

Artificial Intelligence in Music Classrooms: PK-12 Educators' Practices, Concerns, and Confidence

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In this descriptive survey study, we explore PK-12 music educators' perceptions of AI, their current practices, confidence, concerns, and the types of support they need to utilize AI within their music programs. Fifty-four music educators from elementary, middle, and high school settings in Indiana completed an online survey. Quantitative survey responses such as demographic information, Likert-scale responses, and multiple-choice items were analyzed using descriptive statistics, while responses to two open-ended survey questions were analyzed as supplemental opportunities to elaborate on participants' additional perspectives. Based on the results, most participants regularly utilized digital technology, but fewer used AI in music instruction, primarily for lesson planning, creating materials, and completing administrative tasks. Participants recognized potential benefits for differentiated instruction and efficiency, but expressed concerns about ethics, authorship, originality, student creativity, and the accuracy of AI-generated content. Many also reported low confidence in evaluating AI tools and guiding students' responsible use. Participants identified practical examples, professional development, clearer guidelines, and collaboration with other music educators as important forms of support. Overall, the findings suggest that schools may consider providing music educators with practical AI guidance, music education-specific training, and clearer policies for responsible creative AI use.

Keywords: Artificial intelligence; music education; PK-12 music educators; technology integration; teacher readiness

Introduction

There are many benefits of generative artificial intelligence (AI) in the field of education, including instructional support, personalization of learning, assessments, and creation of content¹. Generative AI is the technology of artificial intelligence that generates new content, such as text, images, music, and programming, by using pattern learning based on a training set². Although educational research has identified several potential benefits of AI technologies, including individualized instruction, timely feedback, and greater access to instructional resources³, some possible disadvantages regarding accuracy, ethical issues, impact on students' cognitive skills, and lack of preparation for using AI were raised. For example, Al-waqdani stated that there are some concerns related to training, reliability, creativity, and critical thinking⁴.

These issues become especially pertinent when we apply them to the area of music education. Potential applications of AI in music education include performance evaluation, real-time feedback, composition, assessment, and lesson planning⁵⁻⁷. However, music learning extends beyond technical skills. Interpretation, creativity, performance, cultural aspects,

and musical judgment are all integral to learning and teaching music⁸. Consequently, while AI systems can easily detect pitch or rhythm mistakes, generate music, or provide real time feedback, they often fail to capture the full artistic complexity of the music learning process. Likewise, current research reveals the potential for enhancing music learning experience through engagement and personalization while raising concerns related to issues such as originality, authorship, privacy, artistic expression, and appropriateness⁹⁻¹¹.

Therefore, the growing capabilities of AI place music educators in an increasingly important role in determining how these technologies are used in educational practice. Not only will they have to choose whether to use AI, but they will need to consider how the implementation is compatible with their teaching, learning, and values in music education. Research in other disciplines shows that educators' readiness varies based on variables such as confidence, knowledge of AI technology, education and training, as well as available support^{4,12}. However, this issue may be particularly relevant for music education because of the unique technical and artistic demands essential to music instruction.

Despite the advancements made in AI use in music education research, the literature published so far has primarily revolved around topics that are mostly concerned with tech-

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nical development, performance, composition, and learning. Both Mazlan et al. and Nart emphasize that existing literature focuses primarily on technical, computational, and analytical aspects rather than pedagogical challenges or teacher perspectives^{6,13}. There has been some empirical research related to the use of AI-assisted music platforms by students^{5,10,11}. However, there is not enough research on the use of AI by teachers.

Thus, research on AI in music education remains limited. Specifically, few studies have examined how PK-12 music teachers apply this technology, their feelings towards it, the positive and negative aspects associated with the application of this technology, the difficulties involved, and what kind of support they need. A comprehensive study is needed because there might be instances where music teachers are aware of the importance of AI technology in their teaching practice, yet experience barriers related to confidence, knowledge, and practical implementation.

The purpose of this study is to investigate current trends and perceptions in AI integration among PK-12 music educators. Specifically, this study assesses teachers' familiarity, confidence, perceived opportunities and challenges, barriers faced, and the necessary support required to effectively integrate AI into their teaching. Unlike previous research studies, this study is unique in its focus on the practices and perceptions of practicing music educators to bridge the widening gap between current trends and the situation in PK-12 classrooms.

Literature Review

As we explore the use of AI in education, with a focus on music education, it is important to understand perspectives and research related to this topic and music educators' use of AI. In the following subsections, we review literature related to AI in music education and opportunities, challenges, and educators' readiness related to these fields.

AI in Education

Even though generative artificial intelligence (GenAI) has recently gained much attention, there is an older tradition of using artificial intelligence in education (AIED). Early AIED applications were based on the student modeling approach and concerned with providing adaptive feedback and personalized instruction, but there were also efforts devoted to creativity and exploration that stressed the importance of learner control^{14,15}. Over time, advancements in machine learning and GenAI have expanded these applications to encompass content generation, assessment, feedback, and instruction. This rapid expansion is seen in a bibliometric study by Durak et al., where 1,726 AIED papers were analyzed and found to have a

substantial increase in research and attention to personalized and adaptive learning¹⁶.

Prior literature has supported the efficacy of AI technology in offering a personalized and adaptive learning experience. For instance, Tapalova and Zhiyenbayeva surveyed 184 university students and identified key benefits of AI integration, including continuous access to learning, personalization, virtual instruction, and real-time feedback³. Additionally, other research indicates AI integration does not negatively impact cognitive function. For example, Xie and Wang compared 322 music students using AI tools with 217 arts students not using them, finding no significant differences in intelligence, working memory, or processing speed¹⁷.

All this evidence leads to the conclusion that the use of AI cannot be regarded as good or bad in itself. The educational significance of AI depends on its application, the focus on certain learning goals and skills, and educators' approach to introducing AI into the process of learning. This distinction is particularly important in music education, where learning includes not only knowledge and technical accuracy but also interpretation, expression, creativity, and judgment.

AI in Music Education

Music education presents a unique context for AI applications because instruction includes knowledge acquisition, performance skills, listening, interpretation, creation, and reflection. Music is not like other fields of activity that can be structured according to the idea of finding one right answer, as musical education involves a search for meaning during composing, improvising, and performing^{8,18}.

Recent literature highlights a growing variety of AI applications in music education. The main areas of the applications were identified as learning and practice, assessment, creation, and teaching⁷ and personalized feedback, performance analysis, composition, and instruction support¹⁹. Empirical studies indicate these applications across interactive learning, skill development, and instructional assessment. For instance, Chang et al. created a multimodal AI application offering real-time personal feedback²⁰, while Cui studied augmented reality-supported piano learning where the participants gained skills such as music reading, technical performance, and independent practice²¹. In other cases, the focus was on assessing and evaluating the instructional quality. Specifically, Liu evaluated the effectiveness of interactive college piano teaching using AI-based modeling²², while Yuan explored the factors that influenced vocal music teaching quality using computational methods²³. Overall, these studies indicated that besides supporting musical performance and creation, AI was widely applied for feedback provision, assessment, and instruction process itself. However, these studies were conducted mostly at higher education institutions or technology-related contexts.

Thus, the perspectives and experiences of PK–12 music educators have received limited attention in prior research.

Along this line of research emphasizing the role of technology, Du provides empirical evidence from a 16-week study involving 165 music students and 17 instructors in piano, violin, guitar, and voice⁵. Students who used AI-based software during practice engaged in more frequent and longer practice sessions than those receiving traditional instruction.

However, even considering these advancements, there is inconsistency in existing literature. Nart discovered that the bulk of the research done in the field of using AI in music education has been more focused on analyzing music, writing music, algorithms, and technology rather than classroom practices¹³. In a similar way, Mazlan et al. noticed that most of the studies carried out are more inclined towards computer science and engineering while less inclined towards pedagogic or artistic perspectives⁶. From this, it becomes clear that researchers have made huge progress in highlighting the potential of AI but little progress in its evaluation and integration into music classrooms.

Opportunities and Limitations of AI in Music Learning

Researchers consistently highlight personalized feedback as one of the primary opportunities of AI in music learning. With AI-supported technology, teachers will be able to examine the student's performance data and offer them feedback while they practice individually, which might solve issues when teachers are unable to provide constant one-on-one feedback to their students^{5,7,22,24}. This option would be useful for elements that can be measured, such as pitch, rhythm, timing, and practice patterns.

Beyond feedback, AI tools can enhance student engagement, creativity, and motivation. For instance, Chen observed that positive student attitudes toward AI-assisted learning directly enhanced their creative expression and overall success²⁵. Research further indicates that AI-assisted composition environments lower technical barriers, enabling students to experiment more freely with musical ideas^{20,21,26}. This is reflective of the idea that GenAI technology helps overcome certain technological barriers and allows students to create and experiment with their musical ideas.

The use of GenAI by music students seems to be based on several considerations and not simply on an interest in the technology. According to Song²⁷, usefulness and usability were the determinants of GenAI acceptance by students, while, according to He and Ren²⁸, risk perception, social influences, and habits affected the intention of the students to use AI. Li surveyed 458 music students and investigated the factors affecting their intention to use GenAI in learning music¹¹. Students were inclined to find GenAI useful and enjoyable in cases where it was viewed as efficient and engag-

ing, which positively impacted their intention to use it further. The research showed that students appreciated technologies that enabled easy movement between tasks such as practice, receiving feedback, and theory learning. On the other hand, the issue of privacy and security became an obstacle to using GenAI when performance recording or incomplete pieces had to be uploaded.

Kibici investigated the connection between digital literacy and attitudes towards AI of 229 students at the university level majoring in music, visual arts, fine arts, and other similar disciplines¹⁰. The study found that both digital literacy and attitudes toward AI were positive, and higher digital literacy was associated with more favorable attitudes toward AI. However, the concerns of the students regarding artistic originality and ethical issues remained, demonstrating that positive attitudes towards AI do not eliminate underlying ethical or artistic concerns.

This distinction is crucial since involvement in an AI-assisted task does not always imply musical learning. For instance, while students may find AI-assisted composition highly engaging, high engagement or flow experiences do not necessarily translate to improved musical proficiency or meaningful learning¹¹. Therefore, there is convergence in the literature regarding the possibilities of AI in facilitating access, feedback, engagement, and creation, yet with a question regarding how these experiences relate to meaningful musical learning.

Pedagogical and Ethical Challenges

The increasing deployment of AI technology also creates issues with authorship, originality, evaluation, privacy, copyright, bias, and cultural representation^{9,29}. This is particularly relevant to music since the processes of composing and performing music contain objective and subjective elements.

The use of GenAI for composing music presents a conflict between these two components. With the use of AI technology, students can compose melodies, accompaniments, and other musical material without much difficulty. Cheng suggested that this capacity opens new possibilities, yet it makes the issue of authorship and the creative process more difficult⁹. Likewise, Chu et al. concluded that the perceptions of AI-produced music pose certain issues related to the concept of creativity and authorship²⁶. Therefore, the pedagogical challenge in using AI is not only the capacity of the students to produce music using AI but also what kind of decision-making, revisions, reasoning, and music theory knowledge constitutes their learning process.

The application of AI for music assessment poses related issues. Shaw noted that there are areas where AI could be used for assessment and differentiation in teaching music³⁰. Nevertheless, AI-based assessment of musical skills cannot cover all

possible factors of music execution. In most cases, AI functions better while assessing the aspects that can be quantified, including pitch, rhythm, timing, and articulation, while interpretation, style, culture, and intent require other approaches⁶. Research in the field of piano and vocal music has proved that AI is efficient for modeling and prediction of technical aspects of lessons, while the overall interpretation aspects depend on humans^{22,23}.

There is an additional ethical issue related to privacy. Students of music might upload their recordings, compositions, or even works-in-progress to the AI system. Safety concerns were also noted by Li¹¹ and have a negative impact on the intention of using GenAI, which can mean that the issues of privacy and data may serve as obstacles. Therefore, ethical issues cannot be separated from instruction. The choice of whether the student can use GenAI for his/her own composition, evaluation, or practice is always accompanied by other choices as well.

Throughout these topics, the common thread seems to be that the role of AI is not that of replacement, but complementation. Holster provided examples of the uses of ChatGPT in lesson planning, differentiation, assessment, and activities³¹. However, there was a stress on the need to review AI-produced information by the teacher. Merchán Sánchez-Jara et al. stressed the same idea about the balance between new technologies and educational needs²⁹. In the end, Mazlan et al. suggested the use of hybrid approaches to complement human instruction with AI analysis⁶.

Educator Readiness, Confidence, Barriers, and Support

Given the advancements of AI, the issue of educators' readiness becomes critical. According to the literature beyond music education, teachers tend to demonstrate ambivalent attitudes toward AI rather than either a pro-AI or anti-AI stance. Alwaqadani surveyed 1,101 teachers and found that some of the teachers acknowledged AI's potential in saving time, developing instructional activities, and providing a personalized experience⁴. However, at the same time, the participants mentioned their concerns regarding the need for effort to learn AI, time and training limitations, reliability, creativity, critical thinking, and displacement from the job market. Over half of the participants agreed that teachers might not have enough time and training to utilize AI-based tools.

Further empirical literature has shown that there are variations regarding readiness and confidence among educators. Studies conducted among K-12 teachers have revealed variations in perception towards AI and its usefulness in practice^{32,33}. The studies on teacher candidates have revealed differences in AI anxiety, attitudes, readiness, and confidence³⁴⁻³⁶, whereas studies conducted on university instructors have shown variations in readiness towards the imple-

mentation of GenAI and the need for specific discipline guidance³⁷.

According to the intervention studies, readiness could be achieved if there are systematic chances for the educators to interact with AI and critically analyze it. Estoiteyeh and Mindzak investigated two groups of pre-service teachers who had participated in an AI-based module¹². The participants recognized the chance to become AI literate and more open towards critical AI, but their perception was not entirely positive. They were more receptive to the idea of implementing AI as teachers compared to unlimited use of AI by the students.

Estaiteyeh and McQuirter have come to similar conclusions through narrative inquiry involving professional development workshops for teacher educators³⁸. Participants came into the study with varying degrees of knowledge and differing interests. While some were interested in simply being introduced to GenAI, the more experienced participants wanted the opportunity to discuss assessment, curriculum, and proper integration. Participants found value in the chance to engage in critical evaluation of AI-produced material alongside their peers as opposed to simply understanding the features of a particular tool.

Similarly, more recent research links teacher agency and adoption of AI to ongoing professional development rather than simply training for tools³⁹. Thus, readiness of teachers consists of multiple yet different factors, such as awareness of AI, confidence in its use, evaluation of AI-produced content, ethical implications, and institutional support. It means that teacher readiness cannot be assessed just by having positive attitudes towards AI.

This difference might be especially significant for music teachers. The importance and potential dangers of using AI vary greatly depending on whether it is used for general music classes, ensemble teaching, individual practice, composition, performance evaluation, or music technology. While the use of GenAI by the teacher can be completely certain in generating creative ideas for the lessons, there could be doubt in AI-created compositions, automated performance evaluations, or even uploading student recordings to any outside platform.

Research Gap

In summary, existing studies in this area can be traced back to two interrelated topics. In music education research, scholars have investigated such aspects as AI-based performance analysis, feedback, composition, assessment, students' engagement, creativity, and technology adoption^{5,11,21,22,25}. Meanwhile, in general education and teacher training literature, there is much information concerning educators' attitudes toward AI, readiness for its implementation, barriers to the process, and learning needs^{32,34,36,37,39}. Nevertheless, such domains have not been studied simultaneously. According to

reviews on artificial intelligence use in the field of music education, it appears that research is mainly conducted about the technology itself, the achievements and results of students, performance, and composition, with no concern about the experiences of teachers^{6,13,19}. On the other hand, research on teacher confidence, readiness, and professional development is carried out among general educators, teacher candidates, or university professors, but not PK–12 music educators.

Thus, the gap does not exist solely because of the limited research on the use of AI technology in music education. Limited research has been done regarding the ways in which PK–12 music educators use artificial intelligence technology in the process of teaching, their comfort level with it, potential opportunities and drawbacks associated with its implementation, challenges faced, as well as their needs. Investigation of these areas altogether will give an understanding of the way that artificial intelligence technology is introduced in PK–12 music education.

Research Questions

In this study, we sought to examine PK–12 music educators' perceptions, current practices, and supportive needs related to AI integration in their music education programs in schools. We pose the following research questions:

1. What are PK–12 music educators' perceptions of AI integration in music education?
2. How are PK–12 music educators currently using AI tools and technologies in their music teaching and learning practices?
3. How do PK–12 music educators perceive their levels of confidence, barriers, and supportive needs related to AI integration in music education?

Methods

Participants and settings

Participants included 54 active PK–12 music educators with teaching experience in the state of Indiana. The participants represented a range of school contexts, including public, charter, and private schools. Given the descriptive nature of the study, the sample was used to provide an initial description of participants' experiences and perceptions rather than to make broad population-level generalizations.

The study was conducted in Indiana and focused solely on PK–12 music education settings. Participants were recruited through a distribution list of PK–12 music educators in Indiana.

Data collection

Data were collected through an anonymous and voluntary online survey via Qualtrics, administered in April 2026. Electronic consent was obtained before participants began the survey. Snowball sampling was not permitted. The survey was sent out to 557 music educators in Indiana with no incentives, and four reminder emails were sent out in the process of collecting data. No personally identifiable information was intentionally collected; responses remained anonymous from the beginning of the study and were reported only in aggregate form. This study was approved by the Institutional Review Board.

Instruments

We developed the survey to better understand how PK–12 music educators perceive and use technology in their teaching. Our Qualtrics survey included demographic questions, five-point Likert-scale items, single-response multiple-choice questions, select-all-that-apply questions, and open-ended questions. We collected demographic information about participants' teaching level, years of teaching experience, school setting, primary teaching area, and prior experience with AI. We utilized five-point Likert-scale items (1=Strongly disagree to 5=Strongly agree; 1=Not confident at all to 5=Very confident) to examine educators' perceptions of AI (for RQ#1, see Table 2). We used single-response multiple-choice questions and select-all-that-apply questions to analyze current digital technology and AI usage in music teaching (for RQ#2, see Table 3), and confidence and future intentions in using AI (for RQ#3, see Table 4).

Data analysis

We analyzed survey data using IBM SPSS Statistics software⁴⁰. We utilized descriptive statistics to provide an overview of participant characteristics and response patterns. Responses to the single-response multiple-choice and select-all-that-apply questions were summarized using frequencies and percentages, whereas responses to the Likert-scale items were summarized using means and standard deviations. The survey also included two open-ended questions that allowed participants to share their perspectives on resources that would support AI use and the future role of AI in music education. Open-ended responses were analyzed as additional perspectives and supplementary findings that could not have been captured by the closed-ended, quantitative responses. Findings are shared in the following results section.

Results

Fifty-four PK-12 music educators participated in the survey (see Table 1 for participant demographic characteristics), and represented teaching at the elementary level (65%, $N = 35$), middle school (9%, $N = 5$), high school (15%, $N = 8$), and other/multiple teaching levels (11%, $N = 6$). Participants varied in teaching experience: 15% reported 0-3 years of experience ($N = 8$), 19% reported 4-9 years ($N = 10$), 31% reported 10-19 years ($N = 17$), and 35% reported 20 or more years ($N = 19$). School settings included suburban (49%, $N = 26$), rural (34%, $N = 18$), and urban contexts (17%, $N = 9$). Most participants identified general music as one of their primary teaching areas (80%, $N = 43$), followed by choir (33%, $N = 18$), band (22%, $N = 12$), orchestra/strings (7%, $N = 4$), music theory (7%, $N = 4$), and composition/music technology (4%, $N = 2$).

Table 1 Demographic Characteristics of Participants

Characteristic	Category	N	%
Teaching level	Elementary	35	65
	Middle school	5	9
	High school	8	15
	Other/multiple teaching levels	6	11
Years of teaching experience	0–3 years	8	15
	4–9 years	10	19
	10–19 years	17	31
	20+ years	19	35
School setting	Rural	18	34
	Suburban	26	49
	Urban	9	17
Primary teaching area	Band	12	22
	Choir	18	33
	Composition/ music technology	2	4
	General music	43	80
	Music theory	4	7
	Orchestra/ strings	4	7

Note. $N = 54$. Percentages may not total 100 due to rounding. Primary teaching area was a select-all-that-apply item; therefore, percentages exceed 100.

Participants reported varying levels of prior training related to AI use in schools. Approximately one-fourth of respondents indicated they had no prior AI training (26%, $N = 14$), while a majority reported that they had briefly explored AI on their own in informal ways (52%, $N = 28$). Few participants reported they had attended a short workshop or webinar (17%,

$N = 9$), completed formal training (e.g. professional development course or certificate) (4%, $N = 2$), or had significant experience using AI in teaching or professional work (2%, $N = 1$). These findings suggest that although many participants had some exposure to AI, most had not received extensive or formal preparation for using AI in educational settings.

RQ#1. What are PK-12 music educators’ perceptions of AI integration in music education?

Participants’ perceptions of AI in music education were mixed. Table 2 includes descriptive statistics of survey items. Respondents showed relatively low agreement that AI currently plays an essential role in music education ($M = 2.04$, $SD = 1.08$), but they expressed somewhat greater agreement that AI has the potential to positively impact student learning in music ($M = 3.04$, $SD = 1.32$), and support differentiated instruction in music classrooms ($M = 3.29$, $SD = 1.34$). Participants also reported moderate confidence in their understanding of AI and its relationship to music education ($M = 2.96$, $SD = 1.38$). However, responses indicated substantial ethical concern, with participants reporting high agreement that they had concerns about the ethical use of AI in music education, including issues related to authorship and originality ($M = 3.98$, $SD = 1.39$).

Open-ended responses provided further insight into participants’ cautious and, in some cases, critical perspectives on AI in music education. Several participants emphasized that music education should remain grounded in human creativity, embodied musical experience, and authentic performance rather than increased screen-based instruction. One respondent explained, “Sometimes I want them [students] to have a break in my room and sing, play, move and create without a screen in front of them.” Another participant similarly stated that music education is about “creating authentic experiences in regard to creating, listening, and performing music,” and argued that AI may take away from “the human aspect of performing, listening, and creating.” These responses suggest that some music educators view AI as potentially misaligned with the experiential and human-centered nature of music learning.

Ethical concerns were also prominent in participants’ written responses. Some respondents expressed strong reservations about the use of AI in classrooms, particularly in relation to originality, student dependence, and broader social or environmental consequences. One participant wrote, “I have an ethical issue with the idea that advanced AI is the future of humanity,” while another stated, “I believe generative AI is a drain on natural resources, diminishes human creativity, and enables large corporations to open data centers.”

At the same time, some participants identified limited and practical roles for AI. Rather than viewing AI as a replacement for instruction or creativity, these respondents described

Table 2 Descriptive statistics for Likert-scale items addressing educators' perceptions of AI integration (RQ1)

Survey item	N	M	SD
I believe AI plays an essential role in current music education.	49	2.04	1.08
I believe AI has the potential to positively impact student learning in music.	49	3.04	1.32
I believe AI tools can support differentiated instruction in music classrooms.	49	3.29	1.34
I feel confident in my understanding of what AI is and how it works with music education.	49	2.96	1.38
I believe AI can enhance creativity rather than limit it in music learning.	49	2.82	1.24
I have concerns about the ethical use of AI in music education (e.g., authorship, originality).	49	3.98	1.39

Note. All items were rated from 1 (strongly disagree) to 5 (strongly agree). M = mean; SD = standard deviation.

it as a supplemental tool that could support planning, differentiation, feedback, or technical tasks. For example, one participant stated that AI “should be used to supplement learning goals or allow for differentiation among students, not replace creativity.” These comments suggest that some educators may accept AI when it supports rather than replaces teacher expertise, student creativity, and authentic musical experiences.

RQ#2. How are PK-12 music educators currently using AI tools and technologies in their music teaching and learning practices?

Digital technology use in music education

Although participants expressed caution toward AI, they reported frequent use of digital technology more broadly. Among respondents, 44% reported using digital technology very often in their music teaching ($N = 21$), while 23% used it often ($N = 11$), 23% used it sometimes ($N = 11$), and 10% used it rarely ($N = 5$). The most commonly used technologies were learning management systems such as Google Classroom or Canvas (98%, $N = 47$), online video/audio resources (92%, $N = 44$), music apps or software for practice and assessment (67%, $N = 32$), notation software (e.g., MuseScore, Sibelius, Noteflight) (60%, $N = 29$), and digital audio workstations or MIDI tools (25%, $N = 12$). In contrast, only 23% of respondents reported using AI-based tools (e.g., generative AI, automatic feedback tools) in their current music teaching.

AI use in music education

When asked specifically whether they had used AI in music teaching, 35% of respondents answered yes ($N = 17$), while 65% answered no ($N = 31$). Among those who had used AI, the most common uses were lesson planning or material creation (82%, $N = 14$) and administrative tasks (82%, $N = 14$). Other reported uses included in-class assignments or activities (47%, $N = 8$), student assessment (35%, $N = 6$), performance feedback related to pitch, rhythm, or tone (29%, $N = 5$), and composition or improvisation activities (24%, $N = 4$). These

results suggest that educators who use AI tend to apply it more often for planning, preparation, and administrative efficiency than for direct musical creation or performance-based instruction.

For participants who had not used AI in music teaching, the most frequently reported reason was concern about appropriateness or ethics (81%, $N = 25$). Other reasons included lack of knowledge or training (55%, $N = 17$), perceptions that AI was not relevant to their teaching (29%, $N = 9$), time constraints (26%, $N = 8$), limited access to AI tools (23%, $N = 7$), and lack of institutional support (10%, $N = 3$). Open-ended responses further reflected concerns about environmental impact, the quality of AI-generated lesson ideas, student overreliance on AI, and the belief that AI may conflict with the human and creative purposes of music education.

Open-ended responses provided additional examples of practical applications of AI in music education. One participant described AI as useful for “editing educator-created materials, saving time in administrative tasks such as parent emails/newsletters, ideas/brainstorming dialogue and assistance.” A different respondent suggested that AI could assist with specific music technology tasks, such as converting a scanned score into “usable MIDI information” for creating practice tracks. These responses provide further examples of how AI may be used for instructional preparation, administrative efficiency, and technical music-related tasks.

RQ#3. How do PK-12 music educators perceive their levels of confidence, barriers, and supportive needs related to AI integration in music education?

Confidence in technology and AI use

Participants reported relatively high confidence in integrating technology into music instruction overall ($M = 3.92$, $SD = 1.16$), but lower confidence in AI-specific areas. Respondents reported lower confidence in experimenting with new AI tools for music education ($M = 2.60$, $SD = 1.41$), evaluating AI-generated musical content ($M = 2.44$, $SD = 1.37$), and

Table 3 Current digital technology and AI use in music teaching (RQ2)

Survey item / response option	n	%
Frequency of digital technology use (valid N = 48)		
Never	0	0.0
Rarely	5	10.4
Sometimes	11	22.9
Often	11	22.9
Very often	21	43.8
Technologies currently used (valid N = 48; select all that apply)		
Notation software (e.g., MuseScore, Sibelius, Noteflight)	29	60.4
Digital audio workstations or MIDI tools	12	25.0
Learning management systems (e.g., Google Classroom, Canvas)	47	97.9
Online video/audio resources	44	91.7
Music apps or software for practice/assessment	32	66.7
AI-based tools (e.g., generative AI, automatic feedback tools)	11	22.9
Other	4	8.3
Use of AI specifically in music teaching (valid N = 48)		
Yes	17	35.4
No	31	64.6
Uses of AI among AI users (valid N = 17; select all that apply)		
Lesson planning or material creation	14	82.4
Composition or improvisation activities	4	23.5
Performance feedback (e.g., pitch, rhythm, tone)	5	29.4
Student assessment	6	35.3
Administrative tasks	14	82.4
In-class assignments/activities	8	47.1
Other	2	11.8
Reasons for nonuse among AI nonusers (valid N = 31; select all that apply)		
Lack of knowledge or training	17	54.8
Concerns about appropriateness or ethics	25	80.6
Time constraints	8	25.8
Lack of institutional support	3	9.7
Limited access to AI tools	7	22.6
Not relevant to my teaching	9	29.0
Other	8	25.8

Note. Percentages are based on the valid N shown for each subsection. Percentages for select-all-that-apply items may exceed 100. n = number of respondents selecting each response.

guiding students in responsible and ethical AI use ($M = 2.40$, $SD = 1.50$). This gap between general technology confidence and AI-specific confidence was one of the clearest findings of the study. It may signal that AI readiness involves competencies beyond general technology use, particularly the ability to evaluate AI-generated content, make ethical judgements, and guide students' responsible use of AI. Ultimately, this discrepancy suggests that comfort with digital technology does not

necessarily translate into confidence with AI-related practices.

Support needed and concerns in effective AI use

Participants identified several types of support that would help them use AI more effectively in music education. The most frequently selected support was practical classroom examples (74%, $N=34$), followed by time for exploration and planning (67%, $N=31$), clear ethical and policy guidelines

(61%, N=28), collaboration with other music educators (61%, N=28), professional development workshops (57%, N=26), curriculum-aligned AI tools (50%, N=23), technical support (46%, N=21), and school administration support (33%, N=15). Reported barriers also reflected these needs. The most common barriers were concerns about accuracy or reliability of AI outputs (75%, N=35), concern that AI may reduce students' creativity or musicianship (75%, N=35), lack of time to explore or implement AI (68%, N=32), uncertainty about appropriate or ethical use (64%, N=30), lack of training or professional development (62%, N=29), and concerns about student data privacy (47%, N=22).

Future AI use in music education

Future intentions regarding AI use were moderate to low. Participants reported relatively low agreement that they planned to incorporate AI more actively into their music teaching in the future ($M = 2.55$, $SD = 1.30$). However, they showed somewhat greater interest in receiving more AI training in their schools ($M = 2.98$, $SD = 1.42$) and learning more about AI applications in music education ($M = 3.23$, $SD = 1.42$). These findings suggest that while many music educators remain hesitant to adopt AI more actively, there is interest in better understanding the possibilities, limitations, and ethical implications for AI use in music teaching and learning.

Open-ended responses further illustrated participants' concerns about potential barriers to AI integration. Some respondents were concerned that AI could weaken students' musical development, with one participant noting, "If we grow dependent on poor quality AI, music education will suffer," and another participant warning that students may become "reliant on the technology" rather than listening to peers or watching the director in an ensemble setting. These comments reflect concerns that AI may undermine not only creativity and musicianship, but also the relational and collaborative practices central to music education.

Overall, these responses indicate that while many participants were hesitant about AI's role in music education, some participants identified value in carefully designed and implemented uses that support, rather than replace, educator expertise and student musicianship. In the following Discussion section, we interpret our findings in relation to our research questions.

Discussion

Based on the results of this study, we will discuss the answers to our research questions in the following discussion. The research questions relate to PK-12 music educators' perceptions of AI integration in music education, current use of AI tools and technologies in their music teaching and learning practices, and perceptions of their levels of confidence, barriers,

and supportive needs related to AI integration in music education.

Digital technology use and AI readiness

Study results suggest that PK-12 music educators are active users of digital technology, but their readiness to integrate AI into music education remains limited. Participants reported using learning management systems, online audio and video resources, music apps, and notation software; however, only a smaller group reported using AI-based tools in their current teaching. This distinction is important because it suggests that general technology use does not necessarily lead to AI readiness. Although AI in music education has been described as a tool for personalized learning, feedback, assessment, composition, and educator support, these possibilities depend heavily on educators' ability to evaluate and apply AI tools in pedagogically meaningful ways^{7,9,31}. The current findings therefore suggest that AI readiness may depend not only on educators' preparation, but also on the contexts in which they teach and the opportunities they have to access, explore, and evaluate emerging AI technologies.

One of the most significant insights gained from the results was the discrepancy between educators' confidence regarding general technology integration and AI technology integration. Educators had high confidence regarding integrating technology into their music classes; however, their confidence was lower in evaluating AI-created musical works, guiding the use of AI responsibly and ethically, and experimenting with new forms of AI technology in music education. Although limited formal preparation may contribute to this difference⁴, lower confidence should not be interpreted solely as a lack of training. AI technologies are evolving rapidly, and educators may have difficulty developing confidence with tools whose capabilities, limitations, and appropriate educational uses continue to change¹². Differences in school or district policies, access to AI tools, available time for exploration, and educators' personal interest in AI may also contribute to their reported confidence. Thus, AI readiness appears to reflect a combination of educator knowledge, experience, access, institutional context, and the rapidly changing nature of AI itself.

The characteristics of the sample should also be considered when interpreting these findings. Most participants taught at the elementary level (65%), and general music was the most commonly reported teaching area (80%). In addition, 66% of participants reported at least 10 years of teaching experience, including 35% with 20 or more years of experience. These characteristics may have shaped participants' experiences with and perceptions of AI. For example, the relevance and practical application of AI may differ across elementary general music, secondary ensembles, composition, music technology, and other instructional contexts⁶.

Table 4 Confidence, barriers, support needs, and future intentions related to AI integration (RQ3)

Survey item / response option	n	%	M	SD
Confidence in technology and AI use (valid N = 48)				
I feel confident integrating technology into music instruction.	48	—	3.92	1.16
I feel confident evaluating AI-generated musical content.	48	—	2.44	1.37
I feel prepared to guide students in responsible and ethical AI use.	48	—	2.40	1.50
I feel comfortable experimenting with new AI tools for music education.	48	—	2.60	1.41
Support needed for effective AI use (valid N = 46; select all that apply)				
Professional development workshops	26	56.5	—	—
Practical classroom examples	34	73.9	—	—
Curriculum-aligned AI tools	23	50.0	—	—
Technical support	21	45.7	—	—
Time for exploration and planning	31	67.4	—	—
Clear ethical and policy guidelines	28	60.9	—	—
Collaboration with other music educators	28	60.9	—	—
School administration support	15	32.6	—	—
Other	8	17.4	—	—
Barriers to AI use (valid N = 47; select all that apply)				
Lack of training or professional development	29	61.7	—	—
Limited understanding of how AI works	19	40.4	—	—
Uncertainty about appropriate or ethical use	30	63.8	—	—
Lack of access to reliable AI tools	20	42.6	—	—
Lack of time to explore or implement AI	32	68.1	—	—
Concerns about accuracy or reliability of AI outputs	35	74.5	—	—
Concerns about student data privacy	22	46.8	—	—
Technology limitations (e.g., devices, bandwidth, outdated software)	14	29.8	—	—
Insufficient school/administrative support	5	10.6	—	—
Not compatible with curriculum or teaching goals	14	29.8	—	—
Concern that AI may reduce students' creativity or musicianship	35	74.5	—	—
No perceived need for AI in the teaching context	18	38.3	—	—
Other	6	12.8	—	—
Future intentions regarding AI use and learning (valid N = 47)				
In the future, I want to have more AI training in my school.	47	—	2.98	1.42
I am interested in learning more about AI applications in music education.	47	—	3.23	1.42
In the future, I plan to incorporate AI more actively into my music teaching.	47	—	2.55	1.30

Note. Percentages are based on the valid N shown for each subsection and may exceed 100 for select-all-that-apply items. Confidence items were rated from 1 (not confident at all) to 5 (very confident); future-intention items were rated from 1 (strongly disagree) to 5 (strongly agree). n = frequency; M = mean; SD = standard deviation.

At the same time, effective AI integration into learning goes beyond mere access or general digital literacy. Existing literature highlights the significance of educators' knowledge about how AI technologies work, how AI output can be evaluated, and what types of AI technologies enable or impede musical learning^{7,9,41}. Music learning in particular raises this question significantly since it not only involves technical correctness,

but also interpretation, creativity, listening, cultural knowledge, and critical judgment⁴¹.

Pedagogical opportunities with AI use

The results also indicate that participants recognized some pedagogical possibilities of AI, particularly when AI was

framed as a support for educators rather than as a replacement for human instruction. Among the educators who had used AI, the most common uses were lesson planning, material creation, and administrative tasks. These findings are consistent with literature describing AI as a potential support for educator workload, instructional planning, differentiated materials, feedback language, and resource generation^{7,29,31}. These uses appear to be more acceptable to music educators because they preserve educator judgment and student musicianship while supporting efficiency and preparation. This finding suggests that music educators may be more willing to adopt AI when it enhances educator capacity rather than directly intervening in students' creative or performative processes.

This distinction may reflect a broader boundary that participants draw between using AI to support the work surrounding music instruction and allowing AI to participate directly in the musical and creative processes themselves. In other words, participants' acceptance of AI appears to depend partly on whether the technology preserves human agency^{38,39}. When AI is used to create material, generate ideas, or perform administrative tasks, the interpretation and creativity remain with the educators and students. This may be a reason why these applications were used more often than AI applications for composing, improvising, or performing.

AI use concerns

Along with sharing opportunities related to AI use, participants' responses reflected strong caution about AI's role in music education. The quantitative results indicated high levels of concern related to ethics, accuracy, reliability, privacy of student information, and the ability of AI to make students less creative and musical. These concerns are consistent with issues addressed in the literature, which includes the questions of authorship, originality, copyright, bias, cultural representation, and the limited capacity of AI for the interpretation of cultural and emotional content^{6,7,9}. AI can be helpful in some aspects of music learning, but it cannot replace the role of a person⁴¹.

The tension between AI's potential benefits and the perceived risks was evident in participants' views of creativity. Literature on AI in music education suggests that generative tools may expand access to composition, support experimentation, and help students explore musical ideas with fewer technical barriers^{9,41}. However, the findings from this study indicate that many music educators remain concerned that AI-generated music could weaken students' own creative decision-making. Several participants warned that AI should be supplemental and "never a replacement for human creativity." Another participant expressed concern that if students create music primarily through text prompts, music-making may become less about composing "with your instrument,

mind, body, soul" and more about prompt writing.

These responses reveal more than a general resistance to new technology. They suggest that participants were questioning what should count as meaningful musical learning when AI becomes involved in the creative process. Their concerns appear to center on whether students remain responsible for listening, interpreting, making artistic choices, revising their work, and interacting musically with others. From this perspective, resistance to AI may reflect a desire to protect particular forms of musical agency and experience rather than opposition to technology itself. This interpretation is consistent with Holland's argument that music learning is not simply problem-solving, but also involves problem-seeking, interpretation, revision, and artistic judgment⁸. AI-assisted creativity, therefore, may be more acceptable when it extends students' musical thinking rather than bypassing the processes through which that thinking develops.

The participants' concerns about students becoming "reliant on the technology" rather than listening to peers or watching the director also point to the social nature of music learning. Ensemble participation requires attention, responsiveness, coordination, and communication among musicians. AI tools that individualize or automate aspects of musical activity may therefore be perceived as problematic when they interfere with these interpersonal dimensions of music-making. The findings suggest that participants were not simply weighing the efficiency of AI against its limitations; they were also evaluating AI according to their beliefs about the human, relational, and embodied purposes of music education.

Additionally, participants identified barriers such as lack of training, limited understanding of AI, lack of access to reliable tools, limited time, and insufficient support. Importantly, these barriers reinforce the idea that relatively low AI confidence cannot be attributed to educator preparation alone. Schools and districts may consider whether educators have the time, tools, policies, and support necessary to use AI responsibly. Differences in access and institutional guidance may also mean that educators have very different opportunities to develop familiarity with AI, even when they have similar levels of general technological competence. Without these conditions, AI may become another educational innovation that is unevenly implemented across schools and teaching contexts.

Professional learning in AI use for music education

Our research findings highlight the importance of discipline-specific professional development. Practical instances in the classroom, time for exploration and planning, ethical guidelines, collaboration with other music teachers, and workshops for professional development were mentioned by the participants as the most helpful resources for utilizing AI. This conclusion correlates well with the current literature stating that

the successful integration of AI into classroom settings would rely on the AI literacy of teachers, pedagogical training, ethical considerations, and discipline-specific professional development^{7,9,31}.

Nevertheless, the results imply that professional development should not be viewed solely as a way to address educators' lack of AI knowledge. Training is just one component of a much bigger process which may also include such elements as the provision of adequate tools, protected time, collaboration, and ethics. This is especially important when taking into consideration the fast pace at which the technology evolves, and the need for continuous professional development becomes apparent.

General AI training might be insufficient for music teachers because decisions about AI use are closely connected to the particular goals and practices of the music discipline^{6,38}. Music education involves performance, ensemble interaction, composition, listening, cultural representation, creative ownership, and embodied forms of learning that may not be addressed in generic AI professional development. Professional learning could therefore include music-specific examples that allow educators to examine not only how AI tools can be used, but also when their use supports musical learning and when non-AI approaches may be more pedagogically appropriate.

More specifically, professional learning could include AI training tailored to music education, ethical decision-making frameworks for evaluating appropriate AI use, and curriculum guidelines that provide examples of how AI may be incorporated into areas such as composition, performance, assessment, and instructional planning. These supports could help music educators consider when the use of AI tools is pedagogically consistent with the creative and human-centered goals of music education.

Implications

In our study, we found that music educators are not resistant to technological innovations, but that they consider AI use with values and purposes of music education. While the participants indicated comfort using some digital technology, considerations of AI included issues related to creativity, ethics, student growth, and educator responsibility. Thus, these results further confirm the conclusions drawn from the literature on AI in music education that AI should be viewed not as an innovation to replace human musicianship and educator expertise, but as a pedagogically evaluated supplement to it^{7,8,41}. Consequently, future and integration of AI into music education should involve emphasis on educator agency, ethical aspects, musical authenticity, and student creativity. Future studies such as longitudinal research, intervention-based studies, and comparative analyses should address how music educators build their AI literacy, the role of professional de-

velopment in adopting AI, and the experiences of students of AI in music education.

Limitations

Participants were recruited from one Midwest state, which limits the extent to which the findings can be generalized beyond this specific context. In addition, the sample included a larger proportion of elementary and suburban music educators than secondary, urban, or rural educators. These characteristics may have shaped participants' experiences with AI, professional learning, policy, and technology use. Future studies could include participants from multiple states and more balanced representation across teaching levels and school settings. Inferential analyses and hypothesis testing could also be incorporated in future research to examine potential group differences and relationships among variables.

The application of convenience sampling further limits the generalizability of the findings because participants were recruited from an available distribution list rather than through probability sampling. Educators who chose to participate may also have greater interest in or strong opinions about AI than those who did not respond. Therefore, the findings should be interpreted as reflecting the perspectives of this particular group of participants rather than representing the broader population of PK-12 music educators.

Another limitation is related to the survey instrument used. Because there is still limited validated research and few established survey instruments specifically examining AI use in music education, the authors developed a survey for this study. As a newly developed instrument, some questions were designed to provide descriptive information about participants' experiences and perceptions rather than to measure established concepts through validated multi-item scales. Thus, the findings should be interpreted mainly as a description of participants' views and experiences with AI in music education.

Additionally, this study was deployed in Spring 2026. With technology and AI tool use rapidly changing, we recognize that our participants' perspectives regarding AI and music education may change quickly with new and updated training, policies, tools, and technology use opportunities. Due to the quick changes in AI use, our study is limited in ensuring the findings are relevant and timely.

Conclusion

In this study, we examined the perceptions of PK-12 music educators regarding AI knowledge, use, and integration in their music education programs. In particular, we were interested in understanding these educators' current AI practices, concerns, and training needs. Results from our study indicate that mu-

music educators often use digital tools in their music classrooms, but they do not have as much experience with AI tools used to support their music teaching. While AI in music education is a newer concept, participants recognized potential AI use related to planning and differentiating lessons, completing administrative tasks, and gaining support in using new technology. However, the use of AI raises ethical concerns regarding authorship, creative thinking, and the value of human-created music, all of which are important to consider. This study adds to the literature by showing a clear gap between educators' confidence with general digital technology and their confidence with AI-specific practices. It also identifies the concerns, barriers, and types of support that may be especially important when AI is introduced into music education.

With technology advancing, it is important to continue to research AI use in PK-12 music education programs. Consistent with participants' responses and prior literature, AI tools and technologies may be most appropriate when they complement, not when they replace the knowledge, skills, and expertise of music educators. At the same time, students should continue to have opportunities to develop and express their own creativity^{9,19}. For music educators, this means using AI selectively and purposefully in ways that support differentiation and other teaching tasks while maintaining educator judgement and student creativity.

At the school and district level, longer-term support may include clearer policies of AI use, as well as professional learning tailored to music education. As AI continues to develop, schools will need to consider issues such as authorship, privacy, and appropriate instructional use while ensuring that AI supports the broader goals of PK-12 music education.

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