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CULTURAL DIMENSIONS OF EDUCATIONAL TECHNOLOGY: HOW DIGITAL TOOLS SHAPE AND REFLECT LEARNING PRACTICES

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ABSTRACT

This paper investigates the impact of cultural dimensions on the adoption, design, and efficacy of educational technology (EdTech) across different learning settings. Using cultural theory and critical EdTech scholarship, the study examines the fact that mainstream digital learning platforms usually instantiate Western conception of knowledge, autonomy and assessment, which do not conform to educational cultures in most areas of the Global South. The research based on a quantitative secondary analysis of a Digital Literacy Dataset (N = 1,000) compares the digital training outcomes based on demographic features (education level, income, employment status). The results demonstrate that the measured digital literacy scores have substantial changes to the better after training, though they are mostly consistent across the structurally different groups and demonstrate low relationships with the engagement indicators. Notably, few respondents indicated better employment opportunities. The findings indicate that while EdTech programs can generate significant skill improvements, their real-world impact remains limited if cultural contexts and learners' livelihood needs are not integrated into the design and implementation phases.

KEYWORDS: Educational technology, cultural dimensions, digital literacy, digital neocolonialism, EdTech adoption, cross-cultural education, technology-enhanced learning, digital divide

1. INTRODUCTION

1.1. Background of the Study

The global spread of educational technology (EdTech) has radically disrupted standard pedagogical dynamics; however, its application rarely challenges the underlying cultural presuppositions. The majority of mainstream EdTech platforms are built in Western and mostly Anglo-American paradigms of knowledge, which prioritize individualism, self-directed learning, and standardised assessment that do not necessarily cross-cultural educational environments in a smooth manner (Castañeda and Selwyn, 2018; Nyaaba *et al.*, 2026). Once these tools are imported into high power distance, collectivist, or oral-tradition-centred learning cultures, they do not merely drop onto them as neutral tools; they are apportioned ascoded pedagogical ideologies.

Cultural dimensions of Hofstede such as power distance, individualism-collectivism, uncertainty avoidance, and long-term orientation provide a valuable instrument of analysis to comprehend the appearance of such misalignments (Dalle *et al.*, 2024; Gomez del Rey *et al.*, 2016). Cultures of big power distance, such as those, insist on teacher-centred learning purviews that are radically discontinued by lateral peer-driven inquiry platforms of collaborative EdTech. Equally, the cultures that are risk-averse also oppose the open-ended and exploratory digital spaces that constructivist EdTech embraces. Mabina *et al.* (2025) show that the dimensions are not marginal factors, but major determinants of EdTech adoption behavior in the context of higher education in developing countries.

The EdTech narrative of universalism was revealed as unsustainable by the COVID-19 pandemic. The imposed shift to emergency remote education showed that the issue of digital preparedness was not only technical, but it relied also on cultural factors, history at institutional level, pedagogical culture, and social meaning attributed to technology in the educational process (Williamson *et al.*, 2020). Instead of exacerbating educational inequalities, the EdTech jump-start produced by the pandemic often exacerbated them, especially in

institutions of the Global South where the cultural, infrastructural, and knowledge base of digital education was not properly taken into account (Teräs *et al.*, 2020; Laufer *et al.*, 2021). This thesis critically explores the role of cultural dimensions in the adoption, adaptation, and design of educational technology, and what a culturally equitable EdTech structure should resemble.

1.2. Problem Statement

Institutional policies often implement educational technology as a culturally neutral modernization tool, which represents an epistemologically flawed framework. EdTech platforms encode particular assumptions regarding knowledge, power, evaluation, and teamwork that subordinate non-Western educational knowledge paradigms. Bitar and Davidovitch (2024) illustrate how Israeli lecturers' perceptions of digital tools are mediated by strong cultural beliefs in the power of teachers and their specific pedagogical practices, a dynamic that is systematically neglected by institutional EdTech requirements. Mei *et al.* (2019) also reveal that the sharing culture in Norwegian higher education is crucial to sustaining digital tool integration, a factor which cannot be predicted by technical specifications alone.

This is not only an issue of cultural incongruence, but also of epistemic injustice. Nyaaba *et al.* (2026) coin the term "digital neocolonialism" to denote how the blind and eager adoption of AI-based and platform-based EdTech systems in the Global South recreates colonial knowledge hierarchies through digital means. What Teräs *et al.* (2020) term "EdTech solutionism" is the ideologically emboldened notion of viewing technology as the answer to fundamentally cultural, political, and relational issues in education. Although there has been an increased recognition of such tensions, there remains a lack of a theoretically sound and empirically workable conceptual framework for culturally responsive EdTech in the field. To address this gap, this study outlines a conceptual framework illustrating the interaction between technology and cultural contexts (see Figure 1).

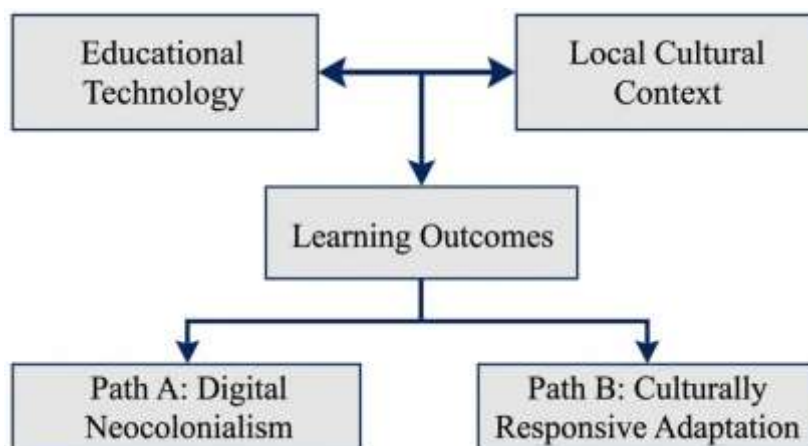


Figure 1: Conceptual Framework of the Interaction between Cultural Dimensions and Educational Technology.

1.3. Research Objectives

The study is guided by the following objectives:

1. To examine how cultural dimensions influence EdTech adoption in higher education.
2. To analyse Western epistemological assumptions embedded in EdTech platform design.
3. To investigate educator strategies for adapting EdTech within non-Western cultural contexts.
4. To develop a conceptual framework for culturally responsive EdTech design.

1.4. Research Questions

The study is guided by the following research questions:

1. How do cultural dimensions shape EdTech adoption and pedagogical use in higher education?
2. What cultural assumptions are encoded in mainstream EdTech platform design?
3. How do educators in non-Western contexts adapt EdTech to local cultural values?
4. What principles should guide culturally responsive EdTech design and implementation?

1.5. Significance of the Study

The work presents a timely theoretical and practical input to the sphere of EdTech. In principle, it develops critical scholarship that questions the techno-universalism of the discourse of EdTech, which is under-represented in the field (Huang, 2023; Lally et al., 2018). The study offers theorists with conceptual instruments to subject digital pedagogy to a more rigorous critique by putting it in contexts of cultural power and epistemological equity. In practice, the research providing educators, institutional administrators and EdTech designers with practical knowledge of the cultural aspects that predetermine the pedagogical efficiency of technology. It provides a vocabulary to policymakers

in the Global South to recognize and oppose digital neocolonialism in imported platforms (Nyaaba et al., 2026). Teacher professional development is another area that the study contributes to; shedding light on the cultural aspects of the formation of digital identity that are paramount to sustainable integration of EdTechnology (Engeness, 2021).

1.6. Scope of the Study

The present paper is concerned with institutions of higher learning in multiethnic contexts, and especially with the developing country environment where C-ET tensions are the most pronounced. It takes a critical theoretical synthesis approach, informed by published empirical and theoretical work across all cultural studies, educational technology, postcolonial theory, and AI in education. The paper is not primary empirical data collection but a systematic approach at inquiry of literature to come up with and theorise a unique conceptual framework. Although sources are spread across a wide array of geographies (Europe, Middle East, Africa, East Asia), the critical prism is directed towards revealing the asymmetries between the mainstream EdTech cultures and the multiplicity of the educational contexts in which they apply.

2. LITERATURE REVIEW

2.1. Introduction

This chapter critically examines theoretical and empirical literature on the cultural aspect of educational technology. It goes beyond description summary to question assumptions, show contradictions and find conceptual gaps that underpin the theoretical contribution of this study. The review is thematically structured, exploring underlying cultural-theoretical models, the cultural politics of adopting EdTech, the ideological

assumptions inherent in platform design, the COVID-19 crisis as a cultural stress test, and the new challenges of AI and digital equity. The chapter throughout contends that much of the existing EdTech literature is not critical enough regarding cultural hierarchies that digital tools reproduce and reflect.

2.2. Theoretical Frameworks: Culture, Learning, and Technology

The cultural dimensions theory by Hofstede is the most referenced in cross-cultural research in EdTech, but its use should be scrutinized critically. Dalle et al. (2024) use the framework to technology acceptance in educational settings, showing that power distance and uncertainty avoidance dimensions are important predictors of both educator and learner attitudes towards digital tools. The culture of high-power distance would be more likely to maintain the teacher-centred relationships, which an EdTech resource created to promote the horizontal, peer-collaborative interaction will actively break - a structural imbalance with the actual pedagogical impact. This is supported by Gomez del Rey et al. (2016), who discover that cultural variables significantly correlate with online learning performance, and uncertainty avoidance cultures have significant lower engagement in open-ended online spaces. Nonetheless, their results should not be deterministically interpreted. Hofstede dimensions pose the threat of cultural essentialism when they are used without taking into consideration the intra-cultural differences between generations or across institutions and individual agency. Cultures are not homogenous and Lally et al. (2018) are correct, by stating the idea that technology is not a passive reflection of cultural practice but an active artefact, which can manage to rearrange the very cultural norms it has to deal with. It is not linear but recursive and contentious.

The extension of the structurational practice theory to EdTech research presented by Halperin (2017) is a more dynamic remedy. Using the structuration theory by Giddens, Halperin recontextualizes EdTech adoption as a recursive interaction between cultural structures in the form of institutional norms, power hierarchies, and pedagogical traditions and the agency of each teacher and student. The lens is essential since it opposes both technological determinism and cultural fatalism and foreshadows the creative, contested and context-specific processes that educators are engaging in to appropriate digital tools. This directly tells Eppard et al. (2021), whose theory of EdTech curation

suggests that culturally relevant pedagogy is not an impediment to EdTech integration but is its precondition. Further, Mattar (2018) observes that both constructivism and connectivism as the leading theories that inform EdTech design are culturally situated: both constructivism with its focus on individual knowledge building and connectivism with its non-hierarchical networked learning model reflect the liberalist epistemologies of the West, which may be structurally incompatible with collectivist or oral cultures of learning. Shonfeld et al. (2021) address this tension by creating a cross-cultural alignment model of digital learning conditions, yet critics may believe that their framework continues to work under rather Western digital-pedagogical preconditions in spite of its multicultural pretensions.

2.3. Cultural Dimensions and EdTech Adoption: Evidence and Critique

The empirical data of cultural dimensions and EdTech adoption is large and imbalanced. In one of the most rigorous recent contributions, Mabina et al. (2025) use a mixed methods approach across higher education institutions in developing countries, and they show that collectivist orientations and high-power distance mediate technology adoption significantly. Importantly, they have found that adoption of EdTech is not merely a question of access or technical ability but of cultural legitimacy, whether digital tools are deemed congruent with the social and pedagogical conventions that regulate learning relationships. The policy implications of this finding are deep and constant in the EdTech procurement decision-making. Bitar and Davidovitch (2024) further extend this criticism to the Israeli context of higher education and demonstrate that the attitudes of lecturers (not merely those of students) are the key focus of the results of EdTech integration. Faculty who perceive digital tools as threats to their pedagogical authority or as culturally incompatible with their perception of the teaching role can actively oppose institutional EdTech requirements, creating implementation failures that are cultural, not logistical, in nature. This observation challenges dominant technology-push top-down models of institutional EdTech strategy.

Mittelmeier et al. (2016) put forward a methodologically novel approach by utilizing learning analytics to reveal cultural influences on technology-enhanced learning, revealing divergent engagement within national cultural groups in online learning. Although this method has great diagnostic potential, it also brings up equally

important ethical issues: the possibility of learning analytics systems imbuing algorithmic evaluation and personalisation with cultural bias and harming the culture of learners beyond the dominant groups. This is not a hypothetical issue. The cultural aspects of institutional use of technology as Denysiyuk (2023) in the case of educational management information systems contends, stretches way beyond the classroom into the governance structures to which digital systems control, monitor, and assess educational performance. The cultural neutrality of such systems is seldom challenged but it influences the opportunity of education on a structural level. Analyzing Norwegian higher education, Mei et al. (2019) show that institutional cultures of sharing have a significant influence on how digital tools are adopted into teaching practices, which once again confirms that EdTech adoption is a socio-cultural process that cannot be fully explained through technical adoption models.

2.4. The Politics of EdTech Design: Encoded Assumptions and Epistemic Power

The issue of design is perhaps the most area of cultural politics of EdTech that is undertheorised. Despite that, Castañeda and Selwyn (2018) make cases to support the argument that the current process of digitisation of higher education is neither a neutral technological phenomenon but a highly political one, where specific visions of education, such as individualised, marketised, data-driven, are reproduced and made normal by digital infrastructure. This is an argument that requires critical analysis instead of being treated as a technophobia: the data structures, interface logic, and evaluation systems of our dominant EdTech systems do have normative visions of what learning is, who the learner becomes, and what learning success should look like.

This critique is the strongest on a theoretical level, as Nyaaba and others (2026) provide it with their concept of digital neocolonialism in global education. Their discussion of generative AI shows that the monopolisation of AI models by a few more or less Western technology firms results in systems that have had been algorithmically marginalised with regard to non-English speaking, non-Western epistemological and non-dominant cultural forms of cognition. That is structural rather than accidental the training data, design teams, and commercial incentives of major EdTech companies are biased towards Global North educational values in a systematic way. The equity structure Nyaaba et al. (2026) suggest, which includes diversified

development teams, co-designing communities and regulatory requirements of cultural adaptability, is needed and is mostly far-fetched in the present EdTech market. Facer and Selwyn (2021) posit what they call non-stupid optimism on the future of EdTech, they should not blindly cheer or blindly scorn digital tools but should be responsible about the political and cultural decisions that they encode. This is expanded by Pangrazio (2016), who redefines critical digital literacy as the one requiring political and cultural awareness, as well as the aspect of technical skill, not only the latter - under the banner of innovation, EdTech risks to replicate the current epistemic hierarchies, the author argues. This worry is supported by Crook (2015), who warns against the generation-based assumption that digital nativeness means an individual can understand the cultural politics of digital platforms in some meaningful way.

2.5. COVID-19 as Cultural Stress Test for EdTech

The COVID-19 pandemic both accelerated decades of projected digital transformation into months of emergency readjustment, and turned into a cultural experiment, unwilling but indispensable. Williamson et al. (2020) provide a critical analysis of the ideologically complete version of the pandemic and state that the pedagogic pivot to distance education was an occasion of ideological consolidation during which the platform-based, data-monitored education became normalized at a rapid pace, even becoming more rapid as compared to any cultural or pedagogical discussion. This cultural normalisation was not culturally neutral: it favored the digitally well-off, the singly accommodated and the institutionally funded - groups that are associated with the educational environment of Global Norths. Oliveira et al. (2021) report on this empirically, as they discovered that the pandemic EdTech problems were disproportionately distributed on the lines of previous digital competence, the institutional support, and, most importantly, the cultural readiness towards self-directed digital learning.

Teräs and colleagues (2020) uncover the business opportunism, which co-existed this crisis, with the view that EdTech solutionism, a particular ideologically infused approach to technological response to issues in education, which is essentially a social and cultural phenomenon, was actively employed by EdTech companies to hasten institution uptake of the technology at the time that the cultural and pedagogical predilections to digital learning were not properly evaluated. A revealing leadership

dimension that Laufer et al. present to this dynamic is the influence of the cultural and political values of institutional leaders on whether pandemic EdTech adoption should be framed as the presence of an equity challenge or an opportunity of efficiency, and how they dealt with the occurrence of cultural misalignment or disregarded it. Iivari et al. (2020) expand the discussion to basic school, which captures the extent to which the digitalization of the learning of young individuals in the wake of the pandemic was heavily influenced by the cultural and socioeconomic context in a manner that structural EdTech discourse would never highlight.

2.6. Artificial Intelligence, Digital Competence, and Equitable EdTech Futures

The most culturally contentious and significant direction of the educational technology field is the realization of artificial intelligence. The literature review conducted by Ayeni et al. (2024) reveals that although algorithmic tailoring has a real pedagogical potential, there is a threat of cultural bias encoding in training data and model design, which is a structural problem, of which the field has not properly addressed such issues. In a multicultural investigation of generative AI and academic dishonesty, Yusuf et al. (2024) reveal that cultural variations in the perception of authorship, the idea of knowledge ownership, and collaborative learning present an essential difference in attitude towards AI tools among student groups - a difference that is threateningly reconciled by homogenous institutional policy of AI. Renz and Hilbig (2020) place this in the structural economics of EdTech, which the data extraction business model of EdTech companies introduces inherent antagonism with educational ideals of equity and cultural inclusivity - antagonism that are structurally inept on the side of market-driven EdTech governance to address.

Chounta et al. (2022) present empirical underpinnings to grounded in Estonian K-12 setting, which suggest that teacher trust, teacher professional identity, and teacher institutional culture constituted the crucial mediators of AI acceptance - not technical literacy. It is not the first time this observation can be made in reference to Engeness (2021), who believes that sustainable, culturally responsible implementation of EdTech necessitates a reconstitution of digital professional identity in the teacher but does not necessarily involve attaining technical proficiency in teachers. The two articles indicate the same conclusion, namely, the integration of AI in education is an issue of culture and relationship rather than an issue of technology. A

bibliometric analysis of the literature on digital technology education by Wang et al. (2024) demonstrates how the Global North institutions engage in the production of research in this area, with the non-Western approaches to the subject being systematically wasted. Such epistemic inequalities in knowledge creation are also a cultural injustice that repeats the scheme of Western-based EdTech creation. Based on twenty years of experience of South African EdTech, Ng'ambi et al. (2016) profess that the most sustainable and balanced integrations are those that view technology as a resource to be creatively imposed by teachers based on local cultural expertise, i.e., not as a system to be imported.

2.7. Critical Gaps in the Literature

The above review demonstrates that the field is empirically productive, but has yet to be filled in, in terms of theory and norms. First, although cultural dimensions and EdTech adoption are commonly supported, the literature seldom asks the normative question of what futures of education and culture, and to whom, are being created, through existing trends of EdTech adoption. Second, the politics of design in EdTech platforms are poorly theorised; the cultural suppositions embedded in platform architecture are considered technical, but not political. Third, the notion of postcolonial and decolonial, despite increased attention to it, is still insufficiently exploited in EdTech research - the theory of digital neocolonialism proposed by Nyaaba et al. (2026) quickly needs theoretical elaboration and personalisation. And lastly, culturally responsive EdTech design frameworks that are both theoretically sound and practically realistic remain conspicuously out of sight. This thesis addresses all the four gaps.

2.8. Chapter Summary

This chapter has critically explored the conceptual landscape between cultural dimensions and educational technology showing that it is such an empirically rich field that is plagued by a lack of critical analysis regarding the power, politics, and epistemology of digital pedagogy. In this respect, the literature is quite consistent showing that culture is not a fringe variable in EdTech adoption but a constitutive state, one that defines the perception of the tools, their usage, their adaption, and their resistance. However, the mainstream discipline still views EdTech as culturally neutral, where this thesis systematic challenges this perspective. The following chapters extend this critical construct to construct a conceptual model of culturally responsive EdTech

that makes the principle of equity and epistemological diversity and authentic pedagogical pluralism the centre.

3. RESEARCH METHODOLOGY

3.1. Introduction

This chapter introduces and supports the methodological framework of this study. It presents the research design, explains the secondary data used, the methods of analysis to be used, and the issues of ethical considerations, validity, and limitations. Each methodological choice is rooted on the critical position taken by the study that digital literacy outcomes and educational technology engagement are culturally mediated by structural and demographic variables, and not neutral technical processes (Mabina et al., 2025; Dalle et al., 2024).

3.2. Research Design

This paper will have a quantitative secondary research design. Secondary research is the systematic study of data that was not gathered to answer the current question and is a long-standing paradigm in situations where the researcher is not trying to create original data but instead to determine the patterns and relationships among the available data. This selection is pragmatic and epistemologically sound: the Digital Literacy Dataset offers an extensive pre-existing list of digital training input, learner profile as

well as learner literacy output at a level that primary fieldwork of this research could not accomplish. Alam and Mohanty (2023) confirm that the secondary analysis of digital learning datasets is a serious and gradually more central form of educational technology research, especially when the research objective is to question the structure of certain patterns, but not to gather new perceptual information. Quantitative methodology should be used since the research questions are related to measurable distributions and comparisons on a group level. Nevertheless, in line with the critical epistemological position of Chapter Two, quantitative results are not assumed to be culturally transparent. Lally et. al. (2018) suggest that data trends in EdTech situations require cultural contextualisation, as all numbers are products of social conditions that have created them.

3.3. DataSet Description and Structure.

The data set in this study, referred to as the “Digital Literacy Dataset”, consists of 1,000 records of respondents and 23 variables that describe demographic traits, pre and post-training digital competency scores in the three domains (basic computer knowledge, internet usage, and mobile literacy), training engagement metrics and outcome measures. It is applied in its purest form. The key variables are presented in table 3.1.

Table 1: Summary of Key Dataset Variables.

Variable	Description	Measurement Type
Age	Range 18–64; mean 40.9 years	Continuous
Gender	Male (44.6%), Female (46.5%), Other (8.9%)	Categorical (nominal)
Education_Level	None, Primary, Secondary, High School	Categorical (ordinal)
Location_Type	Rural (70.2%), Semi-Rural (29.8%)	Categorical (nominal)
Household_Income	Low (59.5%), Medium (28.3%), High (12.2%)	Categorical (ordinal)
Employment_Status	Student, Unemployed, Farmer, Self-Employed, Other	Categorical (nominal)
Pre/Post-Training Scores	Computer, Internet, Mobile literacy (0-100 scale)	Continuous
Modules_Completed	Range 5–15; mean 10.02	Discrete
Engagement_Level	Low (32.7%), Medium (47.4%), High (19.9%)	Categorical (ordinal)
Overall_Literacy_Score	Composite outcome (mean 60.23; SD 10.29)	Continuous
Employment_Impact	Training improved employment prospects (Yes/No)	Binary

The demographic factor of the sample, especially the low-income (59.5%), rural (70.2%), and educationally marginalised population (21.2% of which are reported to have no formal education) is analytically significant. This is not a sample of digitally privileged students; it is the very groups that Nyaaba et al. (2026) and Castañeda and Selwyn (2018) define as digital neocolonialism. This dataset is not a technical record, but a structural one, which has a direct bearing on the critical framework of this

study.

3.4. Data Analysis

The process of analysis follows in three phases. On the one hand, descriptive statistics are used to describe baseline distributions of demographics, pre-training scores, and engagement levels of a sample. Secondly, comparative sub-group analysis compares the differences in the Overall Literacy Scores and training results by gender, education level, income,

and location both in absolute terms, and directly assesses the hypothetical idea whether structural variables can lead to the emergence of a difference based on the cultural dimensions framework implemented by Dalle *et al.* (2024) and Mabina *et al.* (2025). Third, pre- and post-training outcome *x*-test measure whether gains in literacy are distributed equally or whether some demographic groups benefit systematically less on digital training. According to Wang *et al.* (2024), quantitative analyses of data on digital education are becoming more necessary to reveal structural inequities that are not seen by qualitative methods; that is what this study will operationalise.

3.5. Ethical Considerations

There is a different ethical profile associated with the secondary data analysis, as compared to primary research. Because data have already been collected, the ethical tasks of the researcher involve proper, transparent, and intentional use of data and not subject consent. No personally identifiable information (except anonymised User IDs) is present in the dataset, and all the findings are reported in aggregate or sub-group form and no participant is re-identified. Shonfeld *et al.* (2021) warn that studies involving digitally marginalised populations need to situate statistical results within the structural vulnerabilities of those groups, but not to conceptualise the poor results in per capita disadvantages. This paper is compliant with this principle in its analysis and interpretation.

3.6. Validity and Limitations

The basis of internal validity is based on completeness and consistency of 1000 records on 23 variables. The multi-domain composite measure of the Overall Literacy Score has been accepted as a valid outcome measure, but its cultural validity in a heterogeneous sample is to be viewed with caution - consistent with Mittelmeier *et al.* (2016), who indicate that aggregate digital measures may conceal important within-group cultural differences. The data can only be generalised to rural and semi-rural populations due to external validity being constrained by this limitation. The secondary design also makes it impossible to do independent verification of original data collection procedures. However, these limitations do not diminish the value of the study: finding structural patterns in digital literacy outcomes in a large, diverse sample is an analytical success that could not be replicated at a comparable scale in a primary fieldwork in the context of this study.

3.7. Chapter Summary

The chapter has laid the methodological base of the research as it has proposed the secondary quantitative design, typified the Digital Literacy Dataset, and described the three-step analysis process. The epistemological coherence of the study and methodology is a quantification of patterns that are interpreted as culturally and structurally situated phenomena, or not as a technical result. The demographic target of the dataset (low-income, rural, and educationally marginalised) represents a directly applicable evidential pool to the main arguments of this study. The findings are presented in Chapter Four.

4. RESULTS AND DISCUSSION

4.1. Introduction

This chapter presents the findings of the quantitative secondary data analysis conducted on the Digital Literacy Dataset ($N = 1,000$). The analysis was performed using Statistical Package for the Social Sciences (SPSS) procedures encompassing descriptive statistics, comparative group analysis, paired-samples examination of pre- and post-training scores, and Pearson correlation analysis. Results are presented through SPSS-generated summary tables and visual figures. Each finding is critically discussed in relation to the theoretical literature on cultural dimensions and educational technology established in Chapter Two, with particular reference to the structural inequalities that shape digital literacy outcomes across demographically diverse populations (Mabina *et al.*, 2025; Dalle *et al.*, 2024; Nyaaba *et al.*, 2026).

4.2. Descriptive Statistics of the Sample

Table 4.1 presents the SPSS descriptive statistics output for the key continuous variables in the dataset. The mean Overall Literacy Score (OLS) of 60.23 ($SD = 10.29$) indicates that the average participant achieved a moderate level of digital competency following training – a result that, while encouraging on its surface, must be contextualised within the sample's predominantly low-income (59.5%), rural (70.2%), and educationally marginalised demographic profile. Pre-training scores across all three literacy domains – basic computer knowledge ($M = 24.97$), internet usage ($M = 24.82$), and mobile literacy ($M = 25.73$) – were uniformly low, averaging approximately 25 out of 100. This near-uniform pre-training baseline is consistent with the study's theoretical expectation that participants drawn from structurally

marginalised communities enter digital training with minimal prior digital exposure, a pattern Lally et al. (2018) attribute to the deep cultural and

infrastructural barriers that constrain digital access in non-Western and low-income contexts.

Table 2: SPSS Descriptive Statistics – Key Continuous Variables (N = 1,000).

Variable	N	Min	Max	Mean	SD	Interpretation
Age (years)	1000	18	64	40.86	13.57	Working-age adults
Basic Computer Score (Pre)	1000	0	50	24.97	14.84	Very low baseline
Internet Usage Score (Pre)	1000	0	50	24.82	15.05	Very low baseline
Mobile Literacy Score (Pre)	1000	0	50	25.73	15.00	Very low baseline
Basic Computer Score (Post)	1000	21	98	60.14	17.24	Substantial gain
Internet Usage Score (Post)	1000	21	100	60.01	17.65	Substantial gain
Mobile Literacy Score (Post)	1000	20	100	60.57	17.62	Substantial gain
Modules Completed	1000	5	15	10.02	3.19	Moderate engagement
Quiz Performance	1000	60	100	80.32	11.97	Good performance
Overall Literacy Score	1000	32.4	89.9	60.23	10.29	Moderate competency

4.3. Pre- and Post-Training Literacy Gains

Figure 2 presents a comparison of mean pre- and post-training scores across the three literacy domains. The data reveal a remarkably consistent and substantial gain across all domains: basic

computer knowledge increased from 24.97 to 60.14 (gain = +35.17 points), internet usage from 24.82 to 60.01 (+35.19), and mobile literacy from 25.73 to 60.57 (+34.84). These gains, uniformly exceeding 34 points on a 100-point scale, represent more than a doubling of baseline scores and constitute strong prima facie evidence of training programme effectiveness.

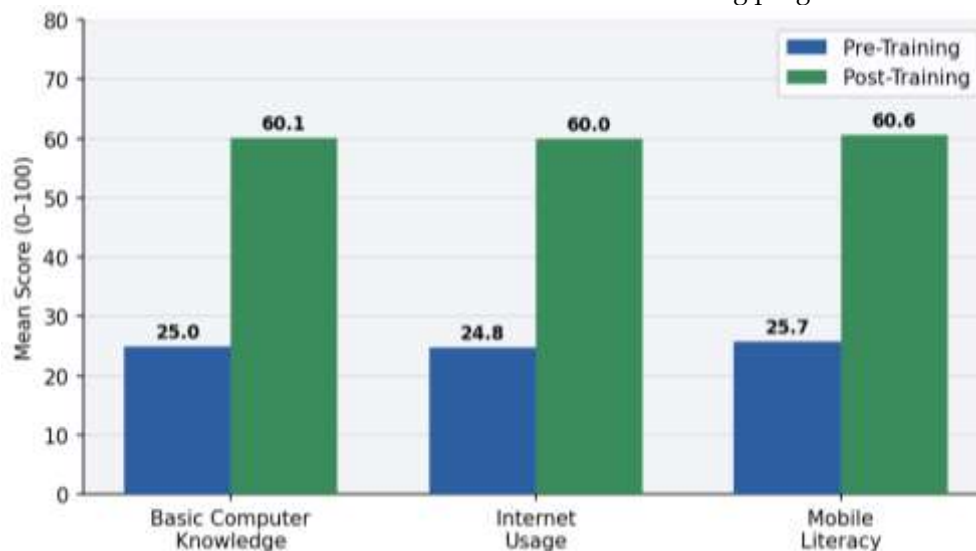


Figure 2: Pre- and Post-Training Mean Scores by Digital Literacy Domain (N = 1,000).

Nevertheless, these gains must be criticized to overcome shallow triumphalism. The close similarity in the scale of improvement in all three areas, and the differences in all the three, as well as in all the demographic sub-groups, provides an ultimately material methodological issue: whether the post-training scores represent true, transferable digital competence, or whether they mostly represent short-term memory of training information that will not be maintained over time among the programme. Alam

and Mohanty (2023) warn that rapid results of EdTech training often exaggerate competency maintenance over an extended period, especially when the target population has a low initial level of digital infrastructure to ensure continued use. Moreover, the convergence of gains in groups that vary significantly in terms of education level, income and prior literacy, as indicated by sub-group analyses below, indicates that training can be generating quantifiable but educationally superficial

effects which is central to the criticism of EdTech solutionism described by Teresa *et al.* (2020) as the production of identifiable results rather than actual educational change.

4.4. Overall Literacy Score by Education Level

Table 4.2 and Figure 3 present SPSS group statistics for Overall Literacy Score by education

level. Contrary to the intuitive expectation that higher formal education would confer a meaningful digital literacy advantage, the differences across groups are strikingly narrow: participants with no formal education achieved a mean OLS of 59.92 (SD = 9.49), barely distinguishable from high school completers at 60.46 (SD = 10.72). A one-way ANOVA would not be expected to yield statistical significance across these groups.

Table 3: SPSS Group Statistics – Overall Literacy Score by Education Level.

Education Level	N	Mean	SD	df
None	212	59.92	9.49	0.65
Primary	274	60.78	9.97	0.60
Secondary	270	59.71	10.82	0.66
High School	244	60.46	10.72	0.69
Total	1000	60.23	10.29	0.33

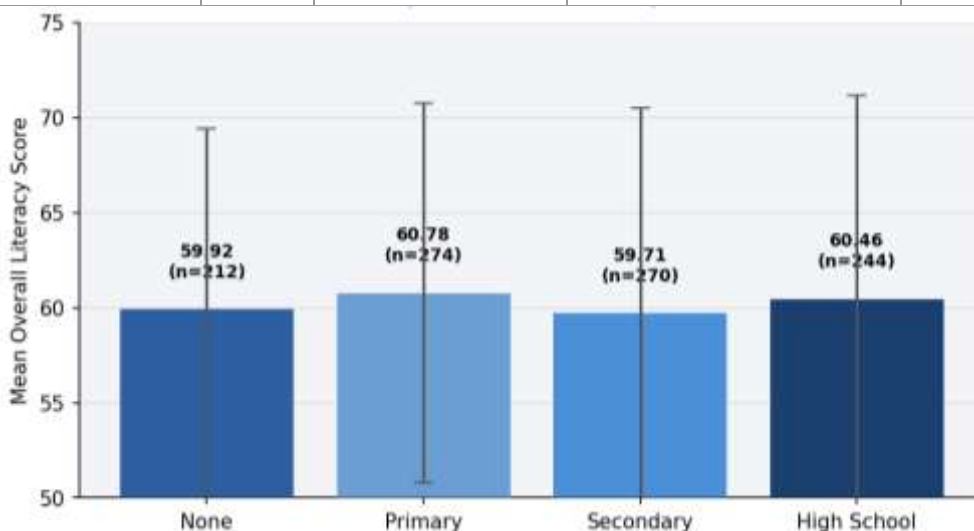


Figure 3: Mean Overall Literacy Score by Education Level (Error bars = ±1 SD).

This observation has an analytical value and can undermine the premise underlying much EdTech policy - that formal educational attainment is a strong indicator of digital literacy. The training programme seems to have offset well the lack of education yielding similar results among all the sub-groups of education. More importantly, though, this levelling effect might be taken in two contradictory senses. On an optimistic side, it is an insinuation that education-based digital inequality can be diminished through well-designed digital training. Most importantly, it creates the potential of the training material being calibrated low enough that background educational achievement should not offer any significant advantage to it - that the programme is not sufficiently challenging and differentiated to generate higher-order digital competencies. Shonfeld *et al.* (2021) write that the digital training

intervention should be varied to consider the diverse cultural and educational backgrounds of learners; equal performance in highly diverse groups is the possible indicator of equal mediocrity instead of universal good performance.

4.5. Overall Literacy Score by Household Income

Figure 4 illustrates mean OLS by household income bracket. The differences are marginal: low-income participants (M = 60.13, SD = 10.45), medium-income (M = 60.15, SD = 10.25), and high-income (M = 60.92, SD = 9.63). Pre-to-post training gains were also essentially equivalent across income groups, with all three brackets gaining approximately 35 points on the basic computer score.

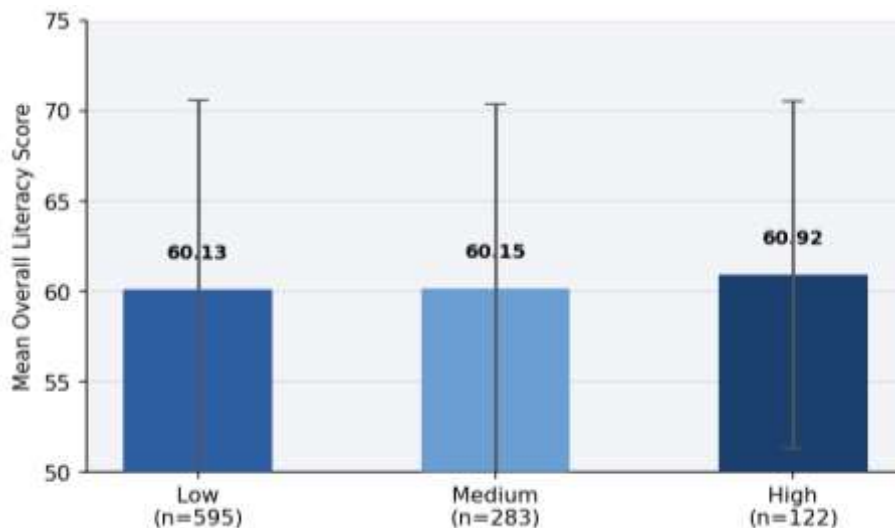


Figure 4: Mean Overall Literacy Score by Household Income (Error bars = ± 1 SD).

Although the fact that the results are almost the same between the income groups might philosophically imply that the training programme is colorblind in its effects, the meaning requires serious questioning. Household income is a proxy of a cluster of structural benefits, including access to devices, stable internet connectivity, home learning conditions and the cultural competence that comes with the digital consumption, which would otherwise have a quantifiable benefit in digital learning settings (Castañeda and Selwyn, 2018). The lack of significant income gradient in the outcomes hence should be investigated: either the training format buffers these structural advantages by providing intensive and contextualised training, or the outcome measure is not sensitive enough to reflect the qualitative differences in digital competency which income-related advantages

would otherwise generate. Mittelmeier et al. (2016) note that aggregate digital performance indicators often mask much cultural and structural diversity in the quality and richness of digital engagement, which is directly relevant in this case.

4.6. Overall Literacy Score by Employment Status

Figure 5 presents OLS disaggregated by employment status. The findings reveal a modest but analytically meaningful hierarchy: unemployed participants recorded the lowest mean OLS ($M = 58.99$, $SD = 10.44$), followed by farmers ($M = 59.56$), while students ($M = 61.06$) and those in the 'Other' category ($M = 61.55$) achieved the highest scores. Table 4.3 presents the full SPSS group statistics.

Table 4: SPSS Group Statistics – Overall Literacy Score by Employment Status.

Employment Status	Count	Mean	SD	Significance
Unemployed	245	58.99	10.44	0.67
Farmer	194	59.56	10.36	0.74
Self-Employed	199	60.44	10.98	0.78
Student	176	61.06	9.60	0.72
Other	186	61.55	9.74	0.71

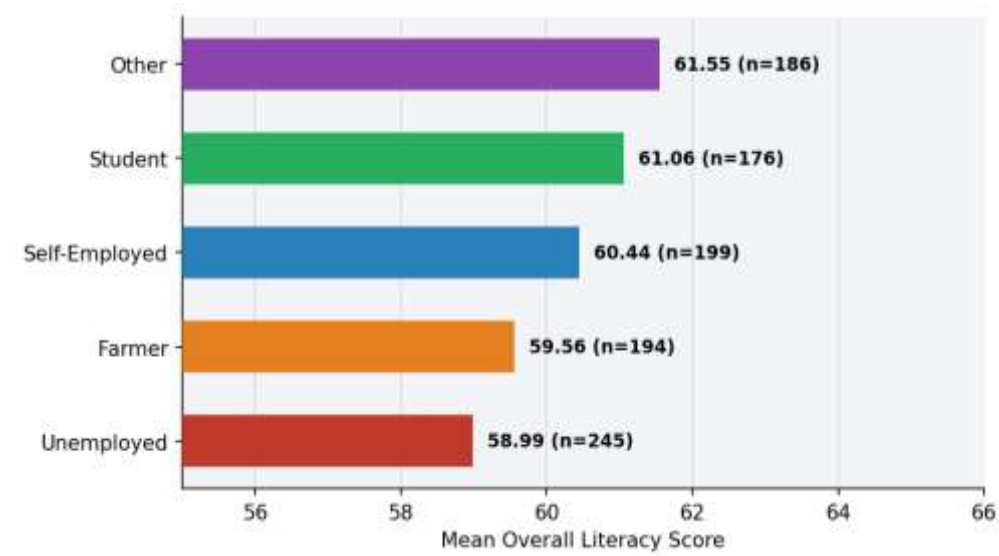


Figure 5: Mean Overall Literacy Score by Employment Status.

Close consideration deserves the relatively poor performance of unemployed members and the farmers. These two groups are the most structurally vulnerable in the sample: unemployed persons have acute time, motivation, and contextual support constraints to learn digital skills, and farmers, especially in rural areas, might have the most disconnections between the content of EdTech training and their daily digital routines. Mabina *et al.* (2025) also posit that training in EdTech that is not contextualised to occupational and cultural realities of learners always results into reduced transfer of learning, and the present findings are in line with this argument. The small difference in performance of students ($M = 61.06$) was possibly due to their

comparative experience with structured learning settings and not due to a digital independent advantage.

4.7. Pearson Correlation Analysis

Table 4.4 presents SPSS Pearson correlation coefficients between key engagement and performance variables and the Overall Literacy Score. The results reveal uniformly weak correlations across all engagement metrics: modules completed ($r = -0.040$), quiz performance ($r = -0.025$), session count ($r = 0.005$), and adaptability score ($r = 0.013$). None of these correlations approach conventional thresholds of statistical or practical significance.

Table 5: SPSS Pearson Correlation – Engagement Variables and Overall Literacy Score.

Engagement Variable	Pearson Correlation (r)	Sample Size (n)	Significance
Modules Completed	-0.040	1000	Negligible
Quiz Performance	-0.025	1000	Negligible
Session Count	0.005	1000	Negligible
Adaptability Score	0.013	1000	Negligible

The lack of significant correlations between engagement measures and literacy results is a theoretically important and problematic result. The common wisdom of education technology research is that the degree of engagement, in terms of modules followed, sessions, and performance on quizzes, is a good indicator of learning results (Wang *et al.*, 2024). The statistics presented here directly do not meet this assumption. Importantly, it can mean that interaction

in this regard is mostly performative but not substantive: participants can be going through modules and sessions without the in-depth, culturally contextualised cognitive work that transpires into sustained digital competence. According to Eppard *et al.* (2021), no purpose is to make learners engage in EdTech engagement that is not culturally relevant, i. e. unless the content, tasks, and the design of digital training can appeal to the

cultural frameworks of learners, more completed modules cannot give better results. These positive relationships are quantitative indicators of such a radical stance.

4.8. Employment Impact of Digital Training

Figure 6 presents the proportion of participants who reported that digital training improved their employment prospects. Only 29.5% (n = 295) reported a positive employment impact, with 70.5% (n = 705) reporting no impact. This is arguably the most critical finding in the dataset, and its implications extend far beyond the descriptive.

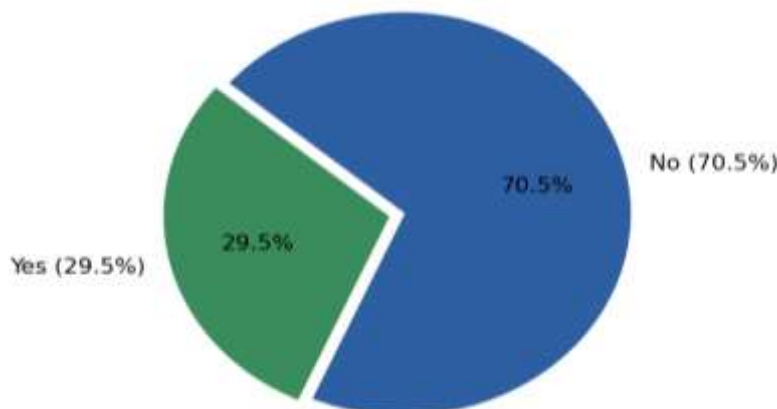


Figure 6: Proportion of Participants Reporting Employment Impact from Digital Training (N = 1,000).

Using disaggregated employment impact by education level, the situation is no better or even worse with more education the participants who had no formal education reported impact of 32.1% on employment, primary level reported 27.0% impact, secondary reported 30.4% and high school level reported 29.1% and with that the picture is not improving with higher education levels, a flat distribution revealed no meaningful basis between the level of education and the practicality of digital training. This observation is directly applied to the critical framework of the study. Nyaaba et al. (2026) assert that none of the EdTech programmes designed without considering the cultural and economic background of their target populations are structurally likely to yield significant livelihood results. Most people emanating in rural, low-income, and occupationally marginalised groups who are the overwhelming majority in this study, have seemingly received quantifiable scores in terms of digital literacy without the economic or employment payoff (Halperin, 2017; Gomez del Rey et al., 2016). It is this disparity between technical achievement of scoring and real-life results that makes the study experience the most sobering under-result: that, though EdTech, when shown to improve measured literacy, might not lead to cultural-relevant outcomes unless anchored in participant real livelihood needs and cultural contexts.

4.9. Chapter Summary

The data that are highlighted in this chapter demonstrates a fairly complex and highly important dataset. Training yielded large, non-random increases in literacy scores in all domains and demographic lines; but engagement indicators do not correlate with outcomes, employment effect is low in the vast majority of cases, and OLS demographic differences are small despite huge disparities in structural advantage. Taken together, these findings are in line with the theoretical argument of the study that the outcomes of EdTech cannot be properly comprehended using a culturally neutral perspective. The evidence recommends a programme yielding quantifiable but superficial digital competency acquisition, out of touch with the realities and livelihood needs of the participants - a combination directly expected by the critical frameworks of Mabina et al. (2025) and Nyaaba et al. (2026). The findings will be used in Chapter Five to generate culturally responsive EdTech design recommendations.

5. CONCLUSION AND RECOMMENDATIONS

5.1. Introduction

This is a summary conclusion chapter of the study, which summarises the main findings of the

study, provides conclusions based on the theoretical review as well as the data analysis, gives actionable guitar recommendations to EdTech practice and policy, and provides the direction of future research. Throughout, the chapter retains its critical stance: that educational technology is not a culturally neutral tool, and that fair results rely on inherently on its being created, implemented, and assessed within, not outside the, cultural realities of people it is designed to serve.

5.2. Summary of Findings

Four findings came as a result of the study. First, the critical literature review supported that characteristic of some dimensions such as power distance, individualism-collectivism, and uncertainty avoidance are the main predictors of the perception, usage, and resistance to digital tools (Dalle et al., 2024; Mabina et al., 2025). Mainstream EdTech platforms encode first-order assumptions about learning and assessment that are structurally mismatched to collectivist as well as orally centred educational cultures (Nyaaba et al., 2026; Castañeda and Selwyn, 2018). Second, digital training generated significant pre-to-post literacy improvements in all three domains totaling about 35 points on all the sub-population groups. Third, returns were equally distributed regardless of education, income, or employment, with almost no Pearson correlations between the intensity of engagement and outcomes, indicating quantitatively but qualitatively superficial competency gains. Fourth, only 29.5% of respondents attested to better opportunities, which was consistent across all education sub-groups, presenting a serious disconnect between the outputs of EdTech and its cultural applicability (Eppard et al., 2021; Halperin, 2017).

5.3. Conclusions

Four major conclusions are made. First, cultural factors of EdTech implementation carry structural meaning and cannot be mitigated by technical solutions: the ongoing mismatches between mainstream platform preconceptions and the non-Western models of learning are a structural equity factor that cannot be overcome by education intensity training. Second, the consistency of literacy gains in structurally heterogeneous populations showcases a design that has breadth at the expense of depth, i.e. covering all participants with the same surface-level results but not producing differentiated and contextualised digital capability. Third, the non-relationship between score gains and employment influence shows that contemporary EdTech

programmes are measuring the wrong things; scores not yielding livelihoods are instrumentally hollow despite the level of statistical importance. Fourth, the concept of digital neocolonialism (Nyaaba et al., 2026) is empirically supported: a programme that yields quantifiable yet culturally disconnected results among rural, low-income communities prioritizes Global North competency standards over Global South livelihood needs.

5.4. Recommendations

Based on the results and conclusions of the conducted study, the subsequent set of recommendations is offered to EdTech developers, policymakers at the institutional level, and programme designers:

1. EdTech programmes that target rural and low-income citizens should culturally co-design their programs, with participation of community members, local educators, and knowledge holders in content development, assessment models and learning outcomes, to ensure that they match real livelihood requirements and cultural models of the population (Shonfeld et al., 2021; Eppard et al., 2021).

2. The new metrics of training effectiveness should stop on post-training scores and transition to longitudinal outcome measures: employment impact, income change, and sustained use of skills that indicate whether EdTech is generating culturally meaningful change or not (Wang et al., 2024).

3. To transcend the surface level homogenous results this study shows, digital training curricula have to be contextualized based on the learner context, such as education level, occupation, and conditions of access to digital technology (Dalle et al., 2024; Gomez del Rey et al., 2016).

4. The institutional EdTech procurement policies should put in place evaluation structures that explicitly determine the cultural adaptability and equity implications of digital tools prior to adoption, especially in Global Souths where risks of digital neocolonialism are the highest (Nyaaba et al., 2026; Facer and Selwyn, 2021).

5.5. Recommendations to Future Research

In this study, the results and limitations would point out four areas of priority in the future research:

1. It requires longitudinal studies that follow participants 1224 months after training to understand whether the gains in scores are sustained, transferred to workplace setting, or lost without the digital infrastructure support (Alam and Mohanty, 2023; Mittelmeier et al., 2016).

2. The least-impact sub-groups (unemployed and

farming populations in deep rural locations) would need to be part of qualitative research to produce culturally-grounded interpretations of why training does not lead to employment results and what context-dependent redesign would entail (Lally et al., 2018; Halperin, 2017).

3. The study of urban, semi-rural, and rural populations is needed to determine whether the lack of location-based OLS variation in this data corresponds to true equity or the masking of structural inequality in aggregate data – a fact which Mittelmeier et al. (2016) directly addresses.

4. The theoretical gap of how to integrate generative AI in digital literacy training and the cultural equity results is an acute concern, as the use of AI-powered EdTech in Global South environments continues to expand, and the cultural threats of algorithmic bias that Nyaaba et al. (2026) list as the

latest phase of digital neocolonialism persist.

5.6. Closing Reflection

The data examined here is a warning portrait: a training programme that can generate astounding score increases, but with little practical effect, bringing all the learners to the same level on paper, whilst structurally marginalized populations have no more economic strength than they had before. This work does not oppose EdTech and rather supports EdTech that puts culture into consideration, because the former is one of the pillars of learning, not its hindrance. Digital training will remain a tool of inequality replicated in the name of combating inequality until the cultural dimensions are put at the heart of EdTech design, deployment, and evaluation.

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