account reveals a dynamic that is theoretically underdeveloped in both UTAUT and Connectives: structural failures do not merely block access in the moment; they erode perceived usefulness and attitudinal motivation over time, transforming episodic technical failures into cumulative engagement deficits. Each connectivity failure deposits a negative experience in students' accumulating mental model of the platform, progressively suppressing the perceived usefulness that the regression results identify as a significant driver of engagement. This motivational erosion mechanism explains why institutional support, while objectively present in some form, fails to register as a significant regression predictor: it is experienced not as enabling but as unreliable, and unreliability negates the motivational effects that reliable support would otherwise generate. This finding is consistent with the Zululand LMS's (2025) study, which found that a perceived lack of feedback and contact was a significant issue, even where platforms were nominally available, leading students to experience disappointment that directly led to disengagement.

5. Discussion

The results of this study converge on a single, policy-challenging conclusion: meaningful student engagement with digital learning platforms in Tanzanian HLIs is determined by students' competencies, attitudes, and motivational dispositions, not by the institutional support and infrastructure that current policy frameworks prioritise. This conclusion is not incidental to the data; it is its central, multi-method finding. It demands not merely

incremental policy adjustment but a fundamental reorientation of Tanzania's digital education strategy.

The competency primacy argument, advanced empirically in this study, has strong convergent support in the recent literature. Ndibalema's (2025) systematic review demonstrated that digital literacy gaps are the primary barrier to technology-enhanced learning outcomes across sub-Saharan Africa. Nalaila et al. (2024) Tanzanian study found that more than half of students at UDSM and SUA, both recipients of significant institutional ICT investment, rated their LMS operational skills as basic to intermediate. Mollel et al. (2025) found negligible effects of online teaching on learning outcomes at Tanzania's flagship universities, attributed directly to low digital competence. Together, these studies and the present regression evidence constitute a sustained and multi-institutional empirical case against the supply-side logic that continues to dominate Tanzanian digital education policy. The MoEST's (2024) NDES 2024–2030 commits to LMS upgrades, bandwidth expansion, and infrastructure investment while treating digital literacy development as a supporting, rather than primary, strategy. Based on the present evidence, this prioritisation is inverted: it should be the other way around.

The non-significance of institutional support ($\beta = .08$, $p = 0.178$) warrants careful, direct interpretation. This finding does not imply that institutions are irrelevant; clearly, they are not, but it does imply that students do not experience institutional support in its current form in Tanzanian HLIs as meaningfully enabling. Bayaga and du Plessis (2024) have theorised this limitation most sharply: UTAUT's facilitating conditions construct assumes institutional stability that does not exist in marginalised settings, rendering it a poor predictor of engagement in contexts where support is intermittent, culturally misaligned, or invisible to those who need it most. The qualitative evidence from AINS 04 above reveals the specific mechanism: when infrastructure is perceived as unreliable, each failure erodes perceived usefulness, which, in turn, suppresses engagement. Institutional investment that is not experienced as reliable and responsive is, from the student's perspective, as good as absent. This is not an argument against institutional investment; it is an argument for radically improving the quality, consistency, and student-facing responsiveness of that investment before expanding its scale.

The PCA emotional engagement deficit explains only 7.8% of total engagement variance, compared to 61.8% for cognitive and 12.7% for behavioral; this is the study's most urgent policy finding. In self-determination theory terms (Ryan & Deci, 2000), emotional engagement corresponds most closely to intrinsic motivation, and the condition under which students learn most deeply, persist most reliably, and develop the academic identities associated with successful higher education trajectories. Its systematic suppression in Tanzanian digital learning environments means that current DLP use is producing a lower-quality form of engagement than its institutional investment warrants. Kok *et al.* (2025) and Mujallid (2024) both demonstrate that emotional engagement is not a byproduct of technology availability; it is an architectural achievement that requires instructors to deliberately build social presence, peer interaction, collaborative activities, and personalised feedback into course designs. In Tanzania, where the relational and communal dimensions of learning carry cultural significance and the classroom community is not merely a pedagogical convenience but a culturally embedded feature of educational experience (Komba & Nkumbi, 2020), the emotional thinness of current digital implementations carries particular weight.

The heterogeneity of results across institutional types, digital literacy's stronger effect in conventional institutions ($\beta = .34$) than in open-distance learning ($\beta = .26$) reveals a nuance that aggregate analyses would miss. In conventional settings where face-to-face instruction is nominally available, DLP engagement is more discretionary: students who engage with platforms do so because they choose to, making their digital competence the decisive variable. In open-distance settings where DLPs are the only instructional channel, even low-literacy students are compelled to engage, attenuating the literacy-engagement relationship somewhat. This suggests that digital literacy interventions will generate the greatest marginal engagement gains in conventional and blended-mode institutions, precisely in settings like UDOM and IAA where most Tanzanian students are enrolled.

These findings have implications beyond Tanzania. They contribute to a growing international argument, supported by Getenet *et al.* (2024), Ajani (2025), and the IJRSS (2025) Africa-wide review, that the dominant infrastructure-centred model of digital education reform in low- and middle-income countries systematically misidentifies the binding constraint on engagement quality. The binding constraint is

not connectivity; it is competency. Not hardware, but human capital. Not platform procurement, but pedagogical design. Policymakers who continue to frame digital education primarily as an infrastructure challenge will continue to invest in platforms that students cannot use effectively, in the expectation of engagement gains that will not materialise.

6. Conclusions and Recommendations

6.1. Conclusions

This study provides multi-institutional empirical evidence that student engagement with digital learning platforms in Tanzanian HLIs is moderate, three-dimensionally structured, and driven primarily by individual competencies and attitudes rather than institutional support. These findings extend beyond Tanzania: convergent evidence from Australia (Getenet *et al.*, 2024), West Africa (Asare & Mensah, 2025), and South Africa (Ajani, 2025), alongside UNESCO's (2024) global framework, confirms that digital literacy, not infrastructure, is the binding constraint on engagement quality across diverse contexts. For Tanzania, the findings demand three policy shifts: repositioning digital literacy as the primary investment priority; redesigning blended learning to underscore emotional engagement through social presence and peer collaboration; and evaluating ICT support on the basis of student-perceived reliability rather than supply-side volume. Theoretically, the non-significance of UTAUT's facilitating conditions construct confirms the need for contextual extension in African HLI settings (Bayaga & du Plessis, 2024), and future research should trace longitudinal pathways between literacy interventions and engagement outcomes.

6.2. Recommendations

Three sets of recommendations follow from the empirical evidence.

For national policymakers (MoEST and NDES 2024–2030): The National Digital Education Strategy must be fundamentally rebalanced from a supply-side infrastructure agenda to a demand-side competency agenda. Digital literacy development should be the primary investment priority, not a secondary objective. At least 40% of the digital education budget should be directed to embedded, curriculum-integrated digital skills programmes, with measurable competency benchmarks assessed at entry, mid-programme, and graduation. A digital engagement quality assurance framework should require HLIs to report student-perceived engagement quality metrics, rather than platform adoption rates, as a condition of HEET fund eligibility.

For institutional leaders (UDOM, IAA, OUT, and analogous HLIs): Institutions must address the reliability gap in ICT support: real-time platform monitoring, minimum uptime guarantees for LMS and connectivity, and clear student-facing response protocols are prerequisites for institutional support to function as an engagement driver. All DLP-delivered courses should incorporate mandated elements of instructor social presence, peer collaboration, and personalised feedback, as required by the course design standards. A tiered peer digital mentorship system pairing proficient senior students with incoming students offers a cost-effective mechanism for closing the digital literacy gap while simultaneously building social community and emotional engagement.

For instructional practitioners (lecturers and course designers): Moving students from compliance-based to authentic engagement requires deliberate strategies activating intrinsic motivation: meaningful autonomy in learning tasks, visible competence progression, and systematic cultivation of social belonging in digital environments (Ryan & Deci, 2000). Practitioners should implement differentiated engagement strategies accounting for literacy heterogeneity, including scaffolding activities for low-literacy students and peer-supported collaborative tasks. Midpoint engagement feedback, not merely end-of-semester evaluations, should be routinely collected and acted upon to identify disengagement while intervention is still possible.

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