



Audio Engineering Society

Conference Paper 1

Presented at the AES International Symposium on AI and the Musician
2024 June 6-8, Boston, MA, USA

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Harmonizing AI with Equity and Inclusion in Music Education

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ABSTRACT

This paper explores how Artificial Intelligence (AI) can transform tertiary music education to enhance fairness and inclusivity, employing Pierre Bourdieu's sociological theories of cultural capital, habitus, and field as a lens to understand its impact. It advocates for the careful application of AI to significantly lessen the educational barriers that underserved communities encounter, identifying AI as a critical instrument for equity in music academia. AI's ability to tailor music instruction and broaden access to musical resources positions it as a powerful force for redistributing cultural capital and fostering more inclusive educational experiences. The paper stresses the importance of an ethical approach to AI integration, focusing on transparency and privacy to ensure AI promotes inclusivity and respects students' diverse backgrounds.

1 Introduction

The integration of Artificial Intelligence (AI) in music education at the tertiary level signifies a transformative shift, promising profound enhancements in teaching methodologies and learning experiences. Amidst a significant digital transformation in education, AI emerges as a crucial force in dismantling long-standing barriers that have restricted access to quality music education for underserved communities. These barriers include limited availability of instruments, specialized resources, and exposure to diverse musical traditions, which have historically hindered musical proficiency and diversity within the field [17, 23]. A multi-stakeholder approach is crucial in governing the educational applications of AI to ensure it serves broad societal interests [2]. This paper conducts a secondary analysis of existing literature to explore how AI can be strategically applied to advance

fairness and inclusivity, positioning it as a pivotal tool for social justice within music academia [27].

This study uses Pierre Bourdieu's sociological theories to examine AI's potential in three critical dimensions: personalizing music instruction, democratizing access to musical resources, and providing data-informed insights that tailor teaching to individual student needs. AI can facilitate comprehensive musical development for all students through extensive musical archives, learning tools, and virtual instruments, significantly enhancing teaching effectiveness [13]. Moreover, this paper addresses the ethical considerations for integrating AI into music education. It underscores the importance of transparency, privacy, and equity, ensuring that AI is an instrument of inclusivity rather than a perpetrator of existing disparities. Through a synthesis of empirical evidence and case studies, the effectiveness of AI in improving

educational outcomes for students from marginalized backgrounds is highlighted, illustrating its role in adapting music composition software to diverse skill levels, providing intelligent tutoring feedback, and employing algorithms to bridge gaps in music theory and practice [36, 1, 38].

This paper advocates for a strategic and informed approach to adopting AI in music education. Stakeholders are encouraged to recognize both the potential and limitations of AI, aiming to leverage this technology to dismantle educational barriers, promote inclusivity, and foster a more equitable environment in music education [2]. AI integration can be a transformative force that can reshape the educational landscape by addressing long-standing inequities and enhancing educational access and quality for all students.

2 Theoretical Framework: Pierre Bourdieu

This paper adopts Pierre Bourdieu's sociological theories to frame the integration of AI in music education, examining how AI can perpetuate existing inequalities or catalyze social equity within educational contexts. Bourdieu's concepts of cultural capital, habitus, and field are instrumental in understanding the dynamics at play. Cultural capital is the non-economic assets influencing social mobility, such as skills, tastes, and education. At the same time, habitus encompasses the deeply ingrained habits, dispositions, and perceptions developed from one's cultural and social experiences [4]. Field is the network or context in which agents and their social positions operate [11, 12].

In music education, these theoretical tools allow us to scrutinize AI's role in reshaping access to learning and resources and influencing the habitus of learners and educators. This paper argues that the advent of AI in music education heralds' potential shifts in pedagogical paradigms that could either reinforce existing social inequalities or catalyze unprecedented educational equity. AI has the potential to significantly transform music education by reducing educational barriers and enhancing inclusivity, as analyzed through Bourdieu's concepts, which reveal both opportunities and challenges in leveraging AI to promote educational equity [13, 27, 23].

AI's capacity to democratize access to diverse musical knowledge and instructional techniques presents a significant opportunity to disrupt traditional modes of cultural reproduction. This technology can provide personalized learning experiences that are more attuned to a diverse student

body's cultural and educational background, potentially leveling the playing field and facilitating a form of educational equity that was previously unattainable. However, if not carefully designed, AI-driven educational tools could mirror existing biases, favoring students who already possess the cultural capital congruent with AI's programming and use, thereby reinforcing existing social structures within the classroom [1, 21].

Furthermore, examining AI's impact on the educational field involves analyzing the relationships and power dynamics between various stakeholders, including students, teachers, educational institutions, and technology providers. Bourdieu's field theory offers a valuable framework for understanding these dynamics, considering the broader socio-cultural context in which education occurs. This analysis will reveal whether AI in music education merely perpetuates the field's existing power relations or actively challenges them, thereby contributing to a more equitable educational landscape [15, 24]. This thesis aims to uncover the extent to which AI can perpetuate or mitigate social inequalities in music education by critically assessing how it can influence these Bourdieusian concepts.

3 Bourdieu's Sociological Theories

Pierre Bourdieu's theoretical framework offers a profound insight into how social structures influence individual agency and practices within different fields, including education. Cultural capital, habitus, and field concepts are central to his theory, contributing to our understanding of how individuals interact within social systems. Bourdieu's work emphasizes the role of power and capital in social stratification, exploring how various forms of capital—including social, economic, and cultural—can affect one's potential for success and influence within a societal context [11].

Cultural Capital is a cornerstone concept in Bourdieu's theory, encompassing the non-economic resources individuals inherit and acquire from their family and social environment [11]. These resources include knowledge, skills, education, and other cultural competencies and preferences that provide social advantages. Cultural capital can manifest in music education as a student's exposure to music theory, instrumental proficiency, or even familiarity with specific music genres, influencing their educational trajectory and success. The deployment of AI in music education has the potential to either level the playing field by broadening access to these

cultural resources or exacerbate existing disparities depending on its accessibility and design [22; 1].

Habitus refers to the deeply ingrained habits, dispositions, and ways of thinking developed from one's life experiences, particularly those experiences rooted in one's class, background, and education [12]. It represents how one's personal history conditions one's body and mind to cope with the various situations one encounters in society. In music education, a student's habitus might influence how they perceive their musical abilities, educational aspirations, and even their engagement with AI-driven educational tools. An AI system sensitive to these diverse backgrounds can offer more customized and effective educational experiences, adapting to each student's needs and dispositions [13].

Bourdieu's sociology considers "**field**" as a critical concept that describes the social arena where agents and their social positions exist. Fields are structured spaces with their own rules, schemes of domination, and cultural narratives, where various forms of capital are at stake, and agents struggle according to the specific logic of the field [10]. The field of music education, with its particular norms and hierarchies, is dynamically impacted by the introduction of AI technologies. These technologies can challenge traditional authority and pedagogical methods, redistributing power and potentially altering the value of different types of cultural capital within the field [15; 24].

Together, these concepts form a robust framework for analyzing the integration of AI into music education. By considering how AI might impact cultural capital, reshape habitus, and reconfigure the field of music education, educators and policymakers can better design and implement AI technologies that promote equity and inclusivity. Bourdieu's theories help highlight the potential of AI as a transformative tool that could democratize education or as a reinforcing mechanism that perpetuates existing inequalities.

3.1 Relevance of these concepts to education and technology.

The concepts of cultural capital, habitus, and field, as developed by Pierre Bourdieu, are profoundly relevant to education and technology, particularly in integrating AI into teaching and learning environments. These concepts offer educators and technologists a critical lens through which to examine how AI tools are designed and deployed and their potential effects on the educational landscape [11]. By applying Bourdieu's framework, stakeholders can assess how AI might influence the

distribution of cultural capital, potentially democratizing access to valuable educational content or, conversely, reinforcing existing disparities based on the socio-economic backgrounds of students [12].

When enhanced through AI, cultural capital in music education can enable a broader range of students to engage with high-level musical training and previously exclusive cultural expressions [23]. This access could reshape students' habits—altering their perceptions of themselves and what they can achieve in music and beyond [13]. Additionally, AI can transform the field of music education itself by introducing new actors (such as AI-driven platforms and tools), changing the rules of engagement, and shifting the dynamics of power and authority within the educational system [16].

Furthermore, understanding AI's role through Bourdieu's theories underscores the potential of technology to act either as a force for equity or as an instrument that perpetuates systemic inequalities [8; 24]. This dual potential makes it crucial for the design and implementation of AI in education to be guided by a commitment to inclusivity and awareness of the diverse needs of all students [1]. By consciously addressing these needs, AI can be harnessed to foster a more equitable educational environment, allowing all students to acquire the cultural capital necessary to succeed [3].

The integration of AI in music education, viewed through the lens of Bourdieu's sociological theories, invites a complex but crucial analysis of how technological advancements can impact educational equity. It prompts careful consideration when developing and utilizing AI applications, ensuring they serve as tools for empowerment rather than exclusion. This approach aligns with ethical educational practices and a broader commitment to social justice in an increasingly digital world [21].

4 AI in Music Education: Opportunities and Challenges

As AI continues to integrate into various educational sectors, its impact on music education is particularly noteworthy, offering significant opportunities and notable challenges. This section delves into how AI reshapes music education through personalized instruction, expanded access to resources, and data-driven insights, each bringing advantages and potential pitfalls. AI-driven systems enable the creation of customized lesson plans that cater specifically to students' individual needs, optimizing learning efficiency and engagement by aligning with students' existing knowledge, skill

levels, and learning paces [23]. Furthermore, AI technology provides unprecedented access to extensive musical resources, breaking down traditional barriers that have limited educational opportunities in well-funded environments [21]. These platforms facilitate interactions such as virtual master classes and real-time feedback from renowned musicians, making high-quality music education more accessible. However, the increased access and reliance on extensive data collection introduce challenges, including the need for robust digital infrastructure, potential information overload, and heightened concerns over data privacy and security [25].

4.1 Personalized Instruction

One of the most significant opportunities presented by AI in music education is the capacity for personalized instruction. AI-driven systems can analyze a student's existing knowledge, skill level, and learning pace, creating customized lesson plans that cater specifically to the needs of everyone. Such technologies also facilitate enhanced classroom preparation, particularly in flipped classroom settings [17]. This approach optimizes learning efficiency and helps maintain student engagement by addressing specific interests and challenges [3]. For instance, AI algorithms can suggest pieces matching students' technical proficiency and stylistic preferences, enhancing motivation and progression [1].

4.2 Access to Resources

AI technologies dramatically expand access to a wide range of musical resources traditionally limited to students in well-funded educational environments. Through platforms that offer extensive libraries of sheet music, recordings, and interactive tutorials, AI breaks down geographical and economic barriers to high-quality music education. Furthermore, AI can facilitate virtual master classes and real-time feedback from top musicians worldwide, making elite education more accessible [16]. However, this increased access also presents challenges, such as the need for adequate digital infrastructure and the risk of overwhelming students with too many choices without proper guidance [30].

4.3 Data-Driven Insights

AI's ability to collect and analyze large amounts of data offers profound insights into the learning process, providing educators with tools to better understand and support their students. By monitoring students' progress through data analysis, AI can identify patterns and predict areas where students

might struggle, allowing for timely intervention. Assessment strategies in the age of AI must adapt to ensure fairness and comprehensiveness [35]. Moreover, this data can inform broader educational strategies, enabling institutions to refine curricula and teaching methods based on empirical evidence [19]. However, this reliance on data also introduces privacy and security challenges, requiring stringent measures to protect student information [31].

4.4 Challenges of AI Integration in Music Education

To fully realize the potential benefits of integrating AI into music education, educators must navigate several challenges carefully while ensuring that the quality of education remains uncompromised. One of the primary concerns is the quality of the data and the design of the algorithms themselves. AI systems rely heavily on the data fed into them, which can perpetuate existing biases if the data is not diverse and representative of all student groups [32]. Moreover, AI's role in education assessment brings risks and opportunities that need careful management [34]. For example, if an AI-powered music composition tool is trained predominantly on classical Western music, it might not adequately support or appreciate other musical traditions, thus limiting its usefulness for a diverse student body [31; 22]. Additionally, integrating AI into education raises questions about the future of jobs in this sector [16]. Such biases in AI programming can reinforce cultural hegemony, inadvertently marginalizing non-mainstream musical expressions and their practitioners [18].

Another significant challenge is the risk of diminishing the intrinsic human elements of music education. Music is about acquiring skills and knowledge and fostering creativity, expression, and emotional development. Over-reliance on AI can potentially undermine these aspects by deprioritizing the importance of personal interaction between students and teachers. Educators provide nuanced feedback, encouragement, and mentorship that AI systems cannot wholly replicate. AI systems may lead to a more transactional form of education that lacks emotional depth and personal touch; as noted by Janssen et al. in 2019, tools must be used as supplements to, rather than substitutes for, human instruction, ensuring that technology enhances rather than detracts from the music learning experience.

Incorporating AI into music education requires a commitment to ethical standards, especially regarding privacy and data security. As AI systems process large volumes of personal information about

students' learning habits, preferences, and performance, there is a substantial risk of breaches and unauthorized use of sensitive data. Schools and educational technology providers must implement robust security measures and uphold strict data governance policies to protect students' privacy [25]. Additionally, there should be transparency regarding how AI systems make decisions and adapt to different learners, allowing for accountability and modifications based on feedback from educational stakeholders [33].

4.5 Potential Benefits for Underserved Communities

Integrating AI into music education holds significant promise for underserved communities, offering unprecedented opportunities to bridge educational resources and access gaps. AI can tailor educational content and pedagogy to meet the diverse needs of students from different socio-economic backgrounds, effectively democratizing the learning process [23]. For example, AI-driven platforms can provide personalized learning experiences that adapt to the individual's pace and learning style, which is particularly beneficial in areas where access to qualified instructors may be limited [1]. Moreover, AI can facilitate access to various musical genres and instruments that students in underserved communities might otherwise never encounter, thus broadening their cultural exposure and enhancing their educational experience [21].

Moreover, AI can level the playing field by providing scalable solutions that organizations can deploy regardless of geographical constraints. By leveraging technologies such as mobile apps and cloud-based learning systems, AI enables students from remote or rural areas to access high-quality music education resources [16]. This accessibility can help foster a more inclusive environment where talent and interest in music can flourish without lacking local resources or opportunities. Such technological interventions enhance learning outcomes and empower communities by making cultural and educational enrichment accessible to all, regardless of economic or geographical limitations [18].

Despite the optimistic outlook, the deployment of AI in music education has challenges and risks, especially concerning privacy and the potential reinforcement of biases. Privacy concerns emerge as AI systems often require collecting and analyzing large amounts of personal data to function effectively. This data can include performance metrics, learning preferences, and even behavioral patterns, which must be handled strictly to protect student privacy

[25]. Schools and technology providers must ensure robust data protection measures to prevent unauthorized access and misuse of this sensitive information, fostering a safe learning environment for all students [28].

Moreover, there is a real risk that AI systems, if not carefully designed and continually monitored, may perpetuate existing biases found in their training data. For instance, if an AI music education tool is primarily trained on data reflecting a narrow set of musical traditions, it may fail to adequately represent or value the diversity of musical expressions across different cultures and communities [32]. This oversight can cause cultural bias, as it undervalues or ignores the musical backgrounds of some students. AI applications must be developed with a clear understanding of cultural diversity and inclusivity, ensuring all students benefit equally from technological educational advancements [33].

5 Analysis Through Bourdieu's Lens

5.1 Cultural Capital and AI in Music Education

AI is transforming the landscape of cultural capital in music education by making it more accessible and inclusive. Traditionally limited to those with access to specialized resources, AI now democratizes this cultural capital by providing diverse and extensive educational materials such as tutorials, music archives, and interactive tools to a broader audience [1]. AI-driven platforms personalize the learning experience by adapting to individual learning styles and paces, thus allowing for a more tailored educational journey that emphasizes personal growth [23]. This personalization enables students from various backgrounds to explore less-represented global music forms, enhancing their understanding and appreciation of music's universal language through exposure to various musical expressions and histories.

Moreover, AI's ability to analyse large data sets substantially benefits curriculum development, offering insights that lead to integrating emerging musical technologies and genres into educational settings [21]. These data-driven adaptations help prepare students for the contemporary music scene and equip them with relevant skills for a digitally connected world. However, the use of AI in music education also presents challenges, such as the potential for over-standardization, which might limit the appreciation of musical education's nuanced and subjective aspects. Educators must, therefore, be vigilant, ensuring that AI tools enhance rather than

constrict the diversity and richness of cultural expressions within the music education field.

5.2 Habitus: Potential Transformation of Student and Teacher Dispositions and Practices through Interaction with AI

AI's integration into music education can potentially transform the habitus of students and teachers significantly. AI can alter how students engage with music learning by providing more personalized and responsive educational experiences [16]. For instance, AI-powered tools can adapt to individual learning speeds, styles, and preferences, potentially changing students' attitudes toward learning music by making it more accessible and enjoyable. This transformation in the learning process can encourage students to take more initiative and develop confidence in their musical abilities, fundamentally shifting their dispositions towards music education.

Teachers' habitus may also evolve with the adoption of AI in music education. The traditional role of the teacher has expanded from that of a knowledge transmitter to a facilitator of learning, where they guide and mentor students through AI-driven curricula [18]. This shift requires teachers to adapt by developing new skills, such as technological proficiency and data literacy, to effectively integrate AI tools into their teaching practices [33]. Moreover, as AI takes on more administrative and evaluative tasks, teachers can focus more on fostering creativity and critical thinking in their students, potentially leading to a more reflective and innovative teaching approach.

5.3 Field: How AI Might Alter the Power Relations and Hierarchies within the Field of Music Education

Introducing AI into music education could significantly reconfigure the field's power relations and hierarchies. Traditionally, a few well-resourced institutions and individuals have concentrated access to prestigious music education and resources. By democratizing access to high-quality music education resources, AI technology can disrupt these traditional power structures by enabling a wider range of institutions and individuals to participate in what was once an exclusive field [25]. This shift could reduce the dominance of elite institutions and broaden the field, allowing for more diverse influences and innovations in music education.

Furthermore, AI could lead to new forms of authority and expertise within music education. Educators adept at integrating AI tools into their teaching may gain new prestige and influence,

reshaping the hierarchies within educational institutions. Conversely, those resistant to or unable to engage with new technologies might find their influence waning. Additionally, tech companies that provide AI solutions may become powerful stakeholders within the field, potentially influencing educational agendas and priorities [32].

6 Strategies to Mitigate Teacher Bias Towards Technology

Teachers' biases towards technology can significantly influence the integration of AI into music education and its effects on cultural capital, habitus, and the field. Teachers who embrace AI technologies will likely integrate these tools more thoroughly into their curricula, enhancing their students' access to diverse forms of cultural capital and potentially transforming students' habitus toward learning [24]. This paradigm shift could foster a more equitable learning environment where all students can develop their musical skills and cultural appreciation.

Conversely, teachers who are skeptical of or resistant to AI may slow the adoption of innovative practices, potentially reinforcing existing educational inequalities. Their biases could prevent students from benefiting from the personalized and enhanced learning experiences that AI can provide, thereby maintaining traditional barriers to access in music education [32]. Such resistance could also affect music education by limiting the integration of new technologies and preserving outdated pedagogical methods and power structures [23].

6.1 Professional Development and Training Programs in AI for Music Education

Professional development and training programs are crucial for equipping educators with the skills necessary to utilize AI effectively in music education and to advocate for its benefits. These programs should be comprehensive, offering initial and ongoing training opportunities that align with the latest advancements in AI technology. Professional development could include subscription-based online platforms for continuous skill and knowledge enhancement, regular workshops led by AI experts, and access to state-of-the-art AI tools in music education [1]. Such multifaceted training helps educators stay at the forefront of educational technology, enabling them to integrate AI more effectively into their teaching practices. Additionally, these programs must accommodate different levels of technological

expertise among teachers, from beginners to those more advanced, ensuring that every educator, regardless of their starting point, can benefit from these opportunities. It is essential to frame AI as algorithmic aides and agentic collaborators in educational settings [25].

Moreover, these training initiatives should emphasize AI's pedagogical implications, helping educators understand how to use AI tools and appreciate their potential to transform student learning outcomes. These initiatives could involve demonstrating real-life case studies of successful AI integration, discussing personalized learning possibilities enabled by AI, and addressing specific educational challenges in music education, such as skill assessment and performance feedback [21,34]. To ensure the success of these programs, schools, and educational institutions must support them by prioritizing funding and offering incentives such as recognition and professional advancement. By institutionalizing these development opportunities, educational systems can foster a more innovative, effective, and inclusive approach to integrating AI into music education, benefiting the entire educational community [15].

6.2 Inclusion of Reflective Practices in Teacher Training

Incorporating reflective practices in teacher training is vital for fostering critical awareness among educators about their use of AI technologies in music education. These practices help teachers critically examine their teaching methodologies, pedagogical philosophies, and any biases toward technology [23]. Regular reflection sessions enable educators to confront preconceived notions and resistance towards AI, providing a platform to articulate concerns, share experiences, and collaboratively develop solutions that enhance teaching practices. Additionally, these sessions encourage educators to consider AI tools' broader ethical, cultural, and social implications, such as data privacy, educational equity, and the impact on student autonomy and creativity, thus aligning AI integration with ethical teaching practices [24].

Teacher training programs should include case studies and role-playing exercises that simulate real-life AI use in music education to deepen these reflective practices' impact. This experiential learning helps bridge the gap between theoretical knowledge and practical application, pushing teachers to think on their feet and understand AI's practical impacts [1]. For these practices to be transformative, they must be an ongoing part of

professional development, fostering a culture of lifelong learning and adaptability. Educational institutions should support these initiatives by providing necessary resources, time for reflection during professional development days, and access to forums for continuous discussion, ensuring that AI integration is effective and reflects educational values.

6.3 Promoting Collaborative Approaches in AI Adoption

Adopting AI in music education can be significantly enhanced through collaborative approaches that connect educators to share experiences, strategies, and best practices. Establishing communities of practice or learning networks focused on AI integration proves highly effective, creating forums where teachers can discuss their challenges and successes with AI tools [18]. Such collaborative environments allow teachers to learn from one another and provide mutual support, alleviating concerns and reducing resistance to new technologies. Regular workshops and meetings are where educators can demonstrate and refine their AI integration strategies, further foster a sense of community and shared purpose, help to demystify AI technology for newcomers and strengthen the expertise of more experienced users.

Collaborative projects are essential in this approach, encouraging educators to work together to integrate AI into their teaching practices. Teachers can co-develop AI-enhanced lesson plans, conduct joint research on AI's effectiveness in music education, or collaborate on performances that showcase AI-assisted learning. These initiatives allow educators to pool their diverse skills and perspectives, leading to more creative and effective applications of AI in the classroom [21]. Teachers can also develop a shared understanding of how to tailor AI to meet the varied needs of their students by working together and promoting more inclusive educational practices.

To support these collaborative efforts effectively, educational institutions must provide necessary resources, including funding for collaborative projects, time for planning and reflection within school schedules, and access to professional development resources focused on collaborative skills and AI technology. Furthermore, educational leaders should foster a culture that values teamwork, experimentation, and innovation, encouraging educators to take collective ownership of AI integration. This institutional support is crucial for cultivating a proactive and collaborative approach to

using AI in music education, ensuring all educational community members benefit from these technological advances.

6.3 Evaluating Teacher Bias on AI Integration

Understanding and mitigating the impact of teacher biases on integrating AI in music education requires a systematic approach to evaluation. Moreover, improving teachers' trust in AI through targeted professional development programs is vital [26]. Teacher biases can subtly influence how they use technology in the classroom and affect the effectiveness of AI as an educational tool. To thoroughly assess these biases, educational researchers and administrators can employ various methods that provide insights into teachers' attitudes and practices [32].

Surveys are a fundamental tool for gauging teacher biases. Well-designed surveys can help uncover teachers' perceptions, apprehensions, and misconceptions about AI technologies [21]. These surveys should include questions that explore teachers' comfort levels with AI, their beliefs about its efficacy, and their willingness to integrate AI into their curricula. Surveys can be distributed before and after AI integration initiatives, allowing researchers to measure attitude changes over time. Analyzing survey data highlights trends and pinpoint areas where biases prevent the effective use of AI tools.

Interviews offer a deeper, qualitative understanding of teacher biases. Unlike surveys, interviews allow for in-depth discussions and can explore the nuances of teachers' attitudes toward AI. By conducting structured or semi-structured interviews, researchers can explore the reasons behind teachers' enthusiasm or resistance to AI, exploring how their educational philosophies and personal experiences influence their approach to technology in the classroom [24]. These interviews can be particularly insightful when they explore teachers' experiences with specific AI applications, revealing how biases might impact the actual implementation and adaptation of technology in teaching.

Classroom Observations provide a direct way to evaluate how teacher biases manifest in real time during AI integration. Observers can note how frequently and effectively teachers use AI tools, observe their interactions with students when using the technology, and assess whether they utilize AI to support inclusive and equitable education practices [23]. Observations should be conducted over a series of classes to accurately represent typical usage and to see how teacher attitudes might shift as they

become more familiar with the technology. This method can also identify discrepancies between what teachers say in surveys or interviews and what they do in practice.

Feedback from Students can also be invaluable in assessing the impact of teacher biases on AI integration. Students often perceive and are affected by their teachers' attitudes toward technology, which can influence their engagement and learning outcomes [18]. Collecting student feedback through surveys, focus groups, or informal feedback mechanisms can provide additional perspectives on how teacher biases toward AI are perceived and experienced in the classroom.

7 Proposing Ongoing Research on Teacher Biases in AI-Enhanced Education

Ongoing research is crucial to fully understand the impact of teacher biases on integrating AI in music education. This research aims to monitor and analyse how these biases affect students' access to and the efficacy of AI-enhanced education over extended periods. A longitudinal study design could be particularly effective in this context, tracking students' progress over several years to observe how teacher attitudes toward AI could influence student learning outcomes, engagement levels, and access to innovative educational tools [32, 21]. Such studies could use quantitative metrics, such as student performance data and AI usage statistics, and qualitative observations, including student and teacher feedback, to provide a comprehensive picture of the interplay between teacher biases and educational technology efficacy.

7.1 Methodological Approaches to Investigating Long-term Effects

Implementing this research would require methodological rigor and a multidisciplinary approach, combining educational technology, psychology, and sociology insights. Researchers should employ diverse data collection methods, including surveys to gauge teacher and student perceptions of AI [24, 1], in-depth interviews to explore attitudes and biases in greater detail [23, 11], and classroom observations to document how these biases manifest in actual teaching practices [18]. Additionally, it would be beneficial to incorporate data analytics techniques to examine the patterns of AI tool usage across different groups and correlate these patterns with academic outcomes. By understanding these dynamics, researchers can

identify whether certain biased behaviours or attitudes link to poorer educational outcomes or limited access to AI resources.

7.2 Implications and Outcomes of the Research

The findings from this research have significant implications for policy-making and educational practice. If researchers find biases limit student access to AI-enhanced education, they can develop targeted interventions to address these issues [35]. For instance, the results could lead to professional development programs tailored to change specific biased behaviours or promote more equitable use of AI tools in the classroom [37]. Moreover, understanding these biases allows educational leaders to design AI systems and training programs that are culturally sensitive and inclusive, potentially transforming the educational landscape to foster a more equitable learning environment [15]. Ultimately, this ongoing research aims to ensure that AI enhances educational equity rather than perpetuates existing disparities.

8 Conclusion

Throughout this analysis, we have explored the multifaceted role of AI in transforming music education, guided by Pierre Bourdieu's sociological theories of cultural capital, habitus, and field. AI's dual potential to democratize music education and reinforce existing inequalities is a key insight that emerges. AI offers unprecedented opportunities for personalized learning and access to diverse musical resources, thereby potentially expanding what constitutes cultural capital in music education [23]. However, implementing AI also risks perpetuating biases if not carefully managed, thus affecting the habitus and field of music education in ways that could entrench existing disparities [24].

To navigate these complexities, it is crucial for stakeholders in music education—including educators, policymakers, and technology developers—to adopt AI responsibly [2, 37]. AI adoption involves actively engaging in professional development to understand AI's capabilities and limitations and fostering a critical awareness of how biases in AI applications can impact educational equity [32]. Stakeholders should also advocate for and implement transparent, inclusive practices in developing and deploying AI technologies to ensure they cater to a diverse student population and enhance educational outcomes without bias [21].

Reflecting on the potential future of AI in music education, its successful integration hinges on a deep

understanding of the social dynamics at play, as Bourdieu's theories help elucidate. By considering how AI influences the distribution and recognition of cultural capital, reshapes habitus, and reconfigures power relations within the educational field, stakeholders can better strategize its use [11]. This forward-looking approach requires a commitment to continuous research and dialogue to monitor AI's impact and adapt strategies accordingly.

Furthermore, Bourdieu's theoretical framework provides a valuable lens through which to anticipate and shape the future trajectory of AI in music education. It encourages stakeholders to take a proactive stance on addressing the socio-cultural implications of technology in the classroom, urging them to ensure that AI tools foster an equitable learning environment [18]. A critical evaluation of how AI can serve as a tool of empowerment rather than a mechanism of exclusion can make music education more accessible and meaningful to all students, regardless of their background.

In conclusion, as AI continues to evolve and become more embedded in educational practices, it offers challenges and opportunities for reshaping music education. The future of music education with AI looks promising if it adheres to Bourdieu's principles and embraces a thoughtful, inclusive approach to technology integration. It can nurture truly transformative learning experiences that are rich, diverse, and equitable.

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