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Integrating Technology into Music Learning: A Tool for Enhancement, Not Substitution

Lan Yao*
Bangkokthonburi University, Bangkok 10100, Thailand

**Author to whom correspondence should be addressed.*

Abstract:

The integration of technology into music education has significantly transformed the learning experience, particularly for beginner piano students. Technologies such as visual feedback systems and tactile measurement tools provide objective insights into performance, enabling learners to self-assess and improve technical accuracy. Digital platforms support flexible learning environments, allowing personalized practice schedules and fostering interactive engagement through online forums and multimedia resources. Blended learning models further enhance pedagogical effectiveness by combining traditional instruction with digital tools, promoting transparency and traceability in progress. However, the successful application of technology depends on educators' critical selection and alignment with pedagogical goals. While technology offers valuable support, it cannot replace the irreplaceable role of teachers in guiding reflective and critical thinking processes.

Keywords:

Technology
Music education
Piano

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1. Introduction

The development of technology is a long process, and music technology is, in fact, simply the application of existing technology to the field of music [1]. Of course, there is now a lot of technology aimed at the music sector, but it is actually also an adaptation of existing technology to the needs of music education. So, how best to make technology work for music education is something that deserves attention [2]. This not only requires educators to master existing music technology and make full use of it to help students, but educators should also actively explore and formulate needs to promote the development of music technology that is relevant to real needs [3–6]. When people discuss the impact that technology brings to music education, there are three questions worth discussing: What aspects of music education can technology help? How can students learn better through technology? How can teachers make the most of new technologies for music education? It needs to be clear that the ultimate aim in discussing these questions is to

use technology to bring about a good impact on music education for students [7–8].

2. Technology provides impartial feedback and highlights learning priorities for music education

Music technology can help teachers and students to objectively perceive student learning outcomes. Hamond, Welch, and Himonides categorized the feedback provided by digital technology into three main types: visual, auditory, and interpersonal feedback [9–10]. Moreover, in piano learning, visual feedback is very important for the learner [11]. The use of technology to provide visual feedback allows the performer to be conscious of their performance [9–10]. In recent years, various techniques have been developed to provide feedback in piano education, and the application of tactile measurement techniques in piano learning has been detailed by MacRitchie, Faulkner, and Harrison [12–16]. With piano tactile measurement technology, people can measure the strength of the playing, capture the pianist's movements, etc., and provide data for analysis to the piano practitioner. This allows the piano practitioner to become better self-aware in terms of hand and body movements. It also gives students and teachers the opportunity to clearly identify weaknesses in the student's power in piano playing through the data analysis provided by the technology and to make targeted corrections [17]. In fact, in piano education, Bobbe et al. have found that postural movements of the fingers and body are important factors in piano practice [17]. The use of piano tactile measurement technology is something that can be relevant to the needs of piano education and is a good example of the use of technology in the field of piano education. However, as Himonides and Evangelos noted in their study on monitoring the posture of musicians during singing, focusing on external issues such as how to adjust one's posture may hinder the ability to concentrate fully on the learning process, which is counterproductive [2, 6]. This also coincides with Hamond, Himonides, and Welch's view that technology is only used to provide feedback, and that the purpose of feedback is to help students reflect [9]. Therefore, the focus should not only be on the feedback provided by the technology itself, but more on the new perspectives of reflection brought about by the objective feedback, which can help improve both the learning process and the teaching process are helpful [9, 10, 18].

In addition to the monitoring of body posture, there is also technology that can identify errors in note playing in piano performance and provide visual feedback. Asahi et al. introduce a piano support system [14]. It records the student's performance and converts it into data. The student's playing data is then compared with the correct score, and playing errors are marked in different colors on the electronic score. Obviously, this way the student can clearly recognize their mistakes and is more likely to make corrections. The student simply finds the corresponding error on the score and identifies the correct note to practice again. And it is worth noting that this system also supports the recording of historical data of the student's practice [14]. Students can recognize bars with a high frequency of errors by comparing the historical data. This further helps students to take stock of their errors and is more likely to enable self-regulation in their individual practice. Asahi et al. found in interviews with ten beginner pianists that this music technology does help students to clarify their practice progress and become more aware of their current situation and immediate goals [14–15]. It also provides teachers with a new scientific way of understanding their students' individual practice, which can subsequently be taught in a more targeted way. Of course, it also has the potential to make students lazier and rely too much on the technology rather than focusing on practice to circumvent errors in practice [6].

The two techniques above provide objective recording and data analysis of students' musical performance, mainly from their perspective. This helps students to reflect on their musical behavior and also helps teachers and students to find the learning focus of the lesson, contributing to future teaching and learning [9, 10, 19].

In the same way, music technology can help music teachers identify what effective teaching strategies are. Himonides and Evangelos note that music technology can transform musical performances into real-time data, which can be used to analyze the types of musical performances that are more likely to elicit strong audience reactions [2]. If such music technology is applied to music teaching, it can also help teachers clarify what teaching behaviors are more likely to improve students' concentration. This can help teachers develop good teaching methods to improve

classroom outcomes. Also, if it is found that the teacher and students are not focusing on the same thing, the teacher can communicate his or her ideas to the students in time to clarify the next learning priorities. This process can also ensure that the teacher and students are working towards the same goal for the rest of the learning process [5].

3. Technology allows for more flexible learning styles in music education

The use of technology in the music curriculum allows students to engage effectively in learning on their own terms. Using online systems, teachers can provide students with a logical structure for their learning. Like the Moodle system people now use, people are able to understand the lesson objectives and lesson plans from the beginning of the course. In addition, weekly course materials are provided as well as relevant extensions. This provides students with great freedom in their learning [7]. Students can plan the content of their studies according to their own time, and they also have the opportunity to study in depth according to their own interests [5]. In addition, the online forum facilitates communication between students and promotes interactive learning between them [5]. This can help students who are not good at offline discussions to interact with each other [5, 20–21]. However, such online discourse is completely public, which may also discourage some students from participating [20]. Alternatively, direct communication with the teacher via email is also a viable way. In other words, the online system allows for maximum access to the course, resources, and deeper engagement with the course. This allows for more freedom and flexibility in student learning [7]. It is worth noting that technology also has an important role to play in informal music learning [5, 22]. In addition to the course content, the teacher can provide appropriate technological extensions, such as SoundJunction, based on the students' previous learning experiences [5]. SoundJunction is more suited to online music education than students exploring on the web themselves [22–23]. It can support students to explore and create music online. This allows space for more capable students to explore in relation to the content they are learning. Such an extension of technology can cater for the learning experience of students at different levels [24].

However, music learning and teaching exclusively through technology require constant adaptation and are costly [25]. Moreover, technology should not become a barrier to monopolize learning, but rather play a supporting role. Thus, blended learning is also the focus of current attention [6, 20, 25–27].

The integration of technology into the traditional teaching and learning process can provide students with diverse learning styles [28]. To assist in piano education, Niu proposes the application of multimedia technology to piano education [29]. Smart piano lessons based on digital pianos allow students to watch recorded lessons repeatedly afterwards. This approach helps students to recall the lesson, and watching the teacher's demonstration repeatedly gives them the opportunity to imitate it several times, and they are more likely to follow the teacher's instructions and practice correctly. Every student has the opportunity to experience the joy of learning through technology in this kind of new classroom [8, 30]. students can collaborate with teachers online through Mentimeter. Participating anonymously allows students to hide themself well without fear of some ridicule if their ideas are too simple and naive. It also gives students the opportunity to express their ideas in a timely manner and get a response from the teacher [31]. Through the Mentimeter technology, they could really get involved in the discussion process of the class and felt it was all very interesting [31–32]. In addition to this, the online collaboration in music production was very innovative and kept the students engaged [33]. This shared, dynamically present online learning environment can contribute to the democratization of education [3]. It is clear that blended learning can provide a more diverse approach to learning and can make teaching and learning more interactive, and it helps students learn more scientifically than traditional music education [7, 34].

4. Facing various technologies, music education should make a proper choice

The implications of technology mentioned earlier are for music technology that is known to be put into use. It is then worth discussing how music educators should integrate technology with their educational beliefs [6]. This can help them to use music technology more in the future of music

education. The key to long-term collaboration between technology and music education is how teachers should critically use technology to suit music education [6].

Music education cannot be dictated by technology, but rather serves music education [2]. Therefore, if the introduction of new technology would increase the pressure on teachers to use it, instead, they could go on to explore more of the functions of existing technology to suit the needs of teaching and learning [4]. For example, a digital recording studio could be replaced by a CD burner [35]. By replacing technology in this way, the technical requirements of the teacher would be reduced, but the required classroom functions would be achieved just as well [4].

In addition, teachers need to judge what is a valuable tool, rather than accepting it all [36]. On the one hand, the teacher needs to be clear about what the purpose of using technology is. In the process of teaching piano, the teacher can use technology that is appropriate to the needs of the student, depending on the individual circumstances of the student. For example, if it is the case that the student does not have a clear perception of the results of his or her practice, the relevant technology can be used to provide the student with objective feedback to help the student reflect and improve [14–16]. On the other hand, not every modern technology can be fully adapted to the needs of music education. The program Teamirn, described by Bobbe et al. in terms of mixed reality, allows students to observe from the first-person perspective of the piano player [17]. Bobbe et al. suggest that it may help students learn proper fingering techniques through three-dimensional visualizations [17]. But in fact, this approach is not very different from watching a demonstration video directly through multimedia technology [37]. The question of how to perform finger power may also need to be taught face-to-face by the piano teacher, or using tactile-related technology to assist in teaching [15]. Therefore, music educators need to identify what modern technology can really offer to help and choose the technology that meets the needs of teaching and learning in order to better assist the students. This may also push the development of music technology to be more applicable to the needs of music teaching.

5. Conclusions

Mature technology offers more possibilities for music education [3]. Technology helps students to understand their own performance and gives a clearer focus to lessons [9, 19]. It also gives both teachers and students the opportunity to give feedback on student performance, ultimately facilitating internal feedback [9]. Furthermore, when technology is actually put into the process of teaching music, it can make the learning process more transparent and traceable [5, 20–21]. Students can better engage with the classroom to review classroom knowledge, and teachers can use technology to create new learning experiences and achieve better classroom results [8, 29, 31].

But even as new technologies continue to develop and advance, the core of music education remains with teachers the ability to reflect and think critically [6]. Music technology cannot completely solve all the problems we encounter in music education, nor can it replace the teacher in teaching, but it can only be used as a tool to assist in music education [2]. Teachers can use music technology critically to provide students with a scientifically interesting learning experience that maximizes their learning. Rather than allowing music technology to replace the teacher's process of guiding students' thinking [6].

In short, technology and music education interact with each other. The development of technology has made music education more scientific and varied. The application and demand for technology in music education also drive the development of technology. It is up to music educators to find the best integration of music technology and music curriculum in the process of integrating music technology into their practice, creating a new future of music education [3].

Disclosure statement

The author declares no conflict of interest.

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