Integrating artificial intelligence [AI] into music education: student teachers' engagement, attitudes and perceptions at methodist college of education, Akyem Asene-Aboabo, Oda, Ghana

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ABSTRACT

Artificial Intelligence (AI) tools are rapidly reshaping academic work in teacher training institutions, yet empirical evidence regarding their application within domain-specific practical fields like music education remains sparse in sub-Saharan Africa. This study examined student teachers' utilisation patterns and perceptions of AI tools in music course assignments at Methodist College of Education, Akyem Asene-Aboabo, Oda, in the Eastern Region of Ghana. Anchored in the Technology Acceptance Model (TAM) and Diffusion of Innovations theory, the study adopted a quantitative descriptive survey design. A sample of 25 student teachers across levels 200 to 400 was selected via simple random sampling from a total population of 49 music education students; 24 fully completed questionnaires were retrieved (96% response rate). Data were analysed using descriptive statistics (means and standard deviations). The findings revealed high baseline AI awareness (Grand Mean = 4.24, SD = 0.63) and strong positive perceptions regarding AI's capacity to enhance academic productivity, task comprehension, and lesson planning (Composite Mean = 4.22, SD = 0.61). ChatGPT, Grammarly and Gemini emerged as the primary tools used for information retrieval, text refinement and idea generation. However, reliance on AI raised concerns regarding reduced creative independence, diminished musical originality and infrastructural challenges such as unreliable internet access. The study concludes that while AI serves as an effective academic scaffold, its unchecked use threatens authentic musical creation and pedagogical reasoning. It recommends the implementation of institutional AI literacy frameworks and clear guidelines for ethical integration in creative disciplines.

Keywords: Academic Assignments, Akyem Asene-Aboabo, Artificial Intelligence, Ghana, Music Education, Oda, Student Perceptions, Teacher Education

I. INTRODUCTION

Artificial Intelligence (AI) is defined as system software capable of simulating human cognitive processes such as learning, adaptive reasoning, pattern recognition and complex problem-solving has rapidly transitioned from an emerging frontier technology into a central driver of global educational transformation (Holmes et al., 2019; United Nations Environmental, Scientific and Cultural Organization [UNESCO], 2023). Within higher education ecosystems worldwide, the proliferation of generative AI platforms most notably Large Language Models (LLMs) like ChatGPT and Google Gemini, as well as automated text-polishing tools is fundamentally reshaping how tertiary students engage with instructional materials, execute research tasks, and complete academic assessments (Crompton & Burke, 2023). These technologies lower cognitive barriers and accelerate administrative workflows, establishing new paradigms for technology-mediated learning in university settings.

While general academic activities such as essay drafting, literature synthesis, and routine text editing easily adapt to generative AI augmentation, specialised discipline areas particularly, music education present a far more complex dynamic. Music education is inherently experiential, multi-sensory, creative and performance-driven. Mastering music requires student teachers to synthesize tonal relationships, compose original works, refine auditory discrimination, and exercise nuanced aesthetic judgment (Kasneci et al., 2023). Consequently, the integration of generative text algorithms and automated composition tools presents a profound double-edged sword: on one hand, it offers unprecedented scaffolding for lesson design, historical research, and notation analysis; on the other, it threatens to undermine independent creative agency, critical ear training, and pedagogical authenticity (Grassini, 2023; Selwyn, 2024).

This pedagogical tension is especially critical in the context of Ghanaian Colleges of Education. Pre-service teachers in these institutions are tasked with mastering both theoretical content and practical methodologies required to deliver the national Standards-Based Basic School Curriculum. However, empirical scholarship on how digital tools are integrated into specialist subjects across sub-Saharan Africa remains thin and severely under-researched. Although anecdotal evidence suggests an increasing reliance on generative platforms among student teachers at the Methodist

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College of Education in Akyem Oda, empirical data detailing the precise scope of AI usage, student perceptions of utility, and the corresponding pedagogical risks within music coursework are largely non-existent.

Addressing this empirical gap is essential for informing institutional policy, preserving subject-specific learning outcomes, and ensuring that pre-service educators develop both technical proficiency and critical digital literacy. Therefore, this study empirically investigates the extent of AI awareness and usage, frequently deployed AI tools, and student teachers' perceptions of AI utility within the music education program at Methodist College of Education, Akyem Oda.

1.1 Statement of the Problem

Despite the potential of AI tools to accelerate academic workflows, overreliance poses significant risks to critical thinking, original content creation, and technical mastery in practical disciplines. At Methodist College of Education, the unit has observed a growing trend of AI utilisation in written music assignments. However, there is a lack of empirical clarity regarding whether student teachers use these platforms as cognitive scaffolds or as substitutes for deep intellectual engagement. Without context-specific empirical data, policy-makers and teacher educators cannot establish evidence-based guidelines that balance digital innovation with academic integrity and musical creativity.

1.2 Research Questions

i. What is the extent of student teachers' awareness and use of AI tools in music course assignments in Akyem Oda?
ii. Which specific AI tools are most frequently used by student teachers for music tasks in Akyem Oda?
iii. What perceptions do student teachers hold regarding the utility of AI in music education assignments in Akyem Oda?
iv. What challenges do student teachers encounter when utilising AI tools for music coursework?

II. LITERATURE REVIEW

2.1 Theoretical Review

The theoretical review presents the theories underpinning the study and explains their relevance to understanding student teachers' adoption and use of artificial intelligence (AI) for music course assignments. The study is anchored on the Technology Acceptance Model (TAM) developed by Davis (1989) and the Diffusion of Innovations (DOI) Theory developed by Rogers (2003). While Technology Acceptance Model (TAM) explains technology adoption from the perspective of individual users' perceptions of usefulness and ease of use, Diffusion of Innovations (DOI) provides a larger perspective through explaining how technological innovations are adopted and spread within a social system. Together, the two theories provide a useful framework for understanding both the individual and social factors associated with student teachers' adoption and use of AI.

2.1.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was developed by Davis (1989) to explain how individuals come to accept and use new technologies. The model posits that technology adoption is primarily influenced by two key constructs: perceived usefulness (PU) and perceived ease of use (PEOU). Perceived usefulness refers to the extent to which an individual believes that using a particular technology will enhance his or her performance, while perceived ease of use refers to the extent to which an individual believes that using the technology will require minimal physical or mental effort.

In the context of the present study, Technology Acceptance Model (TAM) provides a useful framework for understanding student teachers' acceptance and use of AI tools for music course assignments. Specifically, student teachers who perceive AI tools as useful for improving the quality, efficiency, or completion of their assignments may be more likely to use them. Similarly, when student teachers perceive AI tools as easy to access and operate, they may be more willing to incorporate them into their academic activities. Technology Acceptance Model (TAM) therefore provides a basis for examining how student teachers' perceptions of the usefulness and ease of use of AI influence their adoption of such technologies for academic purposes.

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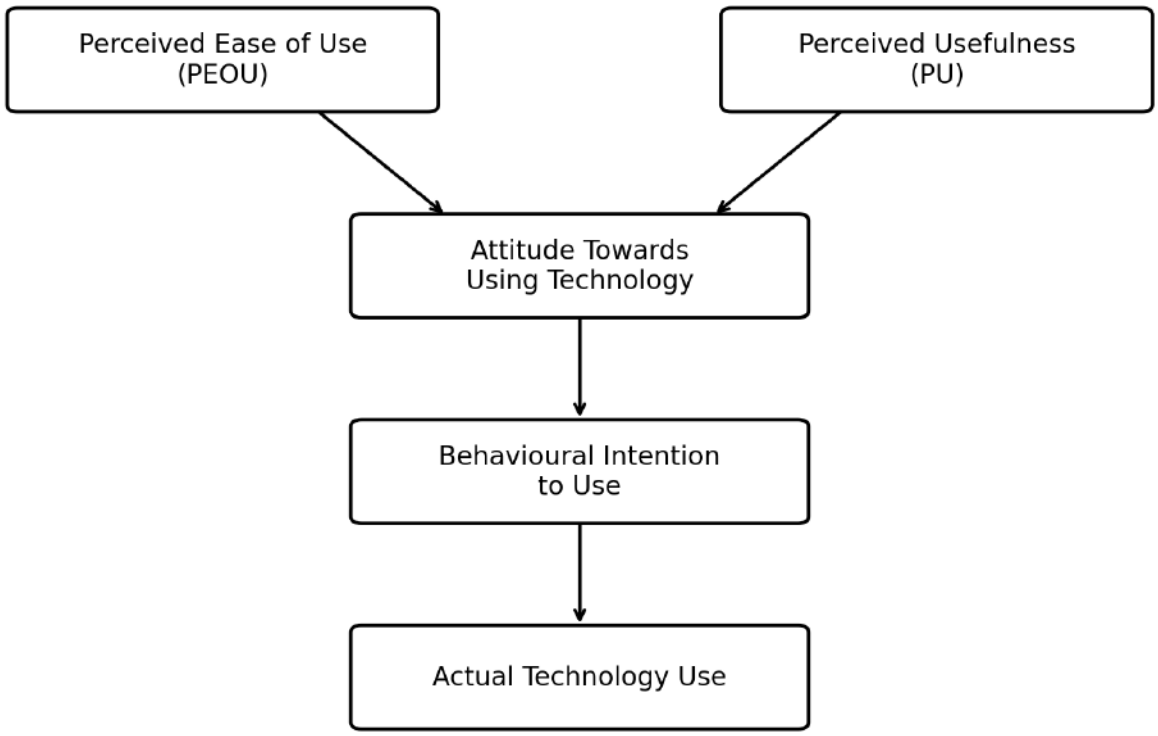


Figure 1
Technology Acceptance Model (TAM)
Source: Adapted from Davis (1989).

Figure 1 illustrates the relationship among the major constructs of the Technology Acceptance Model. Perceived ease of use can influence perceived usefulness because a technology that is relatively easy to operate may also be perceived as more useful. These perceptions influence users' attitudes towards the technology and their behavioural intention to use it, which subsequently influences actual technology use.

The model is particularly relevant to this study because it helps explain the relationship between student teachers' perceptions of AI and their actual use of AI tools in completing music course assignments. For instance, when student teachers perceive AI tools such as generative AI applications as useful for generating ideas, obtaining explanations, improving written assignments, accessing learning resources, or saving time, they may develop a greater intention to use them. Likewise, difficulties relating to usability, access, or the effort required to use AI may affect their willingness to adopt such tools. Technology Acceptance Model (TAM) is therefore appropriate for examining the perceptions and use of AI among student teachers. However, because technology adoption may also be influenced by social interactions, institutional practices, peer influence, and the visibility of the benefits experienced by other users, Technology Acceptance Model (TAM) alone may not fully explain how AI use spreads among student teachers. The Diffusion of Innovations Theory is consequently incorporated to provide a broader social and institutional perspective.

2.1.2 Diffusion of Innovations Theory

The Diffusion of Innovations (DOI) Theory was developed by Rogers (2003) to explain how new ideas, technologies, and practices spread within a social system over time. According to the theory, the adoption of an innovation is influenced by five major attributes: relative advantage, compatibility, complexity, trialability, and observability. Relative advantage refers to the extent to which an innovation is perceived as better than the practice or technology it replaces. Compatibility concerns the extent to which an innovation is consistent with users' existing values, experiences, and needs. Complexity refers to the degree to which an innovation is perceived as difficult to understand or use. Trialability refers to the extent to which an innovation can be experimented with before full adoption, while observability concerns the extent to which the results or benefits of an innovation are visible to others.

In the context of the present study, student teachers may perceive AI tools as having a relative advantage when such tools help them complete academic tasks more efficiently, access information quickly, generate ideas, or improve aspects of their assignments. Compatibility may be demonstrated when AI tools fit students' existing study habits and academic needs. Complexity may affect adoption when students perceive AI applications as difficult to operate or

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understand. Trialability allows student teachers to experiment with AI tools before deciding whether to incorporate them regularly into their academic work, while observability occurs when students observe their peers benefiting from the use of AI.

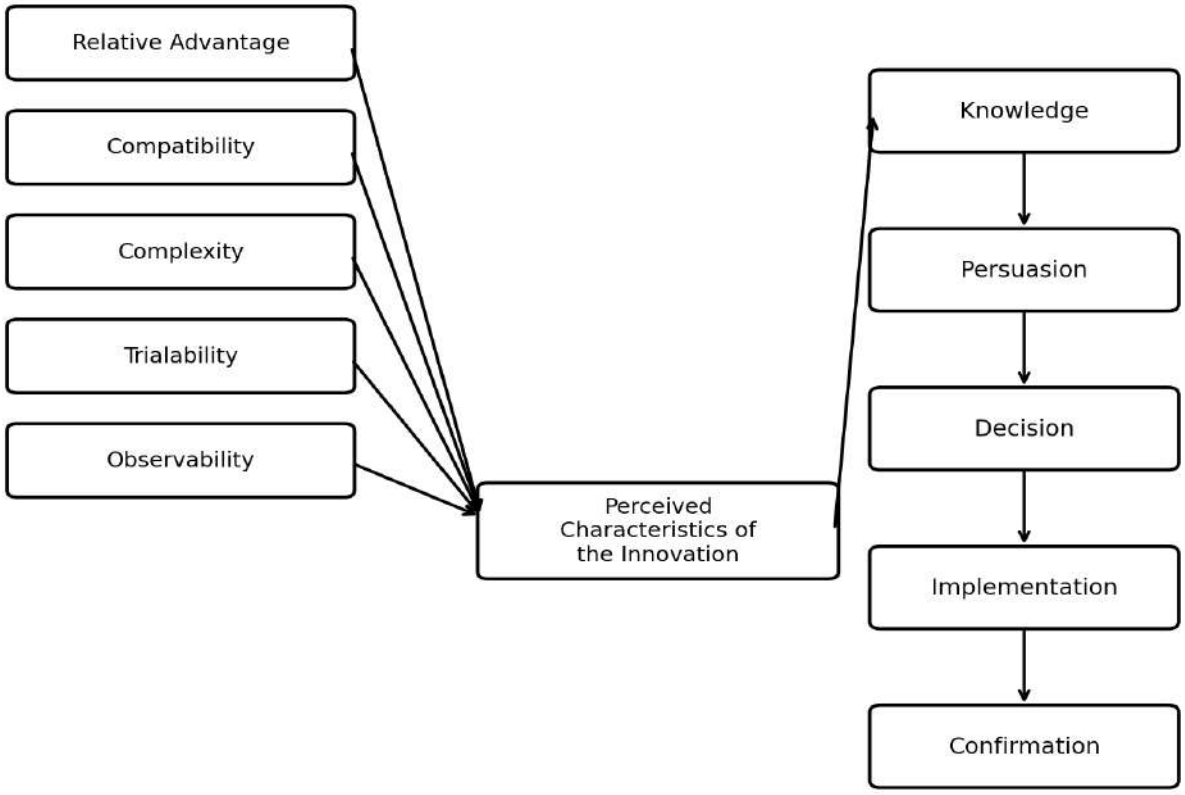


Figure 2
Diffusion of Innovations Theory
Source: Adapted from Rogers (2003).

As illustrated in Figure 2, the perceived characteristics of an innovation can influence individuals as they progress through the innovation-decision process. Rogers (2003) identifies the major stages as knowledge, persuasion, decision, implementation, and confirmation. At the knowledge stage, individuals become aware of the innovation and acquire information about it. During persuasion, they form favourable or unfavourable attitudes towards the innovation. The decision stage involves choosing whether to adopt or reject it, while implementation occurs when the innovation is put into use. At the confirmation stage, individuals evaluate their decision and may continue or discontinue the use of the innovation.

The Diffusion of Innovations Theory is relevant to the present study because the use of generative AI in education represents a relatively recent technological development whose adoption may vary among student teachers. The theory helps explain how AI tools may spread among pre-service teachers through interactions with peers, lecturers, institutional practices, and the broader educational environment. For example, student teachers may be encouraged to adopt AI when they observe their peers using such tools successfully, perceive clear advantages in completing assignments, or find that AI tools are compatible with their academic needs.

The Diffusion of Innovations (DOI) Theory therefore complements TAM by moving beyond individual perceptions of usefulness and ease of use to consider the wider social and institutional processes through which AI adoption occurs. While TAM focuses primarily on factors influencing an individual's acceptance and use of technology, The Diffusion of Innovations (DOI) provides insight into how the adoption and use of AI may spread within a community of student teachers.

2.1.3 Integration of TAM and Diffusion of Innovations Theory in the Present Study

The integration of TAM and DOI provides a more comprehensive theoretical basis for the present study. TAM explains AI adoption mainly at the individual level by focusing on perceived usefulness and perceived ease of use, while

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The Diffusion of Innovations (DOI) plains how the characteristics of AI as an innovation and the surrounding social environment may influence its adoption and diffusion among student teachers of Methodist college of education, Oda.

In this study, perceived usefulness and perceived ease of use are important for understanding student teachers' perceptions of AI and their willingness to use AI tools for music course assignments. At the same time, The Diffusion of Innovations (DOI) constructs such as relative advantage, compatibility, complexity, trialability, and observability provide a broader explanation of why some student teachers may adopt AI more readily than others and how its use may spread among students.

The combined theoretical perspective therefore provides a foundation for examining student teachers' awareness and use of AI, their perceptions of the usefulness of AI, the purposes for which they use AI in completing music course assignments, and the challenges associated with its use. The theories also provide an interpretive framework for discussing the empirical findings of the study.

2.2 Empirical Review

2.2.1 Generative AI Adoption and Applications in Higher Education

Recent scholarship indicates that artificial intelligence has become increasingly embedded in higher education, although the empirical evidence continues to develop rapidly. Crompton and Burke (2023), in a systematic review of 138 studies published between 2016 and 2022, identified a substantial increase in research on artificial intelligence in higher education, particularly during the later years of the review period. Their findings indicated that AI applications were concentrated largely in teaching and learning, while comparatively less attention was given to institutional and administrative applications. This suggests that the expansion of AI in higher education extends beyond administrative automation and is increasingly associated with instructional practices and student support.

The emergence of generative AI has subsequently broadened the range of educational applications. Baig and Yadegaridehkordi (2024), in a systematic review of 57 studies published between 2023 and 2024, found that ChatGPT was being used by students for writing and translation, language learning, coding, personalised learning, debugging, online education, and collaboration. Academic staff used the technology for activities such as assessment and assignment design, lesson planning, curriculum development, and student supervision. Researchers also employed generative AI for idea generation, writing, editing, and aspects of research and data analysis. Importantly, the review found that research on AI adoption was dominated by quantitative and survey-based approaches, with perceived usefulness, social influence, effort expectancy, and facilitating conditions emerging as important factors associated with adoption.

These findings are further supported by McGrath, Farazouli, and Cerratto-Pargman (2024/2025), who reviewed the emerging empirical literature on generative AI chatbots in higher education following the release of ChatGPT. Their review highlights the rapid expansion of research examining how AI chatbots are being incorporated into university teaching and learning while also drawing attention to methodological and pedagogical limitations within the emerging evidence base. Consequently, the increasing visibility of generative AI in higher education should not automatically be interpreted as evidence of established educational effectiveness. Technology adoption and educational impact are related but distinct research questions.

2.2.2 Generative AI as Learning Support

At the level of teaching and learning, Kasneci et al. (2023) identified several potential educational affordances of large language models (LLMs), including the generation of explanations, provision of feedback, creation of educational materials, and support for personalised learning. Rather than presenting these capabilities as evidence of demonstrated learning gains, the authors emphasised both the opportunities and limitations associated with LLMs. They argued that effective implementation requires students and educators to develop appropriate AI literacy, maintain human oversight and apply critical-thinking and fact-checking strategies because AI-generated responses may contain inaccuracies, bias, or other forms of error. Thus, the educational value of generative AI depends substantially on how the technology is incorporated into pedagogical practice rather than merely on its ability to generate fluent responses.

Empirical evidence provides a more nuanced picture of these potential benefits. Albadarin et al. (2024) reviewed 14 empirical studies examining the use of ChatGPT in educational contexts and found evidence of diverse applications and outcomes, while also identifying considerable variation in research designs and educational settings. Their review is significant because it shifts the discussion from hypothetical affordances towards observed uses of ChatGPT in educational practice. However, the relatively small empirical evidence base available at the time of their review limited conclusions concerning the long-term effects of ChatGPT on learning.

More recent experimental evidence provides stronger grounds for assessing learning outcomes. Deng et al. (2025) conducted a systematic review and meta-analysis of 69 experimental studies published between 2022 and 2024. The review found that ChatGPT-supported interventions were associated overall with improvements in academic performance, affective-motivational outcomes, and higher-order-thinking propensities, while also reducing students reported mental effort. However, the analysis found no significant effect on self-efficacy and identified methodological

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concerns across parts of the evidence base, including inadequate power analysis and limitations in post-intervention assessment. These findings suggest that positive effects have been observed under particular instructional conditions, but they should not be interpreted as evidence that unrestricted use of ChatGPT automatically improves learning.

2.2.3 Student Engagement and the Limits of Current Evidence

Student engagement represents another important dimension of generative AI adoption. Lo, Hew, and Jong (2024) synthesised 72 studies examining the relationship between ChatGPT and student engagement across behavioural, emotional, and cognitive dimensions. Their review found evidence of both increased engagement and disengagement in ChatGPT-supported learning environments. This distinction is important because generative AI may make educational tasks more accessible and interactive while simultaneously influencing students' study behaviours and the extent to which they independently engage with learning materials. The authors therefore called for longer-term research and greater use of objective measures rather than relying predominantly on students' self-reported experiences.

Similarly, Crompton and Burke (2024), in a systematic review of 44 peer-reviewed studies, demonstrated that the educational affordances of ChatGPT are accompanied by significant challenges. Their review examined applications involving both educators and students while identifying concerns related to accuracy, academic integrity, appropriate pedagogical use, and limitations in AI-generated content. Taken together with the literature on student engagement, these findings indicate that the central issue is no longer simply whether generative AI is entering higher education, but rather the conditions under which its use contributes to meaningful learning.

2.2.4 Synthesis of the Empirical Literature

Overall, the literature points to three interconnected developments. First, AI adoption in higher education has expanded rapidly, moving from earlier applications such as intelligent tutoring and administrative support towards widespread experimentation with generative AI. Second, generative AI has expanded the range of activities that students and educators can undertake with AI, particularly in writing, coding, feedback, content generation, personalised learning, and academic support. Third, evidence concerning educational outcomes is more complex than evidence concerning adoption. While experimental research increasingly reports positive effects under specific instructional conditions, other studies identify risks involving overreliance, inaccurate information, reduced independent engagement, academic integrity, and inadequate AI literacy.

A key limitation of the existing scholarship is therefore the gap between technology use and demonstrable learning outcomes. Many studies examine students' perceptions, intentions to use AI, or reported experiences rather than objective and longitudinal measures of learning. Baig and Yadegaridehkordi (2024) noted that survey-based quantitative research remains particularly prominent, while Lo et al. (2024) similarly identified the need for more objective and extended measures of engagement. The experimental synthesis by Deng et al. (2025) represents progress in addressing this limitation; however, its identification of methodological weaknesses indicates that the causal and long-term consequences of generative AI use remain important areas for further investigation.

Consequently, current empirical scholarship supports a more qualified understanding of generative AI in higher education. The literature demonstrates rapid adoption and identifies substantial pedagogical potential, but educational effects vary according to the nature of the task, instructional design, degree of student engagement, and the manner in which AI-generated outputs are evaluated and used. A rigorous examination of generative AI in tertiary education should therefore consider not only frequency of use and perceived usefulness but also measurable learning outcomes, student engagement, critical-thinking processes, academic integrity, and the role of educators in mediating AI-supported learning.

2.2.5 Identified Research Gap

Despite the growing body of research on generative AI in higher education, several gaps remain. Much of the existing scholarship has examined university students and higher education populations broadly, with considerable attention given to general academic writing, language learning, coding, assessment, and teaching and learning practices. Comparatively less attention has been given to the experiences of student teachers in Colleges of Education, particularly within specialised subject areas such as music education. Furthermore, much of the existing research has been conducted outside the Ghanaian College of Education context. Differences in institutional resources, internet accessibility, digital literacy, academic expectations, and students' exposure to AI technologies mean that findings from other educational settings may not necessarily reflect the experiences of student teachers in Ghana.

There is also limited empirical evidence specifically examining how student teachers use AI to complete music course assignments. Music education involves distinctive academic and creative activities that may include music history, theory, analysis, composition, performance-related research, lesson preparation, and other subject-specific tasks. Understanding how student teachers employ AI within this context is therefore important for determining the educational opportunities and challenges associated with its use. The present study seeks to address these gaps by examining student

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teachers' use and perceptions of artificial intelligence for music course assignments at Methodist College of Education, Akyem Oda. Specifically, the study examines their awareness and use of AI tools, perceptions regarding the usefulness of AI, the benefits associated with its use, and the challenges encountered when using AI for academic assignments. By focusing on student teachers within a Ghanaian College of Education and specifically within music education, the study contributes context-specific empirical evidence to the growing literature on generative AI adoption in teacher education.

III. METHODOLOGY

3.1 Research Design

Here, a quantitative descriptive survey design was utilised. This approach was selected because it enables the systematic collection of quantifiable data across a target group to map general trends, usage frequencies, and perceptual patterns without manipulating variables (Taber, 2018).

3.1Delimitation

The study was conducted at the Methodist College of Education, located in Akyem Oda in the Eastern Region of Ghana, and was specifically delimited to student teachers in levels 200, 300, and 400 who take music courses, referred to on campus as PEMD students. Consequently, the target population comprised all student teachers enrolled in this music education and PEMD courses across the three-year groups (N = 49; Level 200 = 24, Level 300 = 9, Level 400 = 16).

3.4 Sampling and Sample Size

Using simple random sampling through a computer-generated random number table to ensure equal selection probability, a sample of n = 25 was drawn. A total of 24 respondents fully completed and returned the survey, yielding an effective response rate of 96%.

Table 1

Population, Sample Size, and Response Rate Breakdown by Academic Level

Academic Level	Target Population (N)	Selected Sample (n)	Analysed Responses
Level 200	24	12	12
Level 300	9	5	4
Level 400	16	8	8
Total	**49**	**25**	**24**

3.5 Data Collection Instruments and Procedures

The data was gathered using a closed-ended, structured questionnaire structured into four sections: Demographic Profile, AI Awareness or Usage Extent, Tool Distribution, Perceived Utility, and Implementation Challenges. Again, responses were also measured using a 5-point Likert scale ;1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

3.6 Validity and Reliability

During the study, content and construct validity were established through expert judgment from two senior academics specialising in Music. Instrument reliability was established via a pilot study conducted with 10 student teachers from a neighbouring college of education (Fosu College of Education). Cronbach's alpha coefficient for the instrument yielded $\alpha = 0.89$, demonstrating high internal consistency (Taber, 2018).

3.7 Data Analysis

Descriptive statistics were used during the data analysis, specifically calculating means and standard deviations to interpret student responses.

3.8 Ethical Considerations

Prior to data collection, ethical approval was secured. Informed consent was also obtained from all participants and complete anonymity was enforced throughout the study.

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IV. FINDINGS & DISCUSSION

4.1 Findings

4.1.1 Extent of AI Awareness and General Utilisation (RQ1)

The data presented in **Table 2** demonstrates a very high level of overall AI awareness and adoption among student teachers ($M = 4.24, SD = 0.63$). Respondents reported the highest familiarities with identifying functional AI applications ($M = 4.27, SD = 0.60$) and understanding general pedagogical/academic AI uses ($M = 4.30, SD = 0.62$). Regular individual usage for music assignments ($M = 4.20, SD = 0.66$) and perceived peer adoption ($M = 4.18, SD = 0.70$) also remain high, indicating that generative and support technologies are actively integrated into daily learning routines within the institution.

4.1.2 Frequently Utilised AI Tools (RQ2)

As detailed in **Table 3**, general-purpose language and literacy tools dominate student usage, whereas domain-specific applications show much lower uptake. **ChatGPT** is the most widely adopted platform (87.5%, $n = 21$), utilized primarily for text generation, essay drafting, and conceptual explanations. **Grammarly** follows closely at 79.2%($n = 19$) for proofreading and syntax enhancement. **Google Gemini** (58.3%) and **QuillBot** (50.0%) serve key roles in information search, literature summarization, and paraphrasing. Conversely, **Specialised Music AI tools** (such as AIVA) record minimal utilization (16.7%, $n = 4$), revealing that students rely far more on general academic assistance than specialized compositional software.

4.1.3 Perceptions of AI Utility in Music Assignments (RQ3)

The evaluation in **Table 4** indicates strong positive perceptions regarding the utility of AI in coursework ($M = 4.22, SD = 0.61$). The most substantial benefit noted by student teachers is time efficiency during lesson plan preparation ($M = 4.35, SD = 0.52$), alongside personalized learning support ($M = 4.28, SD = 0.58$) and general improvement in assignment quality and structure ($M = 4.22, SD = 0.59$). While still rated strongly, using AI to stimulate creative ideas in music composition and arrangement scored slightly lower ($M = 4.10, SD = 0.71$), reinforcing the finding that students view AI primarily as a productivity and administrative scaffolding tool rather than a primary creative driver. Formatted Tables with Added Descriptive Titles

Table 2

Extent of Student Teachers' AI Awareness and General Utilisation in Music Education

#	Item Statement	Mean	SD	Interpretation
1	I am familiar with Artificial Intelligence tools used in education.	4.3	0.62	Very High
2	I understand how AI can support academic and music learning activities.	4.25	0.58	Very High
3	I regularly utilise AI tools to execute music course assignments.	4.2	0.66	High
4	AI tools are widely adopted within my peer academic environment.	4.18	0.7	High
5	I can independently identify different functional AI applications.	4.27	0.6	Very High
-	**Grand Mean / Overall Standard Deviation**	**4.24**	**0.63**	**Very High**

Table 3

Distribution and Primary Application Areas of Frequently Utilised AI Tools among Student Teachers ($n = 24$)

AI Platform / Tool	Primary Application Area	Usage Freq (n=24)	Percentage (%)
ChatGPT (OpenAI)	Text generation, essay drafting, conceptual explanation	21	87.50%
Grammarly	Proofreading, syntax polishing, vocabulary enhancement	19	79.20%
Google Gemini	Information search, literature summary	14	58.30%
QuillBot	Paraphrasing, sentence restructuring	12	50.00%
Specialised Music AI (AIVA, etc.)	Audio composition, notation assistance	4	16.70%

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Table 4

Student Teachers' Perceived Pedagogical and Functional Utility of AI in Music Assignments

#	Perceived Utility Dimension	Mean	SD	Interpretation
1	AI enhances my understanding of complex music theory concepts.	4.15	0.64	High Agreement
2	AI tools improve the overall quality and structure of my assignments.	4.22	0.59	Very High
3	Utilising AI saves significant time during lesson plan preparation.	4.35	0.52	Very High
4	AI stimulates creative ideas for music composition and arrangement.	4.1	0.71	High Agreement
5	AI provides personalised learning support tailored to my pace.	4.28	0.58	Very High
-	**Composite Mean / Overall Standard Deviation**	**4.22**	**0.61**	**Very High**

4.2 Discussion

The empirical findings from this study align directly with the core tenets of the Technology Acceptance Model (TAM) formulated by Davis (1989). TAM posits that user adoption of a technology is predominantly governed by two psychological determinants: Perceived Usefulness (PU)—the degree to which an individual believes a tool will enhance job or academic performance—and Perceived Ease of Use (PEOU)—the belief that using the system requires minimal cognitive or operational effort. The high composite mean recorded for perceived utility ($M = 4.22, SD = 0.61$) demonstrates that student teachers at Methodist College of Education adopt AI platforms primarily because these tools reduce cognitive burden, streamline research, and accelerate task execution. In TAM terms, the technology is perceived as both highly useful for managing academic requirements and easy to navigate.

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These findings corroborate global tertiary adoption trends identified by Crompton and Burke (2023) and Holmes et al. (2019), who observed that higher education students systematically lean on automated digital tools to manage dense course schedules and heavy assessment workloads. However, a critical synthesis of the data reveals stark contradictions between students' pragmatic drive for task completion and the long-term pedagogical goals of specialist music education.

4.2.1 Textual Scaffolding and Creative Originality

A striking tension emerges when evaluating the specific categories of technology deployed by student teachers. While $87.5\%(n = 21)$ of respondents regularly utilize general text-focused tools like ChatGPT for essay drafting, lesson structuring, and conceptual explanations, specialized music AI applications—such as automated composition software (e.g., AIVA) or notation assistance tools—registered a remarkably low adoption rate of $16.7\%(n = 4)$.

This disproportion demonstrates that pre-service teachers predominantly treat AI as a generic textual scaffold to navigate word-based academic assessments, rather than as a medium for domain-specific musical innovation or creative exploration. Rather than engaging with generative platforms to experiment with counterpoint, harmonic progression, or digital orchestration, students rely on LLMs to generate standard prose about music theory. This pattern reinforces Selwyn's (2024) critical warning that commercial large language models tend to foster a "transactional submission culture." In such an environment, generative tools produce standardized, formulaic prose, accelerating submission times while bypassing deep, domain-specific mastery and original artistic expression.

4.2.2 Efficiency vs. Cognitive Engagement

The divergence between student perceptions and pedagogical outcomes becomes even more pronounced when analysing workflow efficiency alongside critical learning processes. Student teachers evaluated AI most favourably as an efficiency driver, specifically for saving time during lesson plan preparation ($M = 4.35, SD = 0.52$). While time savings are beneficial for busy pre-service educators, music faculty and researchers raise significant concerns regarding the corresponding decline in deep cognitive engagement, critical analysis, and creative problem-solving.

As Grassini (2023) and Kasneci et al. (2023) observe, over-reliance on conversational AI creates an instructional shortcut that bypasses essential trial-and-error learning. In music training, foundational competencies—such as ear training, harmonic analysis, manual arrangement, and pedagogical reasoning—require iterative failure, reflective listening, and active mental synthesis. When student teachers use AI to synthesize musical explanations or generate complete lesson plans instantly, they risk missing the vital cognitive friction needed to internalize complex musical concepts. Consequently, high efficiency scores may obscure a subtle degradation in authentic, self-directed learning.

4.2.3 Infrastructural Friction in Developing Contexts

Beyond pedagogical tensions, the systemic conditions under which technology adoption occurs present another significant layer of constraint. The dominance of internet instability, high data costs, and power fluctuations as primary operational challenges mirrors findings by Mhlanga (2023) and Tlili et al. (2023). Digital integration within sub-Saharan

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African colleges of education does not take place on a level playing field. Structural deficits create persistent "infrastructural friction," where unreliable connectivity and lack of hardware access compromise equitable learning opportunities. While student teachers express high interest and positive attitudes toward generative AI, these infrastructural barriers turn technology access into a privilege rather than a reliable institutional resource. Without targeted infrastructural investment and contextualized institutional policies, AI integration in teacher training risks reinforcing existing digital divides rather than closing them.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

This empirical investigation provides critical insights into the integration, utility, and broader pedagogical implications of Artificial Intelligence (AI) tools among pre-service music teachers at Methodist College of Education, Akyem Oda. The study conclusively demonstrates that student teachers actively adopt and integrate AI technologies into their academic workflows. Driven by the core tenets of the Technology Acceptance Model (TAM) specifically perceived usefulness and perceived ease of use—students leverage these platforms primarily to manage heavy academic workloads, streamline research processes, and accelerate the preparation of instructional materials. However, a closer synthesis of the findings reveals a significant structural imbalance in how these technologies are applied. Student usage is heavily skewed toward general-purpose text processing, essay drafting, and language refinement applications (such as ChatGPT, Grammarly, Google Gemini, and QuillBot), while domain-specific music technologies (such as automated composition and notation analysis software) record minimal engagement. This pattern indicates that pre-service teachers predominantly employ AI as a generic textual scaffold to navigate word-based academic assessments, rather than as a transformative instrument for creative musical exploration, harmonic analysis, or artistic innovation.

Furthermore, the absence of standardized institutional AI policies and formal pedagogical guidelines creates an environment where technology adoption outpaces ethical governance. While student teachers perceive AI as an indispensable driver of productivity and personalized learning, unchecked reliance on conversational agents introduces serious risks to academic integrity, critical thinking, and authentic artistic expression. When technological efficiency overshadows manual trial-and-error a process vital for ear training, musical arrangement, and pedagogical reasoning cognitive engagement is compromised. Compounded by persistent infrastructural friction, including internet instability and limited hardware access, digital integration currently lacks both equity and strategic direction. Ultimately, while AI holds substantial potential to enhance teacher preparation, its unguided and purely transactional application threatens to substitute procedural task completion for deep, self-directed learning and original creative mastery.

5.2 Recommendations

Based on the empirical findings and conclusions of this study, the following actionable recommendations are proposed for college administrators, curriculum developers, music educators, and policymakers: College management, in consultation with academic boards, must establish comprehensive, context-specific AI policy guidelines. These policies should explicitly define acceptable versus unethical AI usage across various assignment types, establish clear procedures for AI disclosure and citation, and outline transparent mechanisms for maintaining academic integrity. By replacing ambiguity with structured regulations, the institution can protect academic standards while giving students clear parameters for ethical digital practice.

The Department of Arts and Social Sciences, through its Music Unit, should embed formal AI literacy modules into the existing teacher training curriculum. This instruction must go beyond basic technical operation to emphasize critical AI evaluation skills. Pre-service teachers should be trained to identify algorithmic bias, recognize contextual errors and hallucinations, critically cross-reference generated content against standard African and global music curricula, and model responsible digital citizenship for their future classrooms. Music educators should actively guide student teachers beyond generic text generators toward specialized musical AI tools and domain-specific applications. Coursework and practical assignments should incorporate software designed for ear-training assistance, interactive harmony analysis, and notation scaffolding. By intentionally embedding domain-specific tools into the curriculum, faculty can ensure that technology serves as an instructional supplement that deepens artistic understanding, rather than a surrogate for authentic composition and creative expression.

To effectively mediate student AI use, academic staff must receive continuous professional development in emerging educational technologies. The college should organize targeted workshops and seminars focused on AI-assisted assessment design, authentic performance-based evaluation techniques, and strategies for detecting AI-generated coursework. Empowering faculty with updated pedagogical tools ensures that instructional strategies evolve alongside technological advancements. College management must prioritize strategic investments in campus ICT infrastructure. Expanding internet bandwidth, establishing reliable Wi-Fi coverage across academic blocks, and providing dedicated digital resource labs are essential steps to alleviate infrastructural friction. Mitigating connectivity

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barriers and data constraints will ensure that all student teachers, regardless of socioeconomic background, have equitable and uninterrupted access to necessary digital learning resources.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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