

Artificial Intelligence Diagnostics, Declining Innovation, Vacuousness and the Reading Culture of Undergraduates in Nigerian Universities Evidence from Tai Solarin Federal University of Education, Ogun State

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Abstract

The accelerating diffusion of generative artificial intelligence (AI) into higher education has raised concerns that the convenience of machine-produced text may be displacing sustained reading, independent reasoning and originality among undergraduates. This study examined the relationship between habitual AI use and the reading culture of undergraduates at Tai Solarin Federal University of Education, Ogun State, Nigeria, across four dimensions: over-reliance on summarisation and paraphrasing, reduced critical thinking, shallow reading habits, and neglect of conventional academic resources. The study integrates Vygotsky's sociocultural theory of learning and Bandura's social learning theory with human capital and absorptive-capacity perspectives, framing cognitive offloading as a problem of capability formation and not of pedagogy alone. A descriptive survey design was adopted. Eighty undergraduates were selected by purposive, criterion-based sampling and completed a structured twenty-item questionnaire measured on a four-point Likert scale, with a decision criterion of 2.50. Data were analysed using frequencies, percentages and mean ratings. Findings indicate that respondents are broadly aware of AI applications ($\bar{x} = 3.10$), acquire that competence informally through peers and social media rather than through institutional training ($\bar{x} = 3.10$), and routinely delegate summarisation, paraphrasing and conceptual explanation to these tools (cluster $\bar{x} = 2.84$). Respondents further reported asking AI to explain difficult concepts in place of consulting textbooks ($\bar{x} = 3.15$), diminished attention span for print materials ($\bar{x} = 2.87$), difficulty concentrating on extended academic texts ($\bar{x} = 3.10$), and reduced retention of course content ($\bar{x} = 2.80$). Notably, respondents did not report that academic texts had become harder to read ($\bar{x} = 2.42$), suggesting attenuated engagement rather than diminished capacity. Because respondents are pre-service teachers, any deficit in their own capability formation is potentially self-propagating across the education system. The study recommends curricular integration of critical thinking and AI ethics, assessment redesign that rewards process evidence, and institutional policy on acceptable AI use.

Keywords: absorptive capacity, artificial intelligence, cognitive offloading, human capital, reading culture, undergraduates.

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1. Introduction

Reading is the mechanism through which formal learning is transmitted and the principal instrument by which a society reproduces its intellectual capital. It is not a mechanical act of decoding but an integrative process engaging the affective, perceptual and cognitive domains simultaneously, through which learners interpret, evaluate and generate meaning (Collins & Cheek, 1999). Where reading culture is robust, so too are the analytic and innovative capacities on which social and economic advancement depend. Conversely, a decline in sustained reading among those in tertiary education carries consequences that extend well beyond individual academic performance.

Against this background, the diffusion of artificial intelligence into higher education represents a development of considerable ambivalence. AI-based applications offer genuine pedagogical promise: they tailor material to individual proficiency levels, deliver immediate corrective feedback, simplify dense terminology, and sustain motivation through adaptive and gamified formats (Khosravi et al., 2022; Khan & Rasheed, 2023; Noor & Hussain, 2024). In resource-constrained systems, mobile-accessible AI platforms extend such support to learners who would otherwise lack it (Okafor & Ibrahim, 2023). Yet the same affordances that make these tools attractive also make them substitutable for the cognitive labour they were intended to scaffold.

The concern animating this study is that AI functions for many undergraduates as a shortcut rather than a support. Where a tool can produce a summary, an outline or a finished paragraph on demand, the student may bypass the reading, brainstorming, drafting and revision through which comprehension is consolidated. Oladimeji and Yusuf (2023) and Eze and Chibueze (2022) have characterised this dynamic as a double-edged simplification of academic labour, in which improved output coexists with impaired skill acquisition. The result is a species of intellectual vacuousness: fluent production without corresponding understanding. Framed economically, it is the divergence of credential from capability.

Nigerian universities present a context in which this risk is amplified. Large class sizes dated instructional materials and limited individual attention already constrain personalised reading instruction (Ogbomo & Ivwighrehghweta, 2020; Olubunmi, 2022), while poor reading habits among Nigerian students are a documented and longstanding concern (Aina et al., 2025; Onuoha & Unegbu, 2013). Into this environment AI has arrived rapidly and, for the most part, without institutional governance. Existing Nigerian scholarship has concentrated on AI adoption, infrastructural readiness and



ethical policy (Eze et al., 2023; Ibrahim & Musa, 2023; Chukwu & Adebola, 2022); comparatively little has examined what habitual AI use is doing to reading behaviour itself, and less still has situated that question within the economics of human capability formation.

This study therefore examines the relationship between artificial intelligence use and the reading culture of undergraduates at Tai Solarin Federal University of Education, Ogun State, Nigeria. Specifically, it seeks to: (i) examine over-reliance on AI-generated summaries and paraphrasing; (ii) assess the implications of AI use for critical thinking and innovative capacity; (iii) determine the extent of shallow reading habits associated with AI use; and (iv) establish the degree to which conventional academic resources are being neglected. Four corresponding research questions guided the inquiry, each addressed by a five-item cluster in the survey instrument.

2. Literature Review

-Artificial Intelligence in Educational Contexts

Artificial intelligence denotes the capability of computational systems to perform tasks conventionally associated with human intelligence, including learning, reasoning and decision-making (Oladipo et al., 2023). The field expanded markedly after 2012 with the application of graphics processing units to neural networks, and again after 2017 with the transformer architecture underpinning contemporary generative systems (Okeke & Adeyemi, 2022). Since the early 2020s, generative applications producing text from natural-language prompts have moved from research settings into everyday student use.

In education specifically, AI applications match reading materials to learner proficiency (Khosravi et al., 2022); supply instant corrective feedback supporting metacognition and self-regulation (Noor & Hussain, 2024); clarify unfamiliar vocabulary in context; and sustain engagement through adaptive challenge (Ogunleye & Abiodun, 2022). Adelakun and Nwankwo (2023) report comparable gains in student engagement within Nigerian universities.

-Reading Culture and Its Decline

Reading culture is a non-material cultural form, residing in norms, values and habituated dispositions rather than in physical resources alone. Its cultivation has conventionally depended on a distributed set of stakeholders: schools embedding information literacy in the curriculum, libraries providing access and guidance, and parents modelling the practice at home (Lyons, 2022; Okolo & Ivwighrehweta, 2020).



Empirical work in Nigeria and West Africa has consistently documented weak reading habits among students and a corresponding effect on academic outcomes (Owusu-Acheaw & Larson, 2024; Akanda et al., 2023; Nwokocha, 2024; Oribabor, 2024). What distinguishes the present moment is that AI supplies, for the first time, a functional substitute for reading rather than merely a competing demand on students' time. Where television or social media displaced reading by occupying attention, generative AI displaces it by delivering the product of reading without the process.

-Cognitive Offloading and Critical Thinking

The mechanism most plausibly linking AI use to diminished reading capacity is cognitive offloading: the delegation of memory, retrieval and reasoning tasks to external systems. Offloading is not inherently harmful and may free cognitive resources for higher-order work. The concern is that sustained offloading reduces cognitive effort altogether, producing a disposition sometimes described as cognitive laziness, in which the inclination toward deep and reflective processing weakens.

The effect is observable across the constituent dimensions of critical thinking. Analytically, AI can process information beyond human capacity, yet habitual dependence may erode the user's own facility for independent analysis. Evaluatively, AI-mediated filtering can improve source quality but may equally construct echo chambers that reinforce prior belief. Inferentially, predictive systems can support reasoning, but the opacity of their processes encourages users to accept generated conclusions without scrutiny. Longer term, dependence may reduce cognitive resilience, leaving learners less able to reason when the tools are unavailable (Oladimeji & Yusuf, 2023; Eze & Chibueze, 2022).

-Cognitive Offloading as a Human Capital Problem

The consequences of cognitive offloading extend beyond pedagogy into the formation of economically productive capability. Human capital theory holds that education generates returns by producing durable capacities embodied in the person — capacities that raise productivity precisely because they are internalised rather than externally held (Schultz, 1961; Becker, 1964). This framing sharpens what is at stake in substitutive AI use. Where a student delegates comprehension, synthesis and composition to an external system, the observable output is preserved while the embodied capacity is not formed. Credentials continue to be issued; the human capital they are presumed to certify is not accumulated. The result is a widening divergence between credential and capability, with consequences for employer screening, wage signalling and the measured returns to tertiary education.



The concern is more acute from the standpoint of innovation economics. Absorptive capacity — the capability to recognise the value of new information, assimilate it and apply it to productive ends — is a function of prior related knowledge held internally by the individual or firm (Cohen & Levinthal, 1990). It cannot be outsourced, because the capacity to recognise what is valuable is itself the product of accumulated knowledge. A graduate who has consistently offloaded the reading through which such knowledge accumulates enters the labour market with reduced capacity to absorb and exploit new information, irrespective of examination performance. Since innovation proceeds by recombining existing knowledge into novel configurations (Schumpeter, 1934), the erosion of internalised knowledge stock constrains innovative capability at its foundation.

The entrepreneurial implications follow directly. Opportunity recognition — the identification of latent market gaps — depends on domain knowledge and on tolerance for sustained, unstructured enquiry. The present findings report precisely the attrition of that tolerance: respondents affirmed that the ease of generating instant answers has decreased their patience for in-depth research ($\bar{x} = 2.70$). Where entrepreneurial competency is understood as the capacity to operate under ambiguity without a predetermined solution path, habituation to immediate machine-generated answers is developmentally adverse. This concern is amplified by the study site: as pre-service teachers, respondents will shape the human capital formation of subsequent cohorts, making any deficit in their own formation potentially self-propagating across the education system.

A qualification is warranted. The economic literature on skill-biased technological change indicates that complementarity, not substitution, generates the strongest returns: technologies raise the value of the human capabilities they cannot replicate (Autor, 2015). The policy implication is therefore not restriction but the cultivation of genuine complementarity — graduates who direct AI systems from a position of substantive knowledge rather than deferring to them from a position of its absence.

-Gap in the Literature

Existing empirical work on AI and reading is dominated by studies of learning gains, typically employing pre-test and post-test or survey designs, and situated overwhelmingly in Western contexts (Zawacki-Richter et al., 2019; Chen et al., 2021). Three limitations recur: a scarcity of longitudinal evidence; heavy reliance on self-reported data; and minimal attention to the teacher's role in mediating AI integration.

More fundamentally, the literature has been preoccupied with what AI can add to reading instruction and comparatively inattentive both to what habitual use may subtract from reading behaviour and to the implications of that subtraction for human capability formation. This study addresses that gap within a Nigerian undergraduate population.

-Theoretical Framework

The study is grounded in Vygotsky's sociocultural theory of learning and Bandura's social learning theory, and draws interpretively on the human capital and absorptive-capacity perspectives outlined above. Vygotsky's central proposition is that cognitive development is mediated by social interaction and by culturally available tools, and that learning occurs most productively within the Zone of Proximal Development (ZPD) — the interval between what a learner can accomplish independently and what becomes attainable with competent guidance.

AI applications may be understood as digital scaffolds operating within this interval: they supply real-time feedback, simplify complex text and calibrate difficulty to learner need (Khosravi et al., 2022). The theoretical value of the ZPD, however, lies equally in its account of scaffold withdrawal. Scaffolding produces development only when it is progressively removed as competence consolidates. An AI system that is continuously available, requires no negotiation and never withdraws does not scaffold the ZPD so much as collapse it, performing the task rather than extending the learner's independent range. In human capital terms, the scaffold that never withdraws produces output without producing capability.

Bandura's social learning theory supplies the complementary account of transmission. Behaviour is acquired through observation and modelling, and the present data indicate that undergraduates learn AI practices predominantly from peers and social media rather than through formal instruction. Where the modelled behaviour is substitutive rather than supplementary use, the norm propagates through peer networks unmediated by pedagogical judgement — a dynamic that helps explain both the speed of diffusion and the absence of ethical framing around it.

3. Methods and Materials

The study adopted a descriptive survey design, appropriate to its aim of characterising prevailing patterns of AI use and self-reported reading behaviour within a defined population rather than establishing causal relationships.



- Participants

The study was conducted at Tai Solarin Federal University of Education (TASUED), Ijagun, Ijebu-Ode, Ogun State, Nigeria. Established in 2005 as a state institution and adopted as a federal university in March 2025, TASUED is Nigeria's premier specialist university of education, and its undergraduate body consists predominantly of pre-service teachers. The site is therefore of particular relevance to the present inquiry: reading disposition among students preparing to teach carries consequences beyond their own attainment, since the habits they form are those they will subsequently model.

The accessible population comprised undergraduate students of the College of Humanities and the College of Science and Information Technology, enrolled in the 2024/2025 academic session. Eighty (80) respondents were selected using a purposive, criterion-based sampling technique, the inclusion criterion being self-reported prior use of at least one generative AI application for academic work. This criterion was adopted because the research questions concern the consequences of AI use rather than its prevalence; a probability sample of the general undergraduate body would have included a substantial proportion of non-users, for whom the twenty items would not have been meaningful. The sample is accordingly purposive rather than probabilistic, and the study is framed as exploratory rather than as a prevalence estimate. Table 1 presents the distribution of respondents by sex and Table 2 by age.

-Research Instrument

Data were collected using a researcher-designed structured questionnaire. Section A elicited demographic information; Section B comprised twenty items distributed across four five-item clusters corresponding to the four research questions. Items were scored on a four-point Likert scale (Strongly Agree = 4, Agree = 3, Disagree = 2, Strongly Disagree = 1). The criterion mean was set at 2.50: items attaining a mean of 2.50 or above were accepted as Agreed, and those falling below were recorded as Disagreed. Passive and participant observation supplemented the survey.

-Procedure and Data Analysis

Questionnaires were administered directly to selected respondents, retrieved on completion, coded and analysed. Demographic data were summarised using frequencies and percentages. The four research questions were answered using mean ratings, with cluster means computed to summarise each construct. Participation was voluntary, informed consent was obtained prior to administration, and responses were anonymised.

4. Results

Table 1:
Distribution of respondents by sex

Sex	Frequency	Percentage (%)
Male	40	50.0
Female	40	50.0
Total	80	100.0

Note. Field survey (2025).

Table 1 shows an equal distribution of respondents by sex, with 40 males (50%) and 40 females (50%).

Table 2:
Distribution of respondents age

Age (years)	Frequency	Percentage (%)
18–22	[]	[]
23–27	[]	[]
28–32	[]	[]
33 and above	0	0.0
Total	80	100.0

Note. Field survey (2025).

Research Question 1: Over-reliance on summaries and paraphrasing

Table 3:
Over-reliance on AI-generated summaries and paraphrasing (N = 80)

S/N	Item	N	Mean	Remark
1	I am aware of AI tools such as ChatGPT, QuillBot and Grammarly.	80	3.10	Agreed
2	I use AI tools frequently for my academic assignments and research.	80	2.55	Agreed
3	I use AI to summarise long textbooks, articles and lecture notes instead of reading the original texts.	80	2.60	Agreed
4	I frequently use AI tools to paraphrase my written assignments, term papers and projects.	80	2.84	Agreed
5	I learned to use AI tools for my studies primarily through peers and social media rather than formal training.	80	3.10	Agreed
	Cluster mean	80	2.84	Agreed

Note. Field survey (2025). Criterion mean = 2.50.

All five items exceeded the criterion, yielding a cluster mean of 2.84. Awareness of AI applications is near-universal ($\bar{x} = 3.10$), and respondents affirmed using AI to summarise texts in place of reading originals ($\bar{x} = 2.60$) and to paraphrase their own written work ($\bar{x} = 2.84$). The item of greatest institutional significance is the fifth: at a mean of 3.10, respondents indicated that their AI competence was acquired informally, through peers and social media, rather than through any formal university provision.

-Research Question 2: Reduced critical thinking

Table 4:
AI use and critical thinking (N = 80)

S/N	Item	N	Mean	Remark
6	I use ChatGPT, Gemini or Claude to summarise academic texts or articles.	80	3.11	Agreed
7	I use AI tools to generate ideas or outlines before writing an essay or term paper.	80	2.50	Agreed
8	I ask AI to explain difficult concepts instead of reading my textbook or course materials.	80	3.15	Agreed
9	I find it more difficult to read long, complex academic texts since I started using AI tools.	80	2.42	Disagreed
10	My attention span when reading printed books or academic journals has decreased due to quick AI answers.	80	2.87	Agreed
Cluster mean		80	2.81	Agreed

Note. Field survey (2025). Criterion mean = 2.50.

Four of five items met the criterion (cluster mean = 2.81). Respondents most strongly affirmed asking AI to explain difficult concepts in place of consulting course materials ($\bar{x} = 3.15$) and using AI to summarise academic texts ($\bar{x} = 3.11$). Item 9 fell below the criterion ($\bar{x} = 2.42$), indicating that respondents did not perceive complex academic texts as having become harder to read. Read alongside item 10 ($\bar{x} = 2.87$), this pattern suggests attenuated willingness to sustain attention rather than diminished reading capacity.

-Research Question 3: Shallow reading habits

Table 5:
Shallow reading habits (N = 80)

S/N	Item	N	Mean	Remark
11	I enjoy reading academic textbooks and scholarly articles in my free time.	80	2.55	Agreed
12	I usually read a text completely from beginning to end to understand the main context.	80	3.20	Agreed
13	I only read when examinations or continuous assessments are approaching.	80	2.32	Disagreed
14	I struggle to maintain focus when reading long, complex paragraphs.	80	2.54	Agreed
15	I prefer skimming or reading short summaries of long academic materials.	80	2.50	Agreed
	Cluster mean	80	2.62	Agreed

Note. Field survey (2025). Criterion mean = 2.50.

This cluster returned the lowest and least uniform result (cluster mean = 2.62). Respondents affirmed a preference for skimming and summaries ($\bar{x} = 2.50$) and difficulty sustaining focus across long paragraphs ($\bar{x} = 2.54$). However, two items complicate a straightforward reading of decline. Item 12 recorded the highest mean in the instrument ($\bar{x} = 3.20$), with respondents affirming that they read texts completely from beginning to end; and item 13 fell below the criterion ($\bar{x} = 2.32$), indicating that respondents rejected the characterisation of their reading as examination-driven. These findings are addressed in the Discussion.

-Research Question 4: Neglect of academic resources

Table 6:
Neglect of conventional academic resources (N = 80)

S/N	Item	N	Mean	Remark
16	AI tools have significantly reduced the time I spend reading physical textbooks and academic journals.	80	2.57	Agreed
17	I now prefer reading summarised AI bullet points over whole chapters or full-length articles.	80	2.60	Agreed
18	The ease of generating instant answers via AI has decreased my patience for in-depth research.	80	2.70	Agreed
19	I find it difficult to concentrate on long, complex academic texts since I started using AI.	80	3.10	Agreed
20	Using AI summaries has negatively affected my long-term retention of course materials.	80	2.80	Agreed
	Cluster mean	80	2.75	Agreed

Note. Field survey (2025). Criterion mean = 2.50.



All five items met the criterion (cluster mean = 2.75). Respondents affirmed that AI use has reduced time spent with physical texts ($\bar{x} = 2.57$), that they now prefer AI bullet-point summaries to full chapters ($\bar{x} = 2.60$), that instant answers have eroded their patience for sustained research ($\bar{x} = 2.70$), and — most strongly — that concentration on long academic texts has become difficult since adopting AI ($\bar{x} = 3.10$). Respondents also acknowledged reduced long-term retention of course material attributable to AI summaries ($\bar{x} = 2.80$).

5. Discussion

Taken together, the four clusters describe a population that has integrated AI deeply into its academic routine and that recognises, in its own self-report, the cost of doing so. The strongest and most consistent findings concern substitution: respondents use AI to summarise texts they have not read ($\bar{x} = 2.60$), to explain concepts in place of consulting course materials ($\bar{x} = 3.15$), and to paraphrase work they have written ($\bar{x} = 2.84$). This corroborates Oladimeji and Yusuf (2023) and Eze and Chibueze (2022), who characterise AI-assisted academic work as simplifying output while impairing acquisition of the underlying skill.

Read through the human capital lens, these findings describe a population accumulating credentials faster than capability. The reported deterioration in retention ($\bar{x} = 2.80$) is the clearest indicator: retention is the mechanism by which transient exposure becomes durable embodied capacity, and its erosion means that what is assessed is increasingly the output of the tool rather than the formation of the student. The accompanying decline in patience for sustained enquiry ($\bar{x} = 2.70$) bears directly on absorptive capacity, which depends on an internally held stock of prior related knowledge that cannot be externally sourced (Cohen & Levinthal, 1990). Graduates formed under these conditions may perform adequately on structured tasks while being less equipped for the unstructured, recombinative work on which innovation and enterprise depend.

The most consequential single finding, however, may be item 5. That respondents acquired their AI competence through peers and social media rather than institutional training ($\bar{x} = 3.10$) indicates that the norms governing AI use in the university are being set informally, by diffusion through student networks, in the absence of pedagogical or ethical framing. Interpreted through Bandura's social learning theory, this is precisely the condition under which substitutive rather than supplementary practice would be expected to propagate: the modelled behaviour is whatever produces

the fastest acceptable output, and no countervailing model is institutionally supplied. It also indicates that the appropriate intervention is not restriction but instruction.

The Vygotskian frame clarifies why continuous AI availability is problematic even where the tool is pedagogically well designed. Scaffolding within the Zone of Proximal Development generates development only through its progressive withdrawal. A system that is permanently available and never withdraws does not extend the learner's independent range; it substitutes for it. The cognitive work through which comprehension consolidates is being offloaded rather than performed.

Two findings, however, resist the decline narrative and warrant explicit acknowledgement. Respondents did not report that academic texts had become more difficult ($\bar{x} = 2.42$), and they affirmed reading texts completely from beginning to end ($\bar{x} = 3.20$) while rejecting the description of their reading as examination-driven ($\bar{x} = 2.32$). Two interpretations are available. The first is substantive: what has eroded is the disposition to sustain attention rather than the underlying capacity to read, which would suggest the condition is behavioural and therefore more readily reversible than a deficit account implies. The second is methodological: these items invite socially desirable responding more strongly than the others, and self-report may overstate conscientiousness. Because the study relies exclusively on self-report, the two cannot be distinguished here, and the finding is reported as an open question rather than resolved in favour of the study's hypothesis.

-Limitations

Four limitations qualify these findings. First, the purposive, criterion-based sampling strategy and the single-institution site jointly constrain external validity: the findings describe undergraduates at a specialist university of education who already use generative AI, and cannot be read as estimating the prevalence of AI use among Nigerian undergraduates generally. Second, because TASUED trains pre-service teachers, the sample is not representative of students in conventional universities, whose disciplinary reading demands differ; this is analytically useful for the human capital argument advanced here but limits comparative claims. Third, all measures are self-reported, with no behavioural or performance data against which to validate them, so claims about retention and concentration reflect perception rather than measured outcome. Fourth, the cross-sectional design cannot establish that AI use caused the reported changes, since students predisposed to shallow engagement may also be those most drawn to AI assistance. The findings should accordingly be read as exploratory and

as establishing a case for longitudinal, multi-institutional and mixed-methods investigation.

-Pedagogical and Economic Implications

The findings carry four implications for practice. First, because AI competence is being acquired informally, the pedagogical task is not to prohibit these tools but to model their disciplined use explicitly: institutions that leave the norm to peer diffusion will find it set for them. Second, assessment design bears directly on the problem. Where tasks can be completed satisfactorily by generating text on demand, students will rationally do so; assessments requiring process evidence, oral defence or engagement with specified primary sources restore the incentive to read, and in human capital terms preserve the accumulation of absorptive capacity that assessment is meant to certify. Third, library and information-literacy provision requires renewed emphasis, since the neglect of conventional resources documented here represents a reversal of decades of investment in reading infrastructure.

Fourth, and following from the complementarity argument, graduate employability policy should be reframed. If returns accrue to capabilities that technologies cannot replicate (Autor, 2015), then curricula should deliberately cultivate the judgement, synthesis and problem-framing that AI does not supply, rather than the reproducible output that it does. For a university training the next generation of teachers, this is not a peripheral consideration: the capabilities its graduates fail to form are those they will be unable to cultivate in others.

6. Conclusion

This study examined the relationship between artificial intelligence use and the reading culture of undergraduates at Tai Solarin Federal University of Education, Ogun State, Nigeria. Respondents reported extensive and largely substitutive use of AI applications, acquired informally rather than through institutional training, together with reduced time spent on conventional academic resources, diminished patience for sustained enquiry and impaired retention of course material. Countervailing findings on reading capacity and completeness suggest that what has been most affected is the disposition to engage deeply rather than the capacity to do so. Situated within human capital theory, the pattern describes the formation of credentials outrunning the formation of capability — a divergence with consequences for absorptive capacity, innovative potential and entrepreneurial competency. AI is not, on this evidence, inherently corrosive of reading culture; its effect depends on whether institutions govern

its use or leave that governance to the informal networks through which it currently spreads.

- Recommendations

Arising from the findings, the following recommendations are advanced:

- i. Educators should integrate critical thinking and AI ethics into the curriculum so that students are equipped to use these tools without forfeiting intellectual development.
- ii. Faculties should provide workshops and seminars on balancing AI assistance with independent problem-solving, positioning AI as a complement to rather than a substitute for learning.
- iii. University administrators should formulate explicit policy on acceptable AI use and resource the training required to implement it, so that institutional guidance displaces informal peer transmission as the primary source of student practice.
- iv. Assessment should be redesigned to reward demonstrable engagement with sources, thereby protecting the accumulation of embodied capability that credentials are presumed to certify.
- v. Comparable studies should be undertaken in conventional universities, and with probability samples, to establish whether the pattern observed among pre-service teachers holds across disciplinary contexts and at population scale.

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