Exploring the effects of online education technology on music learning in China's higher education institutions

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Abstract

This study explores the role of online education technology in enhancing music education in China's higher education institutions. It aims to assess the impact of various online education technologies on student learning motivation and learning outcomes, addressing challenges such as limited access to diverse resources and regional disparities. A qualitative approach was employed, collecting data from 15 participants through in-depth interviews. The data were analyzed using thematic analysis to identify key patterns and insights related to the use of online education technologies in music education. Findings indicate that a diverse range of technologies, including video tutorials, virtual instruments, and digital sheet music, significantly enhance both practical and theoretical aspects of music education while improving student motivation. However, challenges such as technical issues and information overload were also identified. This study highlights the importance of integrating online education technologies to achieve inclusive and high-quality music education in China. It aligns with Sustainable Development Goal 4 (SDG 4) by promoting accessible and equitable learning opportunities. Recommendations are provided for educators to optimize technology use and enhance their teaching practices effectively to improve education quality.

Keywords: Constructivism, Diversity, Motivation, Music teaching, Online technology.

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Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

1. Introduction

For the past couple of decades, there has been tremendous change in the music curriculum, shifting from traditional teaching methods to more inclusive approaches within China's higher education settings [1]. Despite these developments regarding music education, some issues still hinder development in this area. They range from the non-accessibility of diversified and up-to-date pedagogical resources to a lack of personnel training for teachers in the use of new technologies, not to mention learning rote rather than creativity- or critical thinking-oriented [2]. Due to regional disparities, these challenges have become more serious: students in rural regions have less access to quality music education compared to their peers in urban areas [3]. As such, the current paper begins by exploring how online education technology can be instrumental for music education in HEIs of China.

Previous research into the adoption of online education technologies within music education has demonstrated some advantages, such as improved access and more personalized learning [4]. There are, however, a few gaps: very few studies have been directed exclusively at the Chinese context, and in-depth reviews of different types of online tools are limited. Many studies also failed to discuss in detail how student outcomes were influenced long after exposure to these technologies [5]. The current research addresses these gaps concerning the review of a wide range of online educational technologies used within China's higher education music programs, along with their effects on student engagement and learning outcomes. Based on this, the research aligns with the goals of promoting quality education by proposing innovative technological solutions in support of the United Nations' Sustainable Development Goal 4, which aims to ensure inclusive and equitable quality education for all.

What is new in the study is a focused examination of the specific types of online education technologies applied in Chinese music education, along with their direct impact on learning. Drawing away from earlier studies, this research focuses on these various tools that coexist in their practical applications and on enhancing both the theoretical and practical aspects of music education. This is an important study since it informs educators and policymakers on practices in effective technology integration and also addresses wider educational disparities by providing scalable solutions that can be applied across different regions to lead a transformative change in music education.

1.1. Research Objective

To explore the role of online education technology in music education in China's higher education institutions.

2. Literature Review

2.1. Online Education Technology

The rapid growth in online education technology has decisively changed the learning landscape worldwide [6]. Among the current developments are a host of digital tools and platforms that have been implemented to enhance flexible, interactive, and personalized learning experiences. These include technologies for modern education, such as Learning Management Systems, video conferencing tools, virtual labs, and interactive simulations [7]. A study by Turnbull et al. [8] reveals a growing interest in online education technologies among higher education institutions. This trend is driven by the need for accessible and scalable learning solutions. Additionally, the COVID-19 pandemic accelerated this shift as institutions worldwide transitioned to remote learning [9]. These tools have been shown to increase student engagement, leading to better learning outcomes by providing varied and adaptive learning environments. The rapid growth in online education technology has decisively changed the learning landscape worldwide. The questionnaire includes questions designed to assess how frequently students use these technologies (Question 4) and how they perceive their effectiveness in enhancing their music learning experiences (Question 5).

2.2. Education Technology and Learning Motivation

The relationship between educational technology and learning motivation has been extensively documented through research in this area, and the connection is very strong. Well-integrated educational technologies have the potential to significantly increase students' intrinsic motivation levels by enhancing contributions that make learning more engaging and interactive, Almufarreh [10]. Cho et al. [11] affirmed that, based on the Self-Determination Theory, learners are more highly motivated when they feel autonomous, competent, and related. Gamified learning platforms, interactive quizzes, and virtual simulations are some of the technologies that enable learning through immediate feedback and a sense of accomplishment [12]. Therefore, they increase students' motivation to learn. Besides, according to the research done by Ferrer et al. [13], students who regularly work with interactive tools for education show much higher levels of motivation and engagement. This is because they allow for different learning styles and preferences, thus ultimately guaranteeing a more successful outcome of the learning process. Recent studies show that social capital significantly influences online education technology efficiency, impacting students' academic achievement and happiness [14]. Social collaboration platforms in music education facilitate peer discussions, critiques, and performances, supporting the motivational advantages of technology in education.

2.3. Music Learning in China's Higher Education Institutions

Music education in China's higher education institutions embodies both a rich history and contemporary challenges in pursuit of quality. Traditionally, music education in China has focused on rote learning and technical skills, often at the expense of creativity and critical thinking [15]. Recent reforms aim to strengthen music education through holistic, more student-centered approaches, as explained by Florkowski et al. [16]. However, significant disparities persist, especially between urban and rural areas. Urban institutions generally have better resources and qualified instructors, while rural areas

often lack adequate facilities and support [17]. The study by Chen and Fan [18] shows the need to enhance inclusivity and equity in music education practices across China [1]. Integrating online education technologies could bridge these gaps, providing broader access to quality educational resources and opportunities.

2.4. Theoretical underpinning

According to the learning theory of constructivism, learners use experience and reflection on experience to construct their own understanding and knowledge of the world [19]. As such, the theory tends to focus on active and hands-on learning. Accordingly, students could be allowed and encouraged to explore, experiment, and engage with business-related resources. Knowledge, according to Piaget [20] and Vygotsky [21], is constructed through social interactions and practical, meaningful activities [22]. This makes the process of learning more dynamic and contextual.

In online education technology, constructivism supports the use of interactive and practical tools that enable students to directly engage with content and apply knowledge in real-world situations. Some of the technologies that clearly conform to the principles of constructivism include virtual simulations, interactive tutorials, and collaborative platforms, as they create an environment where students can construct their own understanding through active participation and social collaboration.

Vygotsky [21] concept of the Zone of Proximal Development (ZPD) is particularly relevant here. ZPD refers to the difference between what a learner can do independently and what they can achieve with guidance from a More Knowledgeable Other (MKO) [23]. In online music education, the role of the MKO can be fulfilled by various technological tools and platforms that provide guidance, feedback, and collaboration opportunities. For example, virtual simulations and collaborative platforms serve as MKOs by helping students tackle complex tasks that they might not be able to accomplish on their own. These tools facilitate social learning, allowing students to interact with peers and instructors in a guided environment, thereby advancing their development within the ZPD framework.

The integration of MKOs within online education technologies is evident in the design of the interview questions in this study. Specifically, the questions are crafted to assess how students experience and interact with these technologies in a way that reflects the ZPD framework. For instance, Question 4 (which asks about the types of online education technologies students have experienced) and Question 7 (which explores experiences where technology increased interest in a music subject) are designed to uncover how collaborative platforms and virtual simulations function as MKOs. These questions aim to gather insights on how these technologies facilitate students' progression through more complex learning tasks by providing necessary support and guidance. Moreover, Question 5 (which asks about the impact of different technologies on music learning experiences) and Question 6 (which inquires about how technology influences motivation to learn music) align with the constructivist approach by examining how interactive tutorials and other practical tools enhance students' ability to engage with and understand music concepts. These tools allow students to construct knowledge actively, rather than passively receiving information, thus enabling them to learn within their ZPD with the help of online technologies acting as MKOs.

This theoretical framework underpins the entire study, highlighting how online education technologies, through their alignment with constructivist principles, can create student-centered and interactive learning experiences in music education. By analyzing the data gathered through these interviews, this study aims to demonstrate how such technologies can bridge the gap between what students currently know and what they are capable of achieving with guided support, ultimately fostering deeper learning and engagement.

3. Methodology

3.1. Research Design

This qualitative research paper aims to examine the impact of online educational technology on music learning within China's higher education institutions. The primary objective is to gain an in-depth understanding of the experiences and perceptions of undergraduate music students regarding the use of online educational technologies in their studies. Such a study is suitable for qualitative research because it allows for a comprehensive exploration of subjective experiences and viewpoints expressed by participants [24]. This approach is very suitable for cases when exploring complex phenomena, such as the integration of technology within music education, an area where numerical data may not capture individual experience differences [24]. Using qualitative approaches ensures the gathering of high-quality data, which allows us to gain valuable insights into how different technologies affect learning outcomes, motivation, and engagement in a given cultural and educational setting [25].

Table 1.
Demographic and Professional Details of Study Participants.

Participants	Country of Origin	Gender	Subject Taught	Years of Teaching
P1	China	Female	Music Performance (Piano)	9 years
P2	China	Female	Music Education	10 years
P3	China	Male	Music Composition	8 years
P4	China	Female	Ethnomusicology	9 years
P5	China	Female	Music Therapy	8 years
P6	China	Female	Music Production	11 years
P7	China	Female	Vocal Performance (Bel Canto)	7 years
P8	China	Male	Music History	9 years
P9	China	Female	Instrumental Performance (Violin)	8 years
P10	China	Male	Conducting	10 years
P11	China	Male	Jazz Studies	9 years
P12	China	Female	Music Technology	9 years
P13	China	Male	Music Business	7 years
P14	China	Male	Contemporary Music	10 years
P15	China	Female	Music Theory	8 years

3.2. Sampling Design

In this study, the participants were selected through purposive sampling. Purposive sampling is a technique used within non-probability sampling whereby the researcher selects respondents with certain characteristics or specific criteria relevant to the study [26]. In this research, the targeted population consisted of music learners in China's higher education institutions. This was an appropriate sampling method because it ensured that the subjects had relevant experience and knowledge about the use of online education technologies in their music education [27].

The interviews were conducted using detailed interview protocols, which included well-prepared questions, a structured interview format, and clear instructions for interviewers to ensure a systematic and consistent approach. The questions were organized into four sections: diversity of online education technology, impact of online education technology, motivation and engagement, and challenges and demotivation. Each section aimed to explore specific dimensions of how online education technology influences music learners in higher education institutions in China.

3.3. Data Collection

Data collection was conducted through online interviews via WeChat voice calls. The interview questions broadly solicited participants' experiences with online education technologies, including types, impacts on learning, influences on motivation, and challenges faced by these learners. This data collection method is appropriate for the present study, as it allows for real-time, face-to-face conversations that enable the researcher to probe deeper into participant responses [28]. It is a widely used communication platform in China, and thus convenient and accessible for reaching participants. The voice call feature enables interviews to be conducted in a format that is familiar and comfortable for the participants, encouraging open and honest discussions.

3.4. Data Analysis

Thematic analysis was used to analyze the data collected. Thematic analysis is a method for identifying, analyzing, and reporting patterns (themes) within qualitative data. This approach codes the data as a way of organizing it for analysis, identifies significant themes, and interprets the meanings and implications of the identified themes [29]. Such a method of analysis is suitable for this study since it allows for the systematic examination of qualitative data to facilitate the emergence of themes related to the impact of online education technology on music learning [30]. Thematic analysis is also flexible and amenable to handling large amounts of data; hence, it is able to capture a wide range of experiences and perspectives to which the participants are exposed.

3.5. Trustworthiness and Rigor

Various strategies were employed to ensure that this study is trustworthy and rigorous. Careful checking involved returning the transcriptions and their interpretations back to the participants for them to verify that they are correct [31]. Triangulation refers to the process whereby comparisons of findings from various participants can be assessed for common themes and discrepancies. The methods also include maintaining an audit trail detailing all research activities and decisions. Furthermore, the researcher engaged in reflexive exercises by checking biases and assumptions at regular intervals so they do not influence analysis and interpretation.

3.6. Ethical Considerations

Prior to the survey, each participant was required to sign a consent letter to ensure they understood the purpose of the study, the procedures involved, and their personal rights. Preservation of personal privacy was guaranteed by anonymizing all data and ensuring that no information disclosed the participant's identity [32]. The research was conducted in accordance with ethical standards in human investigations, safeguarding each respondent and protecting their welfare throughout the process.

4. Results

4.1. Overview

The interview data deepened into various dimensions regarding how music learners in higher education institutions in China apply online education technology: diversification of online education technology and its influence on student learning, motivation, and engagement; challenges and demotivation. The findings demonstrate the myriad tools that are online, which students are using to great effect for significant skill and knowledge improvements, heightened motivation, and engagement due to the interactive nature of the tools, along with other challenges such as technical issues and provisions regarding information overload. Each dimension is elaborated with detailed accounts of experiences and perceptions from participants, providing an expansive understanding of how various technologies impact music education.

4.2. Diversity of Online Education Technology

The findings indicate that a wide variety of online education technologies are used by music learners in China's higher education institutions, enhancing their learning experiences. Participants reported using *'video tutorials'*, *'online collaboration tools'*, *'digital sheet music'*, *'virtual instruments'*, *'composition software'*, and more, which provide them with multiple avenues to engage with the material and tailor their learning to specific needs and styles.

Participant 1 emphasized the usefulness of video tutorials and digital sheet music in enhancing their piano practice: "*The use of video tutorials has significantly improved my technique and interpretation skills... Additionally, digital sheet music has been a lifesaver. I can annotate and highlight difficult sections, making my practice sessions more efficient.*" Similarly, Participant 2 described the benefits of virtual instruments and online quizzes: "*Virtual instruments have been a game-changer, especially for students like me who don't have regular access to certain instruments... Online quizzes have also kept me engaged, reinforcing my theoretical knowledge in a fun and interactive way.*" Participant 3 found composition software and virtual instruments indispensable: "*Composition software like Finale and Sibelius has been indispensable in my studies... Virtual instruments further enhance this by providing realistic sound samples.*" Participant 4 valued the access to diverse resources provided by digital libraries and online lectures: "*Access to digital libraries has significantly enriched my research. I can explore rare recordings and manuscripts from diverse cultures, which would be impossible without online technology.*" Participants 5 and 6 highlighted the benefits of video tutorials and DAWs, respectively. Participant 5 noted, "*Case study databases have been incredibly valuable, providing practical examples of music therapy in action.*" Participant 6 shared, "*Digital Audio Workstations (DAWs) like Ableton Live and Logic Pro have been essential for my studies. They offer powerful tools for creating, editing, and producing music, significantly enhancing my production skills.*" Participant 7 appreciated the tailored exercises provided by vocal training apps: "*Vocal training apps like VoxTrain have been incredibly helpful. These apps provide exercises tailored to my vocal range and skill level, and the feedback tools help me track my progress and identify areas for improvement.*" Participant 8 emphasized the importance of digital archives: "*Digital archives have been invaluable for my research. I've accessed rare historical documents and recordings that have enriched my understanding of different musical eras and practices.*" Participant 9 discussed the benefits of practice apps: "*Practice apps like Modacity have revolutionized my practice routines. They offer structured practice schedules, track progress, and provide immediate feedback, which helps me stay focused and make the most of my practice time.*" Participants 10 and 11 highlighted the benefits of conducting classes and virtual jam sessions, respectively. Participant 10 noted, "*Online conducting classes have provided me with unique perspectives and techniques that I wouldn't have encountered otherwise.*" Participant 11 shared, "*Virtual jam sessions have been a fantastic way to practice improvisation and collaboration.*" Participants 12 and 13 found DAWs and online courses beneficial. Participant 12 noted, "*DAWs like Pro Tools and Ableton Live have been essential for my music production studies. They offer powerful tools for creating and editing music, which have significantly enhanced my technical skills and creativity.*" Participant 13 shared, "*Online courses and webinars have provided me with practical knowledge and skills for the music industry. Digital marketing tools, in particular, have been useful for learning how to promote music effectively.*" Participant 14 appreciated the creative possibilities offered by virtual instruments and online collaboration tools: "*Virtual instruments and online collaboration tools have been crucial for my studies. They allow me to experiment with different sounds and collaborate with musicians from different genres, which has enriched my learning experience.*" Participant 15 highlighted the benefits of digital notation tools: "*Digital notation tools like Finale and Sibelius have been invaluable for my studies. They allow me to create and analyze complex compositions, which has deepened my understanding of music theory.*"

These responses demonstrate the broad range of technologies available, each offering unique benefits that contribute to a more comprehensive and enriched learning experience. The diversity of tools allows students to choose the methods that work best for them, enhancing their engagement and effectiveness in learning.

4.3. Impact of Online Education Technology

The impact of online education technology on music learning is significant, with many participants reporting notable improvements in their skills and knowledge. These technologies have enhanced both practical and theoretical aspects of music education, providing immediate feedback and facilitating deeper engagement with the material.

Participant 4 noted the improvement in their piano technique and interpretation skills through video tutorials: "Watching a tutorial by a renowned pianist helped me understand the differences and correct my approach." Participant 5 highlighted the value of case study databases in understanding practical applications: "Reading about different therapeutic interventions and their outcomes has deepened my understanding of how to apply theoretical knowledge in real-world settings." Digital tools like composition software and DAWs have enabled students to experiment with and refine their work. As Participant 3 explained, "Composition software like Finale and Sibelius has been indispensable in my studies...

Virtual instruments further enhance this by providing realistic sound samples." Participant 6 shared how DAWs have been essential in their music production studies: "Digital Audio Workstations (DAWs) like Ableton Live and Logic Pro have been essential for my studies. They offer powerful tools for creating, editing, and producing music, significantly enhancing my production skills." Participant 9 noted how practice apps improved their practice routines: "Practice apps like Modacity have revolutionized my practice routines. They offer structured practice schedules, track progress, and provide immediate feedback, which helps me stay focused and make the most of my practice time." Similarly, Participant 15 mentioned the benefits of digital notation tools: "Digital notation tools like Finale and Sibelius have been invaluable for my studies. They allow me to create and analyze complex compositions, which has deepened my understanding of music theory." Participant 7 discussed how vocal training apps have helped track progress and improvement: "Seeing my progress tracked in the app is very motivating. It's rewarding to see measurable improvements in my vocal abilities." Participant 10 noted the impact of online conducting classes: "Being able to review and replay classes keeps me highly motivated. I can revisit difficult sections and practice until I get it right." Participants 2 and 8 highlighted the benefits of interactive tools and digital archives. Participant 2 shared, "Virtual instruments have been a game-changer, especially for students like me who don't have regular access to certain instruments." Participant 8 added, "Digital archives have been invaluable for my research. I've accessed rare historical documents and recordings that have enriched my understanding of different musical eras and practices." Participant 12 emphasized the creative and technical enhancement provided by DAWs: "DAWs like Pro Tools and Ableton Live have been essential for my music production studies. They offer powerful tools for creating and editing music, which has significantly enhanced my technical skills and creativity."

These findings indicate that online education technologies are not only improving technical skills but also enriching the overall learning experience by providing diverse and interactive ways to engage with music education. Ummi et al. [33] found that interactive teaching methods, such as problem-based learning and real-world applications, enhance student engagement in online learning environments. In music education, a blended approach combining digital tools with instructor feedback maximizes motivation.

4.4. Motivation and Engagement

Online education technologies have significantly increased students' motivation and engagement in their studies. The accessibility, flexibility, and interactive nature of these tools are key factors contributing to this increase in motivation. These technologies enable students to learn at their own pace, access a wide range of resources, and interact with content in a dynamic and engaging manner.

Participant 2 remarked on the motivational aspect of gamified learning through online quizzes: "*The gamification of learning through online quizzes has significantly increased my motivation. Tracking my progress and seeing improvements in my scores makes studying theory feel less like a chore and more like a game.*" Similarly, Participant 1 noted the benefits of accessible learning tools: "*The flexibility to access tutorials and practice tools anytime keeps me motivated to improve consistently.*" Memorable experiences, such as participating in webinars or using virtual orchestra tools, have also played a crucial role in keeping students engaged. Participant 2 shared, "*I remember a specific instance when I used a virtual orchestra tool to practice conducting. It provided real-time feedback on my tempo and gestures, which was incredibly helpful.*" Participant 3 found attending a webinar hosted by a renowned composer particularly inspiring: "*He demonstrated how he uses technology to enhance his compositions, providing practical tips and insights into his creative process. This webinar opened my eyes to new possibilities and techniques.*" Participant 8 valued the ability to explore a wide range of materials: "*The vast array of resources available keeps me highly motivated. Each new discovery feels like a step forward in my research, making the learning process exciting and rewarding.*" Participant 11 highlighted the benefits of virtual jam sessions: "*They allow me to play with musicians from around the world, which has broadened my musical horizons.*" Participants 5 and 6 emphasized the practical applications of online tools. Participant 5 noted, "*Seeing the real-world applications of what I'm learning keeps me highly motivated. It reinforces the importance of my studies and encourages continuous engagement.*" Participant 6 shared, "*The ability to immediately apply what I learn and see tangible results keeps me highly motivated. The instant feedback from DAWs is incredibly valuable.*" Participants 10 and 12 found the flexibility and replayability of online classes and DAWs motivational. Participant 10 noted, "*Being able to review and replay classes keeps me highly motivated. I can revisit difficult sections and practice until I get it right.*" Participant 12 added, "*The ability to immediately apply what I learn and see tangible results keeps me highly motivated. The instant feedback from DAWs is incredibly valuable.*"

These experiences underscore the importance of interactive and engaging technologies in maintaining students' interest and commitment to their studies, making learning more enjoyable and effective.

4.5. Challenges and Demotivation

Despite the many benefits, participants also faced challenges and demotivation related to the use of online education technologies. Technical issues, information overload, and engagement challenges were commonly reported, highlighting areas where improvements are needed to enhance the overall learning experience.

Technical problems, such as lag and connectivity issues, disrupted online collaboration for several participants. Participant 1 shared their frustration: "*While preparing for a virtual ensemble performance, the lag and connectivity problems disrupted our practice, making it difficult to coordinate with my peers.*" Similarly, Participant 6 noted the difficulties in coordinating collaboration across different time zones: "*Technical issues and scheduling conflicts can disrupt the process, making it frustrating.*" Information overload was another significant issue, as reported by Participant 2: "*At times, the overwhelming number of online resources available can be demotivating. Trying to learn from too many sources*

simultaneously led to confusion and stress." Participant 5 echoed this sentiment: "*The occasional overload of information can be demotivating. With so many resources available, it's easy to feel overwhelmed and unsure where to focus my efforts.*" Engagement challenges, particularly with discussion forums and less interactive webinars, also affected participants' motivation. Participant 4 mentioned, "*Discussion forums can sometimes feel less engaging, especially when participation is low.*" Participant 8 found the lack of face-to-face interaction in discussion forums problematic: "*It's hard to have a dynamic discussion without face-to-face interaction.*" Participant 9 noted the authenticity issues with virtual instruments: "*Some virtual instruments feel less authentic compared to playing a real instrument, which can be a bit demotivating. The tactile feedback and sound quality just aren't the same.*" Participant 14 expressed similar concerns about online collaboration: "*Online collaboration can sometimes lack the personal connection of face-to-face interactions. It's harder to build rapport and communicate effectively online.*" Participants 10 and 13 also highlighted engagement challenges. Participant 10 noted, "*Collaboration tools can sometimes be unreliable. During a group project, we faced several technical issues that disrupted our rehearsals and made the process more stressful.*" Participant 13 shared, "*Some webinars felt too basic and unengaging. It was disappointing when the content didn't go beyond what I already knew.*"

These challenges highlight the need for careful selection and management of online education tools to ensure they effectively support learning without causing additional stress or disengagement.

5. Discussion

5.1. Diversity and Learning

These various tools, video tutorials, virtual instruments, digital sheets, and composition software allow students to accommodate different learning styles and needs, providing multiple ways to engage with class assignments. This is very important, as learners can decide and attend to their own needs, thereby improving engagement and retention. The importance of this diversity is underscored by positive feedback from participants, such as Participant 1, who appreciates video tutorials and digital sheet music, while Participant 2 values virtual instruments and online quizzes. These diversified technologies in online education at higher education institutions significantly enhance the experiences of music learners [34].

Previous research has underlined the role of various educational technologies in enhancing learning outcomes. For example, Wekerle et al. [35] argued that "embedding a range of digital tools within teaching practice can enable different learning styles to be accommodated, promoting student engagement and achievement." In this regard, Sharma et al. [36] also commented that blended learning environments, where traditional teaching methods meet online teaching, can provide a more comprehensive experience when both are used together. The conclusions are supported by the findings from this study, which show the differential capabilities characterizing online education technologies that music learners in China can utilize for diversified learning preferences and improved educational outcomes.

5.2. Influence of Online Education Technologies on Learning

The impact of online education technologies on learning within music education is significant; many participants confirmed dramatic improvements in skills and knowledge [37]. These technologies provide immediate feedback, facilitate deeper engagement with the material, and enhance both practical and theoretical aspects of music education [38]. It has been shown that the use of video tutorials, as in the case of Participant 1, to learn effective piano techniques and interpretation, and of case study databases, as used by Participant 5, in finding practical applications for their work, really does work.

These technologies seem to have interactive motivational effects. While most participants, including Participant 2, were highly motivated by gamified learning through Internet quizzes, there were several issues, such as technical problems and information overload, that could demotivate students from learning. Previous research supports these findings; for example, Calderón et al. [39] commented that technology might support intrinsic motivation due to the potential for offering immediate feedback and providing a sense of achievement. On the other hand, Zhang et al. [40] addressed the fact that the enormous quantity of information available on the Internet may be overloading individuals' cognitive capacity, which eventually decreases motivation. From these results, it was inferred that while, generally speaking, online education technologies enhance learning, their implementation ought to be carefully managed so that incentives do not become demotivating. Interestingly, the "Science/Social Science Education-Technology" framework by Ng et al. [41] emphasizes value-driven learning strategies in music education, bridging the gap between theoretical knowledge and real-world application, fostering independent thinking and understanding of cultural, historical, and social contexts.

5.3. Recommendations

Music teachers in China's higher education institutions should continue incorporating diverse online education technologies into their teaching. This approach supports personalized education and caters to different learning styles, creating a more engaging and efficient learning environment. Tools like video tutorials, virtual instruments, and digital sheet music can enhance both practical and theoretical learning.

Educators should provide clear guidance to help students effectively utilize these technologies and avoid being overwhelmed by information. Additionally, they should select stable and user-friendly platforms to minimize technical issues. By doing so, educators can maximize the benefits of online technologies while reducing potential drawbacks, making the learning process more productive and less frustrating for students.

6. Conclusion

The study reveals that integrating various online education technologies in China's higher education settings improves music learners' learning experiences. Tools such as video tutorials, virtual instruments, and digital sheet music enhance practical skills, theoretical knowledge, motivation, and commitment. However, technical problems and information overload pose challenges. This research contributes to the literature on the role of online technologies in music education and aligns with the SDG 4 goals for quality and inclusive education.

7. Limitations and Future Research

The study's limitations include its small sample size of 15 participants from China's only Higher Education Institutions (HEIs), potential bias due to purposive sampling, and reliance on self-reporting data. The qualitative nature of the study also limits its generalizability. Future research should involve larger, more diverse samples, employ a mixed-method design, conduct longitudinal studies, and include in-depth analysis of specific online tools to better understand the long-term effects of music learning technologies on students' output and educational contexts.

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