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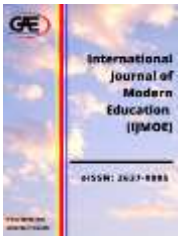

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TOWARDS RESPONSIBLE AI-ASSISTED TEXTBOOKS: ACCEPTANCE AND ENABLERS AMONG AFRICAN SCIENCE EDUCATORS

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Abstract:

Education is being reshaped by the rapid diffusion of generative AI tools, yet educators' acceptance of integration of generative AI into science textbooks development and use, particularly among African educators, remains underexplored. This study, grounded in the Technology Acceptance Model (TAM) examined the acceptance of AI-enabled practices in science textbooks among 100 educators from seven African nations participating in the 2025 Third Country Training Programme (TCTP). Using a 5-point Likert survey, the research tested perceived ease of use (PEOU), perceived usefulness (PU), attitudes toward use (ATU), and facilitating conditions (FC). The instrument showed high internal consistency (Cronbach's $\alpha = .898$; overall $M = 3.31$, $SD = 0.69$). The results indicated broadly positive acceptance; notably, PU emerged as the most influential determinant of attitudes, outweighing PEOU. Structural equation modelling supported all hypothesised paths: FC → PEOU ($\beta = 0.628$, $p < .001$) and FC → PU ($\beta = 0.696$, $p < .001$) were significant; both PEOU ($\beta = 0.516$, $p = .042$) and PU ($\beta = 1.578$, $p = .002$) predicted ATU, with PU the strongest driver; and FC exerted an indirect effect on ATU via PEOU ($\beta = 0.324$, $p = .020$). A clear "capability gradient" emerged: educators reported stronger knowledge than production-grade capacity to embed coding/simulations and AI steps into textbook workflows. Theoretically, the findings proven that improving facilitating conditions, such as reliable infrastructure and structured training, can convert tentative readiness into sustained and habitual AI integration within textbook ecosystems.

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Attitude toward Use (ATU); Facilitating Conditions (FC); Perceived Ease of Use (PEOU); Perceived Usefulness (PU); Technology Acceptance Model (TAM).

Introduction

AI leads on in constant changes of technology that affects economies, societies, cultures, and educations. Digital tools today can support active inclusion even for a variety of under-performing students learning in classrooms and on their own (Tondeur et al., 2017). They are also more important to help manage the speed of educational progress. More schools all over the world are going digital, and educational systems need to do things that help teachers and textbook writers face the moral, technical, and pedagogical problems that come with using technology (European Commission et al., 2017) even in the African region (Kala, 2023). African modernization and digital adoption are moving forward; however, each country has its own set of different obstacles and opportunities (Kala, 2023). In many places, it is difficult to do things because of infrastructure gaps, energy or connectivity, technology being too expensive, and problems of technical skills. Ministries and curriculum agencies are testing digital resources approaches; however, it is hard to use cloud tools or AI-enabled authoring because of bandwidth limitation, high cost of data, differences between urban and rural (International Telecommunication Union [ITU], 2024). However, African Union has the Continental AI Strategy which shows that the whole continent wants to use trustworthy development-focused AI (African Union, 2024). Because of multilingual curricula and local priorities, accessing textbook production needs local assessments and applications (UNESCO, 2023/2025).

Generative AI, as a result, is on the brink of release to aid in drafting, multi-model illustration, and workflow automation. However, the question of deploying it remains. Provenance and attribution rules for authorship and copyrights on AI-assisted outputs are being worked out between ministries and publishers. Efforts are being made to reduce bias-based hallucination in educational content. In African systems, these two aspects interact with political realities to determine whether authors may take, check, and maintain the AI (Kala, 2023) in actual textbook pipelines. However, they agree that in the near term, teachers' beliefs and acceptance of this integration may decide the fate of the national textbook pipeline. Research in digital pedagogy suggests that technology can make learning more exciting and interactive (Tondeur et al., 2017). However, a lack of training, a lack of access, and not knowing how well it would work are common issues. In many African settings, professional development is one of the many ways to solve persistent challenges (African Union, 2024; ITU, 2024). However, such preparation should concentrate on the responsible use of AI and common factors influencing

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digital pedagogy. Practice-oriented professional development will offer teachers and textbook authors the ability and trust to operate in context. This has resulted in interactive, student-centered learning and an increase in performance (Wu et al., 2023; Panja & Berge, 2021).

Guided by acceptance frameworks **TAM**, the perceptions frame in terms of **perceived ease of use (PEOU)**, **perceived usefulness (PU)**, **attitudes toward use (ATU)**, and **facilitating conditions (FC)** (Davis, 1989; Fathema et al., 2015; Renny et al., 2013; Venkatesh et al., 2003), the research study was conducted. In the African textbook ecosystems, FC implies infrastructure and institutional supports as well as AIP policies, copyright/data-privacy safeguards, and localized editing standards that collectively reduce the risk and cognitive demands memory for authors (African Union, 2024; UNESCO, 2023/2025). Therefore, this study investigates African educators in the 2025 TCTP to determine perceptions of the practice acceptance of AI-enabled practices in authoring science textbooks; the correlation of acceptance with practical albeit enabling training, infrastructure, institutional guidance factors unique to African systems and resulting implications for professional development and publishing policy that steer systems from ready to dependable, routinised AI-driven production. The theory of evidence from teacher-education studies suggests that perception correlates with organized training experiences and ready access to resources and supports. Thus, this model aligns with blended learning pedagogy recommendations that combine extensive behaviorist scaffolding with more constructivist (Panja & Berge, 2021; Wu et al., 2023) collaborative projects in the digital classroom.

Literature Review

African Structure Condition in AI Integration

In most of the African regions, education systems are increasingly incorporating digital tools and AI application into their curriculum renewal and textbook modernisation efforts. These tools include the AI-assisted tasks and interactive simulations in administration works as well as the teaching preparation. However, adoption effort always faces the hinder due to the educators' acceptance of integrating generative AI into science textbook development and use, particularly among African educators, remains underexplored (African Union, 2024; UNESCO, 2023/2025). Although studies in African teacher education report broadly positive attitudes toward educational technology including AI translation into routine practice is often constrained: limited hands-on training, uneven digital infrastructure, and inconsistent institutional support impede sustained use beyond initial enthusiasm (Oubibi et al., 2024; Shanmugam, Sivasangar, & Kannan, 2025). Beyond classroom use, textbook authors must satisfy stringent editorial and compliance requirements provenance and attribution, accessibility/UDL compliance, and multilingual localisation thereby raising the threshold for what constitutes "acceptance" in AI-enabled authoring workflows (UNESCO, 2023/2025).

African adoption of cloud-based and AI-enabled textbook workflows is determined by four interlocking restrictions: connectivity and usage, affordability internet and computer, availability electricity, and students and teachers' readiness. First, internet usage of Africa regions remains significantly lower even though the global internet usage has risen, and most population are still offline (Kala, 2023) as reported by ITU statistics proven that the endless gaps in meaningful connectivity and skills that restrict everyday use of cloud authoring tools (International Telecommunication Union [ITU], 2024). Beyond coverage, usage gaps are noticeable: ATU-R report (2024) that in majority Sub-Saharan Africa live within the weak

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coverage mobile-broadband which no allow the daily usage of the internet, while Central Africa is recorded as the world's widest coverage gap and directly limiting daily access to model-based services (ATU-R REPORT, 2024).

Second, affordability for both internet data and computer which limits daily practice. Alliance for Affordable Internet benchmarks entry-level data at ≤2% of monthly income (Kala, 2023); many African markets still exceed this threshold, while computer costs remain a primary limitation to most of the teachers (Alliance for Affordable Internet (2024), 2023, 2024; ATU-R REPORT, 2024; Kala, 2023). Cost-reduction efforts for handsets recognise that, **without affordable devices, educators cannot reliably run modern applications for textbook authoring** (ATU-R REPORT, 2024).). Third, availability electricity supply remains uneven. As reported by World Bank (2023), most of the countries in Sub-Saharan Africa have the largest deficits in electricity-access, indicating that the sustainable digital development growth highly depends on the stability of the electricity power supply. (World Bank, 2023). Fourth, at the students and teachers' readiness, programmes like UNICEF–ITU Giga aim to connect every school by 2030, mapping fibre/wireless/satellite options and market gaps. Until connectivity is mainstream, many teachers must rely on low-bandwidth, offline-first workflows and asynchronous upload policies (UNICEF & ITU, 2024).

Teacher-education studies revealed that digital tools enhance the efficiency of the engagement, differentiation, and assessment with the existing of structured, hands-on practice and continuously support from organization. Multiple case finding indicated that lecturers in two Southern African universities are not consistently and sustainability in integrating technology even though the high practice opportunities and local infrastructure available in university, then the attitude and readiness play the influencer effect (Schlebusch & Mushwana, 2024). In the other hand, across the African pre-service teachers, structured opportunities to design with AI tools (e.g., LMS, quizzes, collaboration apps) and explicit mentoring predict stronger intentions to use technology after graduation, reinforcing that practice and support and drive adoption of AI in school (Oubibi et al., 2024).

Acceptance Level in AI Integration in African Region

Emerging research on AI adoption within teacher education provides more granular evidence. Lots of study on the pre-service teachers reveal that factor of PU and PEOU are strongly sharpen the attitudes and intention to use AI applications than some social-influence variables (subjective norm). It implied that usability and clear benefits of AI integration matter are more than peer pressure in early AI uptake (Alejandro, Goles, & Mananay, 2024). Sanusi et al. (2024) also provided the supportive evidence on the intention to learn and use AI tools is driven by performance and effort anticipation and facilitating conditions likes training which aligning TAM pathways for AI specifically. Additionally, research finding on AI-in-education revealed that AI promotes learning when AI application is guided by teachers, and supported by capacity-building and policy clarity, not when applied as a black box (Garzón et al., 2025; UNESCO, 2023/2025).

When the AI tools are used to develop pedagogical skill likes the digital game-based learning, African pre-service cohorts report positive attitudes and perceived benefits with 21st-century skills likes creativity, collaboration, problem-solving on the students' scaffolds and assessment alignment. A South African TAM-grounded study reported constructive view on AI integrated in developing the pedagogical for sustainable STEM learning, with PU/PEOU as main

determining factor of intention (Gumbi, Sibaya, & Chibisa, 2024). Parallelly, the others research in higher-education contexts also indicated AI integration enhanced teamwork and communication skills, with the condition of the guidance to move and create the enthusiasm in application of AI tools (Zhu et al., 2024; Osorio Vanegas et al., 2025).

Meta-evidence clarifies that the awareness on the competencies and professional development designs posted the guide on the teachers' AI integration acceptance. Osorio Vanegas et al. (2025) identified seven important skills likes instructional design with tech, assessment, collaboration, communication, ethics as persistent requirement for effective technology integration among in-service teachers, underscoring the link between capability development and adoption. Additionally, Fabian et al. (2024) claimed that **TPACK-framed professional development** enhances technology-integration competence when it integrates modelling, guided rehearsal and authentic classroom enactment, with meta-analytic findings emphasizing the added value of strong design fidelity and sustained coaching (Fabian et al., 2024). Incorporating task–technology fit clarifies adoption dynamics: educators prefer tools that fit the job, such as AI authoring platforms with native citation/provenance, accessibility, and localisation supports (Goodhue & Thompson, 1995).

ICT and AI initiatives have the high possibilities in gaining the succeed when the prioritize students' needs, demonstrate clear advantages, and avoid overpromising the transformational power of technology (Hawkins, 2002; Tiene, 2004). Hence, the successful of the lesson or learning activities is determined by the ongoing support from the educators and students' active participation which paired with the digital tool resources (Tiene, 2004). So, the educators with AI tools knowledge and skills in integrating AI into instruction among the top factors to meaningful use (Pelgrum, 2001). At the school level, a good and successful examples of the integration of AI in closing the gaps across hardware, software, and training are depends on aligning **infrastructure and capacity** with curricular intent, mapping AI use to curriculum goals; and navigating tensions between technological change (Cheng & Townsend, 2000; Cheng, 2001; Cheng & Townsend, 2007). In African contexts specifically, adoption is stronger when ICT and AI solutions are **tailored to local needs and market realities** rather than modelled on high-income, formal structures (Davis & Ochieng, 2006).

Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM), proposed by Davis (1989), as the acceptance frameworks in this study which offer a coherent perspective in analysing the educator's belief and acceptance level. TAM identifies perceived ease of use (PEOU), perceived usefulness (PU), attitudes towards use (ATU), and facilitating conditions (FC) as primary determinants of intention and behaviour (Figure 1) (Davis, 1989; Venkatesh, Morris, Davis, & Davis, 2003).

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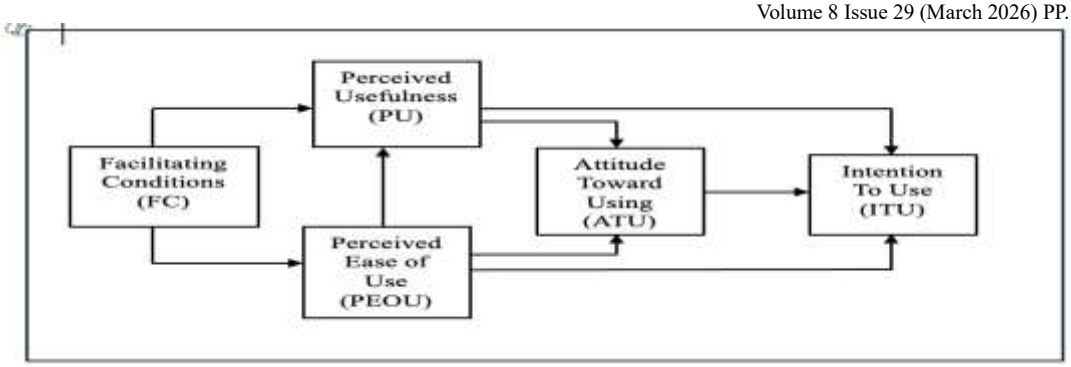

Figure 1: Technology Acceptance Model (TAM)
Sources: Davis (1989) and Venkatesh, Morris, Davis, & Davis (2003)

In African textbook ecosystems, FC encompasses not only infrastructure and institutional support but also explicit AI policies, copyright/data-privacy protections, and localised editorial standards elements that alleviate risk and diminish cognitive load for authors (African Union, 2024; Fathema et al., 2015; UNESCO, 2023/2025). The evidence base thus supports the study's focus: beliefs and acceptance (PEOU, PU, attitudes) rise when FC are designed into teacher education—structured, production-oriented practice; clear policy and integrity guidance (especially for AI); low-bandwidth-tolerant platforms; and mentoring that turns conceptual familiarity into authorship-ready capability (Schlebusch & Mushwana, 2024; Alejandro et al., 2024; Sanusi et al., 2024; Oubibi et al., 2024; Shanmugam et al., 2025). The PU and PEOU have undergone extensive validation in educational technology research, encompassing studies on AI adoption (Nguyen, 2023; Ahmed et al., 2022). Meta-analyses validated that these constructs substantially impacted educators' utilisation of digital learning tools (Ahmed et al., 2022). PU and PEOU are significant predictors of teachers' behavioural intentions to adopt AI platforms, explaining up to 60% of the variance (Ahmed et al., 2022; Hu et al., 2024). Additionally, a 2024 study of private school teachers in Azerbaijan revealed that Perceived Usefulness (PU) significantly predicted actual AI usage, whereas Perceived Ease of Use (PEOU) exhibited a weaker or inconsistent influence (Davis & Granić, 2024).

Methodology

Research Design

This study employed a quantitative cross-sectional survey to delineate African educators' beliefs and acceptance of generative AI tools in science textbook authorship. The research is grounded in the TAM which posits that PU and PEOU are primary determinants of the science educators' ATU. To account for the unique infrastructure challenges in the African context, the framework was extended to include FC as a critical external variable.

Context and Participants

The study sample consisted of 100 science educators from seven African nations—Namibia, South Africa, Lesotho, Ghana, Zambia, Malawi, and Eswatini who participated in the TCTP 2025. Purposive sampling ensured balanced representation across countries and captured varied contextual perspectives on AI integration in teaching and authoring (Creswell & Creswell, 2018).

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Instrumentation

An AI-Integrated Readiness Questionnaire was used to gather data. The instrument applied the Likert-type items (1 = Strongly disagree to 5 = Strongly agree) to assess PEOU, PU, ATU, ITU and FC among the educators' acceptance to incorporate generative AI tools in science textbooks. A mean acceptance score demonstrated substantial reliability (Cronbach's α = .898), in accordance with psychometric standards (Cronbach, 1951; Nunnally & Bernstein, 1994). The instruments were based on proven TAM scales and changed to focus on writing textbooks with AI. The AI-Integrated Readiness Questionnaire was divided into five construct: (1) PU, which study the efficient it was to create textbooks; (2) PEOU, which study the easiness for educators to use AI interfaces; (3) FC, which study easiness to get hardware, connect to the internet, and get help from the school; (4) ATU; and (5) ITU, which study at the "capability gradient" between general AI literacy and production-grade textbook authoring.

Expanded TAM with FC in African Context

To fulfil the need of the professional in developing science curricula, the TAM was modified by integrating the AI-assisted into practice. Besides measuring the usage of technology, PU was changed to measure how well AI to be able to make science textbook, for instance diagrams and lesson simulations. Likewise, PEOU was modified to focus the technical accessibility of generative AI interfaces for educators **easy to learn and apply** within existing textbook workflows with **minimal effort**.

In considering the geographical topography of the African education sector, the TAM was modified by integrating FC. This modification was essential to examine the role of external facilitators—namely, reliable internet connectivity, hardware accessibility, and institutional policy as principal mediators of technology acceptance among the 2025 TCTP participants. By incorporating these context-specific characteristics, the study transitions from a broad review of technology to a focused assessment of AI preparedness in educational settings with limited resources.

Data Analysis

Structural Equation Modelling (SEM) in SmartPLS was used to study the relationships between constructs (Hair et al., 2021). Descriptive statistics were utilized to determine mean scores for educator readiness, while path analysis was conducted to measure the comparative influence of PU versus PEOU on educator attitudes. Sample participation was voluntary and anonymous, with implicit consent; no personal identifiers were gathered, and data were securely stored. The results can be found in Table 2 and Figure 1.

Research Structure and Hypotheses

The interconnection between PU, PEOU, FC, and ATU among the African educator's readiness to integrate AI-enabled textbook in the classroom was investigated. Figure 2 depicts the conceptual model used in this study and
the four hypotheses as follows:

H1: FC positively influence PEOU of AI-enabled textbook-authoring tools.
H2: FC positively influence PU of AI-enabled textbook-authoring tools.

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H3: PEOU positively influences ATU toward ITU AI- enabled textbook-authoring tools
H4: PU positively influences ATU toward ITU AI- enabled textbook-authoring tools
H5 (mediation): PEOU mediates the relationship between FC and ATU, such that stronger FC improve PEOU, which in turn strengthens ATU.

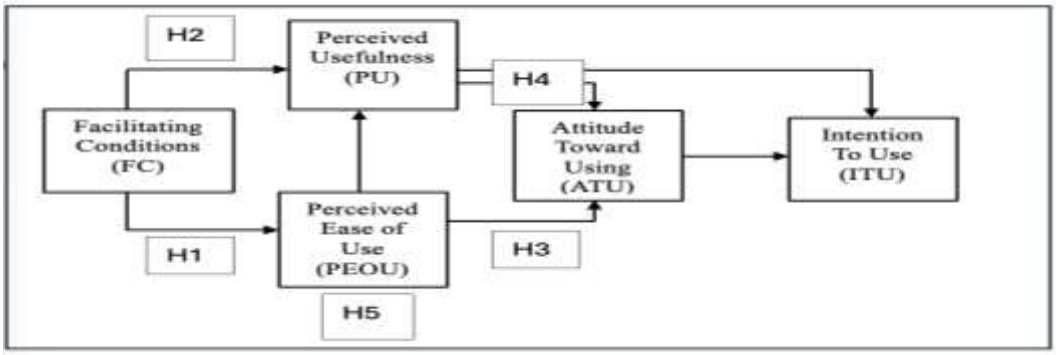

Figure 2: Hypotheses and Research Model

Source: Authors' Work

Result and Discussion

The result and discussion were based on the TAM to study African educators' PU and PEOU of integration AI tools in science textbook and the effect. The perceived value of AI is reflected in PU, while confidence in applying AI is reflected in PEOU. There were 100 of the science educators' participants from seven African nations country were identified were analyzed and recorded in Table 1.

Table 1: **Number of Participants from Seven African Nations**

Country	No of participants
Namibia	15
South Africa	15
Lesotho	15
Ghana	15
Zambia	15
Malawi	15
Eswatini	10

Table 2 presents descriptive statistics (mean and standard deviation) for 12 items measuring five dimensions related to the acceptance of AI-enabled textbook-authoring tools.

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Table 2: Descriptive Statistic for 12 Items in AI-Integrated Readiness Questionnaire

Dimension	M	SD
PEOU1	4.12	0.78
PEOU2	4.05	0.81
PEOU3	3.98	0.84
PU1	4.25	0.72
PU2	4.30	0.70
ATU1	4.10	0.76
ATU2	4.00	0.80
ATU3	4.15	0.75
FC1	3.85	0.88
FC2	3.78	0.91

The results demonstrate a high degree of acceptance for AI-assisted textbook-authoring technologies. PU was the most important factor in having a good attitude (Table 2). This indicates that African science instructors prioritise the practical value of AI specifically its capacity to improve material quality and decrease workload over its PEOU. African educators highly agree that AI tools are easy to learn and straightforward for writing and revision after the training in the TCTP. In alignment with the TAM, the high ratings for PEOU suggest that 2025 TCTP program effectively lowers the technical barrier for entry. However, a significant "capability gradient" persists; while educators found the tools easy to learn, they expressed lower confidence in moving from conceptual use to production-grade textbook authorship. The importance of the PEOU as a primer driver of attitudes and usage as emphasized by Davis, 1989; Venkatesh & Davis, 2000).

The results (Table 2) identified that African educators displayed particularly strong agreement on PU and PEOU, which revealed the highly **preferable** and acceptance in using AI in textbook authoring. These results fully agreed with the previous research on the TAM, which emphasizes PU and PEOU as primary indicators of technology adoption (Davis, 1989). Hence, in the effort in gaining the successful integration of AI in certain institutions or country, initial efforts must be focus on providing **continuously professional training, technical and device support**, and **exposure of AI tools integration** into existing pedagogical workflows. The "capability gradient" found here reveals that professional training needs to focus on general AI literacy as well as more specialised, integrated coaching. For AI to be used in science curriculum development in a way that lasts, there has to be localised support systems that lower the risks of infrastructure instability as it moves from "intention" to "routine use."

African's educators have gain the awareness on potentials of AI tools in enhancing the quality and reduce with word load and time that also aligned with TAM's finding that perception on usefulness of the tool is the strongest attitudinal lever (Davis, 1989). Attitude Toward Thirdly, ATU is favourable and the intention in utilized the AI tools (ATU1–ATU3 ≈ 4.00–4.15), from favourable to immediate adoption. But for the ATU2 with the question: I intend to use AI in the next textbook development cycle with the ATU2 mean values is 4.00 sits slightly low general attitude and desire to ulitize AI tools, signalling that environment and contextual problems may hinder the likelihood to the intention to integrate (Venkatesh et al., 2003).

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FC scored the lowest ratings compared to the others, which indicated FC is a major problem in Africa. These findings demonstrated that readiness attitudes towards AI cannot be effectively integrated into professional practice without rectifying systemic deficiencies in infrastructure, hardware accessibility, and institutional regulation. Educators have no confident on the availability of the facilities, device and enough training in their country that precisely the supports that TAM that facilitating conditions identify as prerequisites for translating positive perceptions into routine practice (Venkatesh et al., 2003; Venkatesh & Bala, 2008). So, the lower ratings for **FC** and **institutional readiness** may lag the educator's good intentions to apply the new technology in teaching and learning. These findings align with Venkatesh et al. (2003), who argue that external support and supportive environments with the continuous professional development are determinant for behavioural intention to be fully transfer and transform in practice and classroom.

Table 3: Direct and Indirect Effect Path Coefficients

Hypothesis	Relationship	β	t-value	p-value	Confidence interval (BC)		Results
					LL	UL	
H1	FC → PEOU	0.628	3.708	0.000	-0.050	0.837	Supported
H2	FC → PU	0.696	4.209	0.000	0.233	0.926	Supported
H3	PEOU → ATU	0.516	2.038	0.042	-0.032	0.934	Supported
H4	PU → ATU	1.578	3.110	0.002	0.245	0.955	Supported
H5 (mediation)	FC → PEOU → ATU (Indirect)	1.324	2.326	0.020	-0.025	0.590	Supported

The results of the SEM provide strong support for all hypothesized relationships (H1–H5) regarding the acceptance of AI-enabled textbook-authoring tools (Table 3). The structural model strengthens this research study by showing that institutional support (FC) is the main factors of acceptance. The structural equation model verifies that institutional support is the principal factor determining educator acceptability. Path analysis proves that FC strongly predict both PEOU and PU ($p < .001$), hence validating the expanded TAM with FC. This explains when the resources are limited, teachers' professional attitudes about how useful AI is can only be changed if they have reliable internet access and institutional support. External factors and environment shape beliefs about usability and utility (Venkatesh & Bala, 2008).

Without the device technology and internet, the teaching will be difficult to be conducted even though the educators have the high perceived into AI tools usage. These results indicate that when institutions furnish sufficient infrastructure, training, and support, educators are more inclined to regard AI tools as both accessible and advantageous. This corresponds with the extended TAM, which emphasises the impact of external factors on perceptions of usability and utility (Venkatesh & Bala, 2008).

Moreover, H3 was supported. Together with the diagram's strong PEOU → ATU linkage (H3) (β = .516) (Table 3), the model illustrates a cohesive belief-formation chain: in the presence of infrastructure and training, tools are perceived as more accessible; when tools are perceived as more accessible, they are evaluated as more beneficial; and when perceived usefulness is

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prominent, attitudes are reinforced. This suggests that educators are more likely to have positive attitudes towards the use of AI tools when they are seen as easy to use. In line with established TAM research, H4 exhibited the most significant relationship in the model, PU demonstrates the most significant direct impact on ATU (= 1.578, t = 3.110, p =.002), whereas PEOU also exerts a direct influence on ATU (H3) (=.516, t = 2.038, p =.042) (Davis, 1989; Venkatesh & Davis, 2000). This underscores the significance of perceived usefulness in shaping user attitudes, aligning with the original Technology Acceptance Model (Davis, 1989), which identifies perceived usefulness as a principal factor influencing technology acceptance behaviour.

The mediation hypothesis (H5) also received support. The indirect relationship from FC to ATU via PEOU was statistically significant (β = .324, t = 2.326, p = .020), demonstrating that PEOU functions as a significant mediator. This finding supports the notion that favourable institutional conditions foster more positive attitudes by initially improving perceptions of usability. Venkatesh et al. (2003) pointed out that these kinds of indirect effects are very important in determining how people will act in environments with a lot of technology. Looking at the path diagram (Figure 3) and the item means together makes the practical levers clearer. The primary reason PU → ATU (H4) is the most important driver is that the highest PU means (quality and efficiency gains) show that value signals (better drafts, time saved) seem to matter more than usability alone when educators decide whether to adopt something. The relatively lower FC means, and the modestly lower integration-ability means explain why intention lags slightly behind overall attitude: educators are convinced of the benefits and generally find the tools learnable, but day-to-day enactment depends on reliable devices/connectivity, structured training, and workflow-aware guidance. In summary, the model endorses a cognitive-affective pathway—FC → PEOU → PU → ATU—overlaying a direct usability-to-attitude trajectory, resulting in a strong, TAM-consistent acceptance pattern.

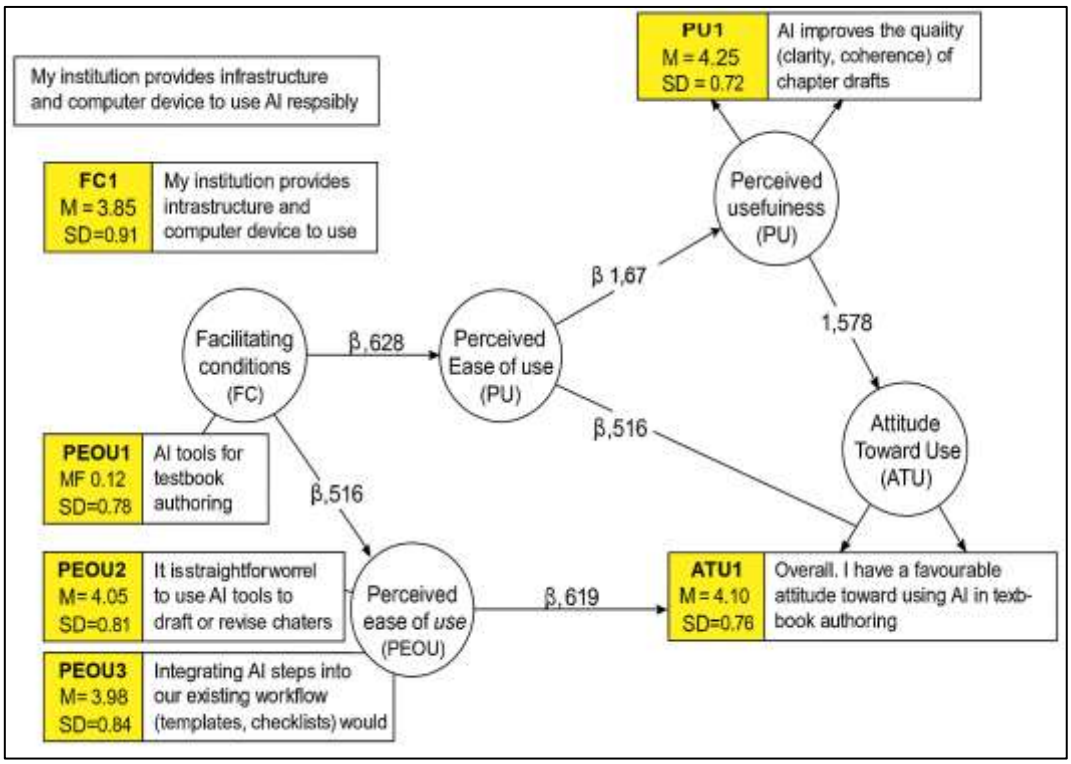

Figure 3: Interconnection Between the Constructs

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An emergent finding of this work is the 'capability gradient,' which outlines a specific threshold at which general AI literacy must transform into specialized, production-grade competence. Although educators shown considerable self-efficacy in utilizing AI for conceptual tasks, their preparedness for integrating intricate scientific simulations into professional textbooks is constrained by technological and infrastructural impediments. The identified capacity gradient in this study proves that while training programs like TCTP do help educators get over their initial fear of technology by showing the better PEOU, but the training do not immediately lead to professional competence. This gap shows the necessity to go from AI literacy to specific mentoring that related to educator's job requirement. For AI to be embraced continuously, institutions do not only provide basic workshops, but localized support systems that keep infrastructure stable during the "routine use" phase need to set up.

There are two implications of the study. First, activate the institutional enablers first. The availability of devices and infrastructure are strong. The specific training that aligned with the requirement of the educators and give policy and governance advice on how to use the devices safely. When the rise of PEOU and PU, then raise ATU (Venkatesh & Bala, 2008). Second, close the gap between design and integration: give people examples and templates that add AI steps to their writing processes, such as versioning checklists, prompt libraries that follow house style, and localization routines. Also, provide professional development with micro-credentials on how to use AI for coding and simulations in science chapters. These measurements target integration items with the lowest scores, transforming positive beliefs into habitual behaviour (Venkatesh et al., 2003).

Summary, the results proven that that people like AI-powered textbook-authoring tools because of their features as well as the support systems that come with them and the impact value to the education. The study result indicated that educational institutions aiming to utilise AI-driven authoring systems should prioritise not only technical implementation but also training, ease of integration, and the demonstration of utility to educators. This kind of broad strategy could make it much more common for AI tools to be used in making content and developing curriculum.

Conclusion

This study demonstrates that educators possess predominantly favourable opinions regarding AI-enabled textbook-authoring tools, driven primarily by their perceived utility in enhancing teaching quality. Theoretically, the research extends the TAM with FC to the emerging domain of AI-assisted science textbooks, underscoring that FC is critical in shifting educator attitudes. This study demonstrates that educators possess predominantly favourable opinions regarding AI-enabled textbook-authoring tools. The highest means were for PU, which means that respondents believe that AI will improve the quality and efficiency of droughting and reviewing. PEOU was also high, but a little lower for workflow embedding. This means that the tools are easy to learn and use, but they still cause some problems when they are added to existing authoring routines. Overall, the ATU was positive, but the intention signals were a little behind the general enthusiasm. This suggests that the problem is with the context, not with AI itself. Integration ability was average, which means that teachers could improve their ability to use AI features (like simulations and coding inserts) in their subjects. FC had the lowest means, which shows that the infrastructure, device access, training, and guidance were not all the same.

Practically, the results indicate that for AI to move from a promising pilot to a routine tool in curriculum development, institutions must prioritize localized support systems, including reliable connectivity, device access and workflow-specific pedagogical training. The structural model elucidates these relationships: FC significantly and positively influences both PEOU and PU; PU has the most substantial direct impact on ATU; PEOU also directly affects ATU; and FC indirectly affects ATU through PEOU. Institutional readiness is the first step towards acceptance in real life: when infrastructure and training are in place, tools seem easier to use; when tools seem easier to use, they are seen as more useful; and when usefulness is clear, attitudes get stronger, and intentions rise.

Limitations and Directions for Future Work

Findings are constrained by self-report measures, a cross-sectional design, and the instrument. Findings are constrained by self-report measures, a cross-sectional design, and the institutional context, which may limit generalisability. Future research ought to (a) employ longitudinal or quasi-experimental designs to ascertain whether infrastructure/training interventions causally enhance usage and quality outcomes; (b) triangulate surveys with objective usage logs and artefact quality rubrics; (c) investigate differential effects by subject area and task archetype; and (d) augment the model with variables such as trust, ethical comfort, and governance clarity. By combining these lines of inquiry with focused capacity-building, institutions can transition from promising pilot adoption to sustainable, system-wide influence in curriculum development institution context, which may limit generalizability. Future research ought to (a) employ longitudinal or quasi-experimental designs to ascertain whether infrastructure/training interventions causally enhance usage and quality outcomes; (b) triangulate surveys with objective usage logs and artefact quality rubrics; (c) investigate differential effects by subject area and task archetype; and (d) augment the model with variables such as trust, ethical comfort, and governance clarity. By combining these lines of inquiry with focused capacity-building, institutions can transition from promising pilot adoption to sustainable, system-wide influence in curriculum development.

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