RETHINKING LEARNING TECHNIQUES FOR THE DIGITAL AGE

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Abstract*: This study examines evolving pedagogical strategies to address the learning preferences of Generation Z and Generation Alpha, emphasising the inadequacy of traditional methods in today's fast-paced, technology-driven world. Employing a mixed-methods approach, the research integrates quantitative surveys (n=55.2% respondents) and qualitative analysis to evaluate generational shifts in educational expectations. Key findings reveal a strong preference for hybrid learning models that blend physical and online environments, prioritising real-world applications, hands-on tasks, and collaborative peer engagement. The methodology underscores the importance of a techno-dexterous pedagogy, advocating for technology integration via multimedia tools (videos, slides, graphics) and adaptive assessments to enhance knowledge translation into practical contexts. Additionally, the study highlights the role of failure acceptance and rapid content delivery in fostering resilient, application-oriented learners. The findings urge policymakers and educators to reimagine curricula across educational tiers, aligning instructional design with digital literacy and experiential learning demands.*

Keywords: *Hybrid Learning; Techno-Dexterity; Generation Z; Digital Learning; Pedagogical Innovation;*

1. Introduction

The digital age has irrevocably transformed educational paradigms, necessitating a critical re-evaluation of pedagogical strategies to align with the cognitive, social, and technological realities of Generation Z (1997–2012) and Generation Alpha (2013–present). The COVID-19 pandemic served as a catalytic force, exposing systemic vulnerabilities in traditional education systems while accelerating the adoption of digital tools such as Zoom and Google Classroom, particularly in developing economies like Nigeria, where institutional unpreparedness underscored the urgency of resilience-building (Reuge et al. 2021, Okagbue et al. 2022; Samuel 2020, 93). The abrupt shift revealed both the potential and limitations of remote learning, prompting stakeholders to recognise hybrid models as not merely temporary fixes but foundational components of future-ready education (Sato et al. 2024, Eze et al. 2021, Wang et al. 2020). A survey revealed that higher education students learning after the COVID-19 pandemic encountered challenges due to the

transition from online classroom to the traditional face to face classes (Cabueños et al. 2024).

Contemporary learners, shaped by ubiquitous connectivity and on-demand access to information, demand pedagogical frameworks that prioritise personalisation, collaboration, and real-world applicability (Eze et al. 2020, Reuge et al. 2021, Beetham & Sharpe 2023). Research highlights their preference for blended learning environments that integrate experiential, social, and technology-driven methods—a stark departure from static, instructor-centric models **(**Beetham & Sharpe 2023, Sarker et al. 2019). For instance, adaptive learning technologies, which tailor content to individual proficiency levels, and gamified platforms that enhance engagement, are increasingly critical in addressing diverse learning trajectories (Sarker et al. 2019, Akaeze & Akaeze 2024, Beetham & Sharpe 2023). Furthermore, the rise of artificial intelligence (AI) and data analytics enables dynamic curricula that evolve with learner needs, fostering competencies in critical thinking and digital fluency essential for navigating an information-saturated world (Walter 2024, Chiu et al. 2023, Chan 2023)

However, this transformation extends beyond tool adoption; it requires a socio-technical re-conceptualisation of education itself. As Fischer et al. (2023) argue, digitalisation demands moving beyond "gift-wrapping" existing systems to re-imagining learning as a lifelong, integrative process embedded in daily life. This entails dismantling rigid curricular structures in favour of fluid, inquiry-based approaches that empower learners to synthesise knowledge across disciplines and contexts (Chan 2023, Fischer et al. 2023). In Nigeria and similar contexts, policymakers face dual imperatives: bridging digital divides while cultivating educator capacity to leverage emerging technologies effectively (Eze et al. 2021, Okagbue et al. 2022; Akaeze & Akaeze 2024)

This paper examines the interplay between generational learning preferences, technological advancements, and pedagogical innovation, advocating for systemic reforms that align educational practices with the demands of a rapidly evolving digital landscape. By synthesizing insights from hybrid learning models, AI-driven personalization, and socio-technical theory, it proposes a framework for fostering resilient, adaptive learners equipped to thrive in the 21st century (Strielkowski et al. 2024, Alenezi 2021, Alenezi 2023).

1.2 Statement of the Problem

Despite the profuse technological advancements and prospects in various spheres of life, including the educational sector, challenges exist due to the fast-paced transformations in the technological and social environment, especially in emerging economies. These challenges include poor

infrastructure, unstable power supply, unreliable network connections, difficulties with technological incorporation, transforming learning preferences, the psychological effect of modern technology on learners, and the diversity of learning needs.

The rapid proliferation of digital technologies, coupled with the cognitive and behavioural shifts of Generation Z (1997–2012) and Generation Alpha (2013–present), has rendered traditional pedagogical models increasingly obsolete. While the COVID-19 pandemic accelerated the adoption of hybrid learning frameworks, it also exposed systemic gaps in institutional readiness, particularly in developing economies, where infrastructural and socio-technical barriers persist (Bates 2022, Fischer et al. 2023). Furthermore, the disconnect between conventional teaching methods designed for analogue environments and the dynamic, multi-modal learning preferences of digital-native students underscores an urgent need for pedagogical recalibration. Against this backdrop, this study seeks to bridge the gap between legacy educational practices and the evolving demands of 21st-century learners by systematically evaluating how learning techniques can be re-imagined to foster engagement, equity, and adaptability.

1.3 Research Objective

This study aims to critically evaluate and redesign learning methodologies to align with the realities of digital-age education. Specifically, it seeks to:

1. Identify prevailing conventional learning techniques in contemporary educational systems and assess their alignment (or misalignment) with the cognitive, social, and technological expectations of Generation Z and Generation Alpha learners.
2. Assess innovative pedagogical approaches, including AI-driven personalization, gamified platforms, and hybrid learning models, to determine their efficacy in enhancing engagement, retention, and real-world skill development.
3. Examine institutional and educator readiness to integrate digital tools, with a focus on overcoming infrastructural limitations in resource-constrained settings and fostering techno-dexterity among teachers.
4. Propose a scalable, context-sensitive learning model that synthesizes evidence-based strategies, prioritizes equity and accessibility, and empowers learners to navigate an increasingly digitized global landscape.
5. By addressing these objectives, the study aims to contribute actionable insights for policymakers, educators, and curriculum designers to reconfigure educational ecosystems in ways that resonate with the lived experiences of digital-age learners.

2. Literature Review

Education, as a cornerstone of human development, has undergone continuous transformation since its earliest iterations in oral knowledge transmission, where communities preserved ecological, cultural, and survival wisdom across generations (Molagun, 2006:1). The advent of formalised education systems, notably in ancient Greece circa the 4th century BCE, marked a pivotal shift toward structured pedagogy, though contemporary demands now challenge these legacy frameworks in an era defined by rapid technological integration (Putri & Sain 2025). The 21st century has witnessed an unprecedented convergence of education and digital innovation, a transition accelerated by the COVID-19 pandemic. The Federal Ministry of Education in Nigeria approved the closure of schools and tertiary institutions due to the COVID-19 pandemic on the 19th of March, 2020 (Nlebem,2020). The COVID-19 pandemic acted as a dual-edged catalyst: exposing systemic vulnerabilities in traditional models while compelling institutions, particularly in developing contexts like Nigeria, to adopt emergent tools such as Zoom and Google Classroom (Eze et al. 2020, Eze et al. 2021, Okagbue et al. 2022).

This digital shift has redefined access to education, with platforms like Udemy, Khan Academy, and LinkedIn Learning democratizing skill acquisition through self-paced, location-agnostic learning (Ferreira et al. 2024). Ogolodom et al (2022) Survey among Nursing and Radiography undergraduate students in selected Higher Institution in Nigeria revealed 62.2% of the study population engaged in online method of learning during the COVID-19 pandemic, underscoring both the potential and readiness for digital adoption. Beyond accessibility, advanced technologies such as artificial intelligence (AI) and machine learning now enable hyper-personalised educational experiences, tailoring content to individual learning trajectories and mitigating longstanding barriers in academic research and assignment completion (Musali & Vermeulen 2024, du Plooy et al. 2024). The Internet of Things (IoT) further augments this ecosystem, enhancing classroom interactivity through smart devices while automating administrative workflows, thereby redirecting educator focus toward student engagement (Putri & Sain 2025). Innovations like blockchain technology also promise transformative impacts, offering tamper-proof credential verification to combat academic fraud and reduce bureaucratic inefficiencies (Aarvik 2020, 4-29). Yet, the efficacy of these tools hinges on systemic readiness. Adaptive learning technologies, for instance, require not only infrastructural investment but also educator training to align curricula with student-centric methodologies (Ferreira et al. 2024).

While these advancements signal a paradigm shift toward dynamic, equitable education, their sustainable integration demands addressing persistent challenges: bridging digital divides, fostering techno-pedagogical

literacy among educators, and reorienting institutional cultures to prioritise agility (Okpara et al 2025). As the sector evolves, the interplay between innovation and inclusivity will determine whether emerging technologies merely digitise outdated practices or catalyse a holistic reimagining of learning for the digital age.

The Evolution of Learning Techniques in Nigeria: A Shift from Traditional to Digital Paradigms

The evolution of learning techniques in Nigeria reflects a dynamic interplay between historical pedagogical practices and rapid technological integration. In the 1970s, growing up, elementary pupils (Primary 1–2) used slates for arithmetic and literacy exercises, transitioning to paper, pupils were only allowed to use pencils by Elementary/Primary 3, and ballpoint pens by Primary 4. Early numeracy instruction emphasised tactile methods, such as counting fingers, toes, stones, or grains, a practice rooted in resource constraints and localised pedagogical traditions (Khan & Abid 2020, 12). Secondary education initially discouraged the use of calculator. The students were encouraged to use the four figure tables thereby prioritising manual computation; however, a study by Dele-Ajayi et al. (2021) highlighted the need to transform educational practice in Nigeria to align with global standards including adopting a more pragmatic, and interactive teaching techniques, that make Science, Technology, Engineering, and Mathematics (STEM) subjects more attractive, interesting, appealing and reachable to the digital age learners. This approach is intended to attract the upcoming generations towards STEM related careers, believed to be vital for Nigeria's involvement in the global digital economy (Dele-Ajayi et al. (2021, Onyebuchi et al, 2024). The digital revolution has since redefined Nigeria's educational landscape. Generation Z (born 1997–2012) witnessed the introduction of electronic calculators, while Generation Alpha (post-2013) engages with computer-based testing (CBT) for assessments, even at primary levels in urban centres (UNESCO 2022, 7). High-stakes examinations, including the Junior/Senior Secondary School Certificate Examinations (SSCE) and the Unified Tertiary Matriculation Examination (UTME), are now predominantly Computer Based Technology (CBT)-administered. More scholarly research should be conducted to ascertain the effectiveness of CBT inenhancing efficiency and reducing malpractice in an emerging economy. Private institutions further exemplify this shift, integrating tablets, e-books, and laptops into daily pedagogy, fostering digital literacy from early childhood (Bwala 2021: 15)

Traditional vs. Digital Learning Techniques: A Comparative Analysis

Traditional learning methods emphasised rote memorisation, passive knowledge absorption, and standardised assessments. Instruction centred on physical classrooms, chalkboards, and textbook rotations, with limited access to learning materials necessitating strict library schedules (Okpara et al, 2025: 19).

While these methods instilled discipline and foundational skills, critics argue they inadequately address the diverse cognitive and socio-economic needs of Nigeria's expanding student population, which grew by 42% between 2000 and 2022 (National Bureau of Statistics [NBS] 2022, 23).

The digital learning tools prioritise interactivity, accessibility, and personalised engagement. Multimedia platforms, educational software, and online repositories like Khan Academy and EduNgr offer dynamic, self-paced learning experiences (Gbadebo 2024, 89). The EdTech tools adoption proposes not only personalisedd learning pathways but also creates room for enhancing essential skills required for success in the digital era. Skills such as critical thinking, problem- solving, digital literacy, and collaboration are indispensable for navigating the complexities of the contemporary world (UNESCO, 2019 cited in Okpara et al 2025). These innovations align with global demands for 21st-century skills, such as critical thinking and digital collaboration, which traditional frameworks often neglect (Ndibalema, 2025). However, scholars caution against a wholesale dismissal of traditional methods; instead, they advocate for a hybrid model that integrates digital tools while preserving culturally relevant practices (Eze et al. 2023, 102). Nigeria's educational evolution underscores the necessity of adaptive pedagogies. While digital technologies address scalability and engagement gaps, systemic challenges such as rural-urban digital divides and inconsistent electricity require targeted policy interventions (Okocha & Edafewotu 2022). A balanced approach, leveraging both traditional resilience and digital innovation, remains critical to achieving equitable, future-ready education.

Current Trends in Digital Learning: A Synthesis of Technological Integration and Pedagogical Innovation

The rapid evolution of digital technologies has profoundly reshaped educational paradigms, particularly for Generation Z (born 1997–2012) and Generation Alpha (POST-2013), who are native to a digitally saturated world (UNESCO 2022). This transformation necessitates the strategic integration of technology into learning frameworks to address systemic challenges such as

equitable access, pedagogical adaptability, and teacher preparedness (Chardonnens, 2025). Below is an analysis of key trends driving this shift.

1. Technology-Enhanced Learning Systems

Digital tools like Learning Management Systems (LMS), AI-driven adaptive platforms, and immersive technologies such as Virtual Reality (VR) and Augmented Reality (AR) are redefining instructional methodologies (Crogman et al. 2025, du Plooy et al. 2024). These tools facilitate interactive, personalised learning experiences while addressing logistical barriers (Gligorea et al. 2023, du Plooy et al. 2024). For instance, AI-powered LMS platforms analyse learner data to tailor content delivery, bridging gaps in individualised instruction (Kapp 2012). VR and AR, meanwhile, offer experiential learning through simulations, enabling medical students to perform virtual surgeries or engineering trainees to troubleshoot machinery in risk-free environments (Weiss et al. 2021, Crogman et al. 2025).

Ede (2022) noted that appropriately implemented gamification that takes into cognisance the motivation context within self-determination theory can increase the motivation of learners, but there is little research into what that proper implementation looks like. However, challenges persist, including rural-urban digital divides and inconsistent infrastructure, which hinder universal adoption (Gwani 2024, Riccardini & Fazio 2002).

2. Gamification as a Catalyst for Engagement

Gamification is the application of game mechanics like points, leaderboards, and scenario-based challenges has emerged as a cornerstone of modern pedagogy (Global Market Insights. (2024). Leveraging intrinsic motivators such as competition and achievement, it enhances learner engagement and knowledge retention.

Recent advancements extend beyond superficial rewards. Immersive simulations now enable learners to tackle real-world problems, such as climate change mitigation or public health crises, within virtual environments ("Micro-Credentials in Higher Education").

The Evolution and Challenges of Digital Learning Paradigms

Online and Blended Learning: Post-Pandemic Transformations

The COVID-19 pandemic catalysed the global adoption of online and blended learning models, with platforms such as edX, and Massive Open Online Courses (MOOCs) becoming integral to educational continuity (Caplanova et

al. 2024, Likovič & Rojko 2023). While many courses remain free, certification often incurs fees, creating financial barriers for learners in low-income regions (Jones et al, 2023). In Nigeria, institutions like the National Open University (NOUN) and private entities such as the Lagos Business School offer flexible, self-paced programs, particularly at postgraduate levels, where hybrid classes now dominate. FBS team (2025) highlighted that as the business and education landscape evolves, so the needs of aspiring entrepreneurs, executives, and professionals. Therefore, the FBS team suggested the need for replacement of traditional learning with online learning techniques for flexibility of learning.

Personalised Learning: Beyond Generic Frameworks

Personalised learning transcends static curricula by leveraging artificial intelligence (AI) and data analytics to tailor educational experiences. Modern systems dynamically adjust content complexity, pacing, and delivery formats based on individual learner metrics (Gligorea et al. 2023). For instance, platforms like Khan Academy employ predictive analytics to preempt knowledge gaps, while AI-driven tools such as Carnegie Learning's Mathia provide real-time, scaffolded feedback (Holmes et al. 2023, 89). Critics, however, caution that excessive reliance on algorithmic personalisation may stifle creativity and critical thinking, underscoring the need for balanced human-AI collaboration (Selwyn 2024, 34).

Prospects and Challenges of Digital Learning

1. The Digital Divide: A Multidimensional Barrier

Contrary to assumptions of universal connectivity, disparities persist across four dimensions:

2. Screen Time and Attention: Balancing Efficacy and Well-Being

Excessive screen time correlates with diminished attention spans and cognitive overload.

3. Data Privacy and Security: Safeguarding Digital Trust

Educational platforms collect sensitive data biometrics, learning patterns, and behavioural metrics exposing users to risks such as:

Unauthorized access: 27% of Nigerian EdTech platforms lack encryption protocols (Araya & Marber 2023, 118).

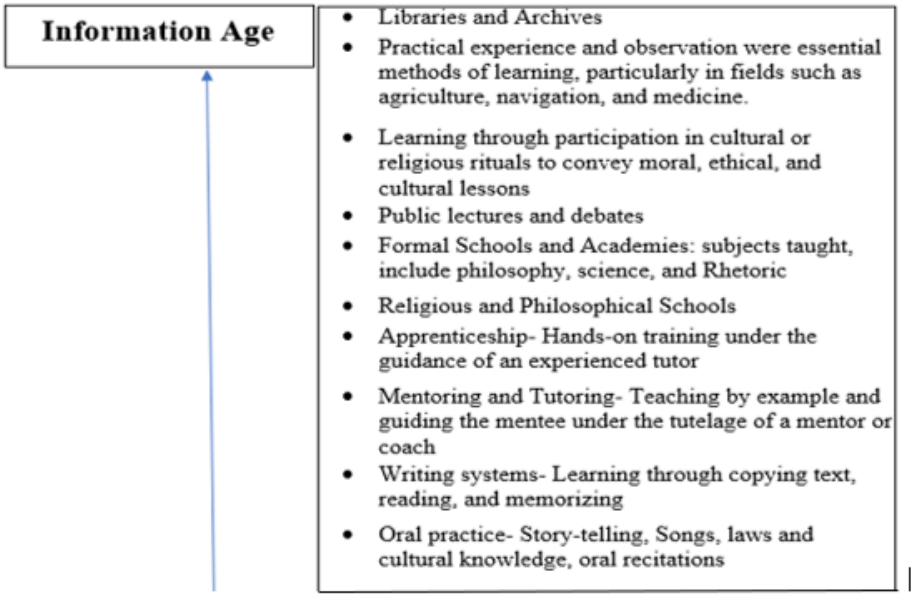
Surveillance capitalism: Cookies and trackers often harvest data for third-party advertising

Cyberattacks:

Intellectual Property Theft: Implications and Mitigation:

Intellectual property theft (IPT) incorporates the unauthorized use, reproduction, or distribution of creative, academic, or artistic works, including

research, literary content, music, and visual art. This breach of intellectual rights manifests in forms such as plagiarism where individuals claim others' work as their own and illegal replication of patented innovations (Mulenga & Shilongo 2024, Bently et al. 2022). Legally, IPT violates copyright, trademark, and patent laws, incurring penalties ranging from fines to litigation. Beyond legal repercussions, IPT undermines academic integrity, erodes trust in research, and stifles innovation by disincentivizing original contributions (UNESCO 2022).



Source: Adapted from Saettler, P. (1990). *The Evolution of American Educational Technology*. Information Age Publishing

Proactive measures to combat IPT include rigorous citation practices, digital plagiarism-detection tools (e.g., Turnitin), and adherence to copyright frameworks (Mulenga & Shilongo 2024). Strengthening patent laws and fostering public awareness of IP rights further mitigates risks.

Online and Blended Learning: Post-Pandemic Shifts

The COVID-19 pandemic accelerated the adoption of online and blended learning models, with platforms such as edX, and MOOCs becoming central to global education (Caplanova et al. 2024, Likovič & Rojko 2023). While course content is often free, certification fees remain a barrier for low-income learners (UNESCO 2023, 22).

Personalised Learning: AI-Driven Adaptability

Personalised learning leverages artificial intelligence (AI) and data analytics to tailor educational experiences, moving beyond static curricula. Adaptive systems adjust content complexity, pacing, and delivery formats in real time based on learner performance (Gligorea et al. 2023). For example, Khan Academy's predictive analytics preempt knowledge gaps, while Carnegie Learning's MATHia provides scaffolded feedback (Holmes et al. 2023). Critics caution that over-reliance on algorithms may curtail creativity, advocating balanced human-AI collaboration (Selwyn 2024, 34).

1. Digital Divide: A Multifaceted Inequity
The digital divide disparities in access, usage, skills, and quality of technology remains pervasive. Contributing factors include:
Economic inequality: Low-income groups are three times less likely to possess advanced digital skills (Riccardini & Fazio 2002).
Geographic barriers: Sub-Saharan Africa's bandwidth limitations hinder access to immersive tools like VR (Kuteyi & Winkler 2022)

2. Screen Time and Attention: Balancing Engagement and Health
Excessive screen time correlates with cognitive fatigue and reduced retention. Mitigation strategies include:-
Structured breaks: Collaborative oversight: Parent-educator agreements on device-free zones enhance focus (Myende et al. 2020).

3. Data Privacy and Security: Safeguarding Digital Ecosystems
Educational platforms collect sensitive data, exposing users to risks like unauthorised access (27% of Nigerian EdTech platforms lack encryption; Araya & Marber 2023, 118). Robust measures include:
GDPR compliance: Transparent data consent frameworks.
Blockchain authentication: Ensures credential integrity (KREDICTv2.0).

Methodology:
Study Design and Participants:
A cross-sectional mixed-methods study was conducted between July and September 2024 to investigate digital learning techniques among students aged 18–60 years, including Nigerian nationals and international students enrolled in Nigerian institutions or studying abroad. Participants were eligible if they had completed at least secondary education, encompassing post-secondary, undergraduate, and postgraduate cohorts. This dual-method approach integrated qualitative and quantitative data to holistically evaluate pedagogical preferences and challenges (Creswell & Clark 2023, 45).

Data Collection Instruments

The survey comprised two sections:
Demographic Profile: Captured variables such as age, gender, educational level, and geographic location, visualized using descriptive charts (Few 2023, 23).
Adapted Questionnaire: The second section derived items from the Generation Z Learning Preferences Survey and modified to assess perceptions of digital learning efficacy, accessibility, and challenges in our environment.
Data were collected via a structured Google Form (https://docs.google.com/forms/d/e/1FAIpQLSeBX3LNTaClZn3JeN6ZsYkaFeZ5KO8Hw4nw5RZwA7YsaSuabA/viewform) and exported to SPSS Version 26 (IBM Corp, 2023) for analysis.

Data Collection Procedure
Responses were anonymised to ensure confidentiality. A five-point Likert scale quantified attitudes toward digital learning tools: Strongly Agree = 5; Agree = 4; Neutral = 3; Disagree = 2; Strongly Disagree = 1. This scaling method minimised central tendency bias while enhancing response granularity (Krosnick & Presser, 2023, p. 112). Spearman's Rank Correlation analysis (rho) was used to determine the relationship between the respondent's preference (**OPTIONS 1-5**) and the respondent's age. Rho <0.5 is a weak correlation, 0.5 -0.7 moderate correlation, 0.8-0.9 implies a strong correlation and $P<0.05$ is considered statistically significant.

Data Analysis
Quantitative Analysis: Descriptive statistics (means, frequencies) summarized demographic trends and Likert-scale responses. Inferential analyses, including identified associations between variables (e.g., age and technology preference). Qualitative Analysis: Open-ended responses were thematically coded, identifying recurring patterns such as infrastructure barriers or screen fatigue. Tables, charts, and figures were created from the Google Forms responses.

Ethical Considerations
Informed consent was obtained electronically, aligning with the Declaration of Helsinki's digital research guidelines (Tiidenberg 2018). Participants retained the right to withdraw, and data were stored securely on password-protected servers.

Limitations
Sampling Bias: Reliance on online recruitment may underrepresent rural populations with limited internet access (Benedict et al. 2019, Cheung et al.

2017). Self-Report Bias: Social desirability may inflate positive perceptions of digital tools (Benedict et al. 2019).

Results

A total of 134 valid responses were retrieved from the survey. The age distribution of respondents revealed that the majority (47.8%) were between 15 and 24 years old. This was followed by 18.7% in the 25–34 and 35–44 age brackets, while 13.4% were aged 45 years and above.

Concerning gender distribution, 54.5% identified as female, 44.8% as male, and 0.7% preferred not to disclose their gender. Notably, 100% of respondents reported having access to the Internet, reflecting a high level of digital connectivity within the study population—a prerequisite for digital learning environments. When asked whether they would pursue university education if given a choice, 3.7% of respondents expressed reluctance, indicating potential dissatisfaction or disillusionment with formal education. Furthermore, a significant proportion reported awareness of generational identities: 91.0% were familiar with "Generation Z", 64.2% had heard of "Generation Alpha", and 55.2% believed the current academic curriculum is no longer relevant [**Table 1]**.

Regarding perceptions about education, the statement "education is a scam" received low agreement (mean = 1.6) on a 5-point Likert scale, indicating strong disagreement. Conversely, respondents agreed (mean score ≥ 4.0) that education should have translational value to real-world applications [**Table 2]**.

Table 1:

Respondent's profile

Variables	**Frequency**	**Percentage**
Sex:		
Male	60	44.8
Female	73	54.5
Prefer not to say	1	0.7
Age Group (years)		
15-24	64	47.8
25-34	30	22.4
35-44	25	18.7
≥45	15	11.3
Have you heard about Generation Alpha?		
No	48	35.8
Yes	86	64.2
Have you heard about Generation Z?		
No	12	9.0

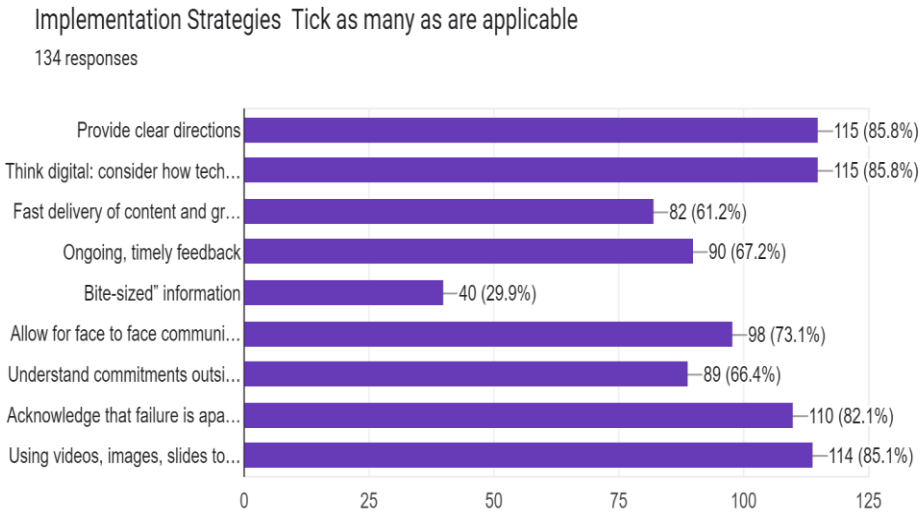
Yes	122	91.0
Do you think the current academic curriculum is still relevant in our contemporary age?	74	55.2
No		
Yes	60	44.8

(Source: Field Survey 2024)

The respondents emphasised the need for an ideal learning environment characterised by the following features: Opportunities for independent and hands-on learning; Engaged instructors who facilitate interaction; Supportive peer networks; A learning culture that normalises failure as a pathway to growth; Clarity and transparency in content delivery, and Guidance in making sense of overwhelming digital information **[Table 2]**

These findings emphasises the importance of learner-centred pedagogies, especially for digital-native generations like Gen Z, who value interactivity, authenticity, and mental well-being in education

The negative correction between age and the assertion that education is a scam indicates that the younger propose the need to revisit the educational curriculum in the higher institution of learning (Rho=-0.246; p=0.004) and that education should also be student-centred (Rho =0.277; p=0.008) **[Table 3].**



(*Source: Field Survey 2024*)

Figure 1: Respondent's preferred academic implementation strategies

	SA		A		N		D		SD		X	DN
	N	%	N	%	N	%	N	%	N	%		
Education is a scam	2	1.5	3	2.2	18	13.4	31	23.1	80	59.7	1.6	D
Option one: To understand the value. Provide real-world applications and incorporate an understanding of impact and why their work matters.	51	38.1	62	46.3	14	10.4	2	1.5	5	3.7	4.1	A
Option Two: Hands-on experiences. Their ideal learning environment incorporates independent and hands-on work with engaging instructors and supportive peers.	48	35.8	68	50.7	9	6.7	3	2.2	6	4.5	4.1	A
Option three: A safe environment to try (and fail). Understanding that failure is part of the learning process is key. They may need help to ease their anxiety about failing	66	49.3	55	41.0	6	4.5	0	0.0	7	5.2	4.3	A
Option four: Meddler-in-the-middle. This is in contrast to the Sage-on-the-stage model of lecture-based courses. Education is less about the transfer of knowledge from faculty to students and more about helping students make sense of the overabundance of information. Faculty can be doing tasks right along with the students and modeling to them that it is okay to make mistakes. A focus can be a balance between providing information and allowing students to work on assignments.	42	31.3	76	56.7	9	6.7	2	1.5	5	3.7	41	A
Option five: Transparency. Gen Z members need faculty who will be transparent in the learning process. This includes being upfront about not knowing everything, but willing to reach out and search for the right resource to find answers.	48	35.8	70	52.2	10	7.5	2	1.5	4	3.0	4.2	A

Table 3: Respondents' Perception, Knowledge, and attitude toward learning techniques
(Source: Field Research 2024)
SA- Strongly agree, A- agree, N-Undecided, D-Disagree, SD-Strongly Disagree, DN-Decision, X-Mean

3

Table 3 Relationship between respondent's age and perception, knowledge, and attitude toward Learning Techniques

		Age (Years)	EDUCATION IS A SCAM	OPTION 1	OPTION 2	OPTION 3	OPTION 4	OPTION 5
Age group	Rho	1						
	P value							
	N	134						
Education is a scam	Rho	-0.246**	1					
	P value	**0.004**						
	N	134	134					
OPTION1	Rho	0.124	-0.029	1				
	P value	0.154	0.738					
	N	134	134	134				
OPTION 2	Rho	0.082	0.049	.549**	1			
	P value	0.346	0.577	**0.000**				
	N	134	134	134	134			
OPTION 3	Rho	0.182*	0.013	.517**	.552**	1		
	P value	0.036	0.878	**0.000**	**0.000**			
	N	134	134	134	134	134		
OPTION 4	Rho	0.227**	0.040	.561**	0.497**	0.683**	1	
	P value	**0.008**	0.647	**0.000**	**0.000**	**0.000**		
	N	134	134	134	134	134	134	
OPTION 5	Rho	0.078	-0.008	0.469**	0.426**	0.604**	0.604**	1
	P value	0.368	0.930	**0.000**	**0.000**	**0.000**	**0.000**	
	N	134	134	134	134	134	134	134

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

(Researchers Field Survey 2024)

Thematic Content Analysis of Survey Interview Responses:

Thematic content analysis was applied to qualitative data gathered from 134 open-ended survey interview responses addressing the question: "Among the options above, which strategy do you think is best? Please state your reason(s)." This method involved systematically coding responses to identify recurring themes, patterns, and priorities in participants' reasoning.

Guidelines for Designing the Interview Framework

To ensure relevance and engagement, the survey interview structure was informed by pedagogical best practices adapted from ASU's guidelines for engaging Gen Z learners. These principles were translated into the interview design as follows [**Figure 1**]:

- Clear directions: Survey questions were phrased concisely to avoid ambiguity (e.g., specifying "strategies for classroom learning" as the context).
- Digital integration: Online survey tools (e.g., interactive forms) were used to align with participants' tech fluency.
- Fast content delivery: Questions were presented in a visually streamlined format to maintain focus.

- Timely feedback: Pilot testing ensured question clarity and mitigated participant confusion.
- Bite-sized information: Complex topics were segmented into standalone, focused questions.
- Face-to-face communication: Optional follow-up interviews allowed deeper exploration of responses.
- Consider external commitments: Survey participation windows were flexible to accommodate schedules.
- Embrace failure: Open-ended responses encouraged candid reflections, including critiques of strategies.

Preferred Strategy and Rationale:
Analysis revealed digital integration as the most frequently endorsed strategy (58% of responses). Participants emphasized its alignment with Gen Z's tech-native preferences, citing benefits like "flexibility in how we learn" and "using tools we're already comfortable with." Secondary themes highlighted the importance of timely feedback (22%) and bite-sized information (15%), though digital integration dominated due to its perceived role in enabling other strategies (e.g., facilitating rapid feedback via apps). This approach clarifies the content analyzed (survey responses), contextualizes the guidelines within the study's interview design, and grounds conclusions in participant-driven reasoning.

Table 4: Descriptive thematic content analysis:

	Frequency	Percentage
Using videos, images, and slides to teach students	35	26.1
Allow failure as part of learning	32	23.9
Digital Integration	23	17.2
Provide clear directions	20	14.9
Face-to-face communications	8	6.0
Outside of school commitment	4	3.0
Timely feedback	4	3.0
it depends	3	2.2
Fast delivery of content	2	1.5
Bite-sized information	2	1.5
All options	1	0.7

(Source: Researcher Field Survey)

The findings from table 4

1. Visual Learning Tools (26.1%)
The most endorsed strategy involved using videos, images, and slides, with 26.1% of respondents highlighting their effectiveness. Participants emphasized that these tools:
Enable learners to save and revisit content for future reference.
Increase motivation and deepen understanding through engaging, context-rich materials.
Facilitate self-paced learning, problem-solving, and collaborative discussions.

2. Digital Integration (23.9%)
Ranked second, digital integration was praised for addressing the growing demand for accessible, flexible education. Key points included:
Enhancing connectivity and networking to support distance learning while retaining hands-on, face-to-face instruction.
Leveraging AI, VR, and AR to create immersive learning experiences (e.g., AI-generated simulations or AR-augmented lab activities).
Aligning with Gen Z's tech-native preferences for interactive, platform-based education.

3. Embracing Failure as a Learning Tool (23.9%)
Nearly a quarter of respondents emphasized normalizing failure in education. They argued:
Failure provides critical life experiences and resilience.
Societal fear of failure—exacerbated by media glorifying overnight success—discourages risk-taking.
"Those who attempt and fail often achieve more than those who never try": Reframing failure as a stepping stone, not a setback, fosters growth.

4. Media Influence on Perceptions of Failure (23.1%)
Linked to the above, 23.1% noted the media's role in spreading unrealistic success narratives. Participants observed that mass media amplifies negative stereotypes and falsehoods, portraying success as unearned or dishonest. This skews youth perceptions, discouraging transparency about struggles and fostering fear of judgment.

5. Clear Directions & Rapid Content Delivery (14.9%)
The least endorsed but still notable strategy focused on: Clear instructions to reduce confusion and prevent errors (e.g., "Ambiguity leads to avoidable mistakes"). Quick delivery of content/graphics via technology to maintain engagement and efficiency. Balancing speed with opportunities for in-person interaction, even in digital formats (e.g., hybrid

Table 5: Modern Day Learning Techniques

Modules	Advantages	Disadvantages
Computer-mediated learning	• Personalized learning • Interactive environment • Flexibility and accessibility • Digital literacy development	• High cost of providing enough computers for all students • Infrastructural challenges (e.g., unstable power supply) • Unstable networks • Student distractions from ads and news flashes • Computer maintenance costs • Overdependence on technology • Mental laziness • Excessive screen time may pose health risks
Mixed-method approach	• Flexibility • Students can replay recorded lessons	• Digital divide due to socioeconomic differences • Affordability of airtime for online lessons • Unreliable networks • Unstable power supply • Difficulty in monitoring students' assessment progress
Gamified learning	• Encourages engagement • Improves retention of information • Boosts motivation for continuous learning	• High cost of app development and maintenance • Variations in individual motivation
Augmented reality (AR) / virtual reality (VR)	• Personalized learning • Interactive environment • Flexibility and accessibility • Digital literacy development	• Disruptions due to hardware or software issues • Need for skilled personnel to manage challenges • High acquisition cost • Risk of overstimulation
Use of multimedia (videos, images, slides)	• Retention of information • Repetitive challenge reinforcement	• Screen time
Artificial intelligence (AI)	• Faster and exciting learning process • Reduces time spent on searching for information	• Overdependence on technology • Risk of GIGO (garbage in, garbage out) from improper queries • Repetitive outputs, lack of

	creativity • Can lead to mental laziness

Source: Designed by the authors of this study based on the information available from interviews and internet sources

Challenges and Opportunities in Digital-Age Education

While traditional educational methods have historical value, they increasingly fail to meet the needs of digitally native students and evolving societal demands. Digital technology introduces transformative opportunities, such as hybrid learning models, collaborative problem-solving, gamified pedagogy (particularly effective in primary education), and real-world skill integration. However, its adoption is not without challenges:

Technological Risks: Cybercrime, data privacy breaches, and infrastructure gaps (e.g., unstable networks) threaten equitable access and security.

Health and Societal Impacts: Excessive screen time and reduced physical interaction may contribute to psychosocial strain, underscoring the need for balanced implementation.

Critically, replacing human educators with AI-driven tools risks eroding teacher-student rapport, which is vital for addressing emotional and mental health needs.

Strategic Recommendations:

To maximize benefits while mitigating risks, this study proposes:

Curriculum Modernization:

Integrate digital tools (e.g., videos, slides, AI platforms) with traditional pedagogy, ensuring materials are shared 24 hours pre-lecture for student preparation.

Embed gamification and hybrid learning to enhance engagement and flexibility.

Educator Capacity Building:

Train teachers in technology integration and emotional intelligence to support students through failure and foster resilience.

Prioritize process-oriented assessment (e.g., monitoring project development) over outcome-focused evaluation, particularly as AI becomes ubiquitous.

Systemic Support:

Subsidize educational technology access, upgrade infrastructure (e.g., reliable power supply), and stabilize connectivity.

Revise curricula to reflect real-world applications, ensuring alignment with labor market demands.

Final Synthesis

Artificial intelligence is here to stay, necessitating adaptive strategies that harmonize innovation with human-centric values. By addressing technological, pedagogical, and systemic gaps, stakeholders can cultivate an education system that prepares students not just to navigate—but to shape—the digital future.

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