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Improving Music Education Using Virtual Reality Techniques

Melhorando a educação musical usando técnicas de realidade virtual

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Abstract: Digital technology is becoming an integral part of music education. The research focused on effectiveness of learning music using virtual reality tools. The study involved 342 second-year students (59% of girls and 41% of boys), with the mean age of 19.02±0.48. The sample population was divided into 2 groups: Group 1 studied the Chinese folk song "Jasmine" using traditional learning methods; Group 2 applied virtual reality techniques. To study students' attitudes towards digital learning and their awareness of the possibilities of virtual reality, a questionnaire was applied, based on which it was found that most students positively evaluated digital learning in general and were aware of the possibilities of virtual reality. The level of motivation of students was determined according to Ehlers' method, most participants using virtual reality reported their high motivation, while participants using more traditional learning tools were less motivated. Research findings suggested strong correlation between the level of motivation and academic achievements. Music educators and school administrators can use the information provided when planning and conducting classes using digital technologies, including virtual reality. Also, computer software

developers can take student motivation data into account when making technological decisions in the development of applications for educational purposes.
Keywords: Music education. Education sciences. Music and computer-aided learning of music. Motivation. Virtual reality.

Resumo: A tecnologia digital está se tornando parte integrante da educação musical. A pesquisa se concentrou na eficácia do aprendizado de música usando ferramentas de realidade virtual. Participaram do estudo 342 alunos do segundo ano (59% meninas e 41% meninos), com média de idade de 19,02±0,48. A população amostral foi dividida em 2 grupos: Grupo 1 estudou a música folclórica chinesa "Jasmine" usando métodos tradicionais de aprendizagem; Grupo 2 aplicou técnicas de realidade virtual. Para estudar as atitudes dos alunos em relação à aprendizagem digital e sua consciência das possibilidades da realidade virtual, foi aplicado um questionário, a partir do qual se constatou que a maioria dos alunos avaliou positivamente a aprendizagem digital em geral e estava ciente das possibilidades da realidade virtual. O nível de motivação dos alunos foi determinado de acordo com o método de Ehlers, a maioria dos participantes que utilizam a realidade virtual relatou sua alta motivação, enquanto os participantes que utilizam ferramentas de aprendizagem mais tradicionais foram menos motivados. Os resultados da pesquisa sugeriram uma forte correlação entre o nível de motivação e os resultados acadêmicos. Educadores musicais e administradores escolares podem usar as informações fornecidas ao planejar e conduzir aulas usando tecnologias digitais, incluindo realidade virtual. Além disso, os desenvolvedores de software de computador podem levar em consideração os dados de motivação dos alunos ao tomar decisões tecnológicas no desenvolvimento de aplicativos para fins educacionais.
Palavras-chave: Educação musical. Ciências da educação. Música e aprendizagem de música assistida por computador. Motivação. Realidade virtual.

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Introduction

The current development of high tech and information technology give an impetus to the transformation of contemporary music education (GORBUNOVA *et al.*, 2015). The quarantine measures associated with the COVID-19 pandemic have made significant changes to the traditional educational process. Instructors and students have become used to offline, online, and blended study formats, as well as information technology for distance, electronic, digital learning and M-learning (KHUTORSKOY, 2019). Music teaching approaches rely on extensive use of innovative digital tools and computer-aided learning of music. Such approach makes possible student-centered teaching of music, combining the achievements of the traditional and innovative education systems, and makes the learning process interactive and affordable (SHIRIEVA and DYGANOVA, 2020; LIU and LIANG, 2021).

The peculiarity of music education is the need to practice playing a musical instrument, and traditional digital teaching methods such as video lessons, audio files, and blogs lack interactivity and cannot fully replace lessons in the academic walls (NSAIRAT *et al.*, 2022). There is a need to find more flexible feedback tools that are appealing and understandable to students. Research in music education has shown that more motivated students learn more, do better academically, are more confident socially, and have higher levels of self-efficacy and self-esteem (OLIVEIRA *et al.*, 2021), so a component of student motivation when using technology is essential. Among the interactive learning tools that can attract students and ensure their effectiveness are virtual reality technologies (FAUZI *et al.*, 2019; ROOPA *et al.*, 2021).

The global music community seeks to expand the opportunities for its creativity and is already ambitiously using artificial reality technology. Musicians and contemporary researchers are exploring the possibilities of augmented and

virtual reality. Virtual reality technology completely immerses the user in an artificial environment, without access to real-world settings. Augmented reality makes it possible to maintain the real-world settings, but feel the superimposed, new, additional elements (KRASNOSKULOV, 2018).

Virtual reality in music improves the quality of sound through visual immersive experience (immersion in a virtual environment), tactile sensations and interactivity. The following features of the virtual environment are currently widely used: Vinyl Reality, Music Room VR, Beat Saber, The Wave, The Virtual Orchestra: Sibelius 5, Drops: Rhythm Garden, Eight VR, Taryn Southern - Life Support and others (MBRYONIC, 2019).

Literature review

Music education is experiencing a wide introduction of cutting-edge digital technology and elements of virtual reality, which upgrades not only the learning process, but also the entire global music industry.

Using virtual reality in a learning system to enhance hands-on experience was studied by Mexican researchers (PEREZ-RAMIREZ *et al.*, 2021). Virtual reality technology helps build and reinforce students' skills. Interactive 3D modeling of the real world is a more effective learning tool compared to other traditional tools. Virtual environment makes it possible to use virtual reality equipment, resources, tools and interactive 3D environments. Immersion in the environment provides students with the necessary training, exercise, and evaluation, making it possible to consolidate the necessary skills in a short period of time (PEREZ-RAMIREZ *et al.*, 2021).

The impact of virtual reality on students was studied by Taiwan researchers (WANG and SUN, 2021). Visualization of virtual reality structure, due to its new and exciting environment, has a significant impact on the emotional involvement of

students in the learning process and their motivation (WANG and SUN, 2021).

Australian researchers (RAPPA *et al.*, 2019) studied eye tracking technology in virtual and mixed reality environments. Eye tracking is a relatively new approach to data collection in virtual reality (VR) and mixed reality (MR) environments. Temporal, spatial and quantitative indicators make it possible to develop depth perception of information, facilitate the learning process and improve its effectiveness (RAPPA *et al.*, 2019).

Moroccan researchers (EL KABTANE *et al.*, 2020) analyzed opportunities offered by virtual and augmented reality to enhance the interactivity of the existing online courses. Electronic, online and distance learning, which are being widely used, have their limitations - insufficient proactive interaction and hands-on experience. These limitations can be removed, and students can be encouraged to a stronger involvement during the class, improving their understanding and skills. This requires creating a 3D model of the necessary operations (virtual simulations and exercises). Depending on the instructor's choice, augmented reality or virtual reality elements can be used. Two modes can also be applied:

- online mode (in which all manipulations and interactions take place online); and
- offline mode (students can download the necessary manipulations for their local use).

Integrating virtual reality techniques into instruction improves students' understanding and enhances their skills (EL KABTANE *et al.*, 2020).

Korean researchers (SHIM and LEE, 2021) analyzed the impact of virtual reality elements on the students' competencies and satisfaction with education. The study lasted six weeks. After the implementation of the project, a correlation between

students' competence and their satisfaction with education was observed. The developed program demonstrated the opportunities for building student competence and showed the importance of virtual reality. The lack of appropriate learning content of virtual reality technology constituted the experiment's limitation (SHIM and LEE, 2021).

Australian researchers (MARKS and THOMAS, 2021) have studied the specific features of the introduction of virtual reality technology in higher education. Virtual reality technology is making its way into education and can facilitate immersive learning in environments, which are usually physically inaccessible to students, through 3D models and interactive 360° videos. In this study, a specially designed virtual reality lab with a cutting-edge headset was set up. The experiment lasted 2.5 years, and researchers evaluated the design, costs, learning rate and student experience. Students reported a positive perception of the virtual learning environment, and improved academic achievements were also observed (MARKS and THOMAS, 2021).

The influence of the instructor-student relationship on learning outcomes has been described by U.S. researchers (LEAHY and SMITH, 2021). They explored teaching approaches and students' needs. Instructors report a willingness to meet the demands of their students. Students, on the other hand, report a lack of experience with specific instrument. The relationship between instructors and students plays an important role in the learning process and is reflected in academic achievements (LEAHY and SMITH, 2021).

Italian researchers (BIASUTTI *et al.*, 2019) studied the difficulties with online courses and professional development programs for music instructors. The survey describes the professional development of music instructors and difficulties they face. Special adapted courses that improve the necessary technical and digital skills significantly enhance proficiency of music instructors (BIASUTTI *et al.*, 2019).

U.S. researchers (ORMAN, 2016) analyzed the effects of virtual reality and audio signals on eye contact in conductor training. The study lasted four weeks, using the participants' individual videos as instruments. Virtual reality elements made it possible to achieve a sense of reality. Participants who used sound tools had more eye contact, which is essential for a musician (ORMAN, 2016).

Yet, the original study of music education relying on virtual reality techniques complements and delves into previous research on the problem.

Problem statement

Improvement of music education requires the use of computer-aided learning of music to secure a cutting-edge learning process, making it possible to learn musical composition effectively and quickly with modern content. A relevant approach involves the use of virtual reality techniques, which not only upgrade the learning system, but also ensure strong academic achievements. The interaction between instructors and students, as well as the students' motivation, play a crucial role in this learning process. Music education in the current context relies on extensive use of virtual reality technology to improve musical skills.

The relevance of this study determined its topic - the improvement of music education using virtual reality techniques. This study shows the effectiveness of learning music using cutting-edge digital technology. To achieve the purpose, the following objectives were set: (1) explore students' attitudes toward digital learning and their awareness of virtual reality tools; (2) measure the students' motivation and academic achievements when using traditional methods and virtual reality tools; (3) analyze the relationship between students' motivation and their academic achievements.

The authors were the first to study the relationship between the motivation and academic achievements of students relying on virtual reality technology. Virtual reality secures not only the continuity of interesting learning, but also enables building and practicing skills in music studies. An integrated approach in music education requires not only mentors' strong teaching skills, but also innovative digital support.

Methodology

Research design and sample

The study was conducted at Musicology Department of Guizhou Nationalities University. The authors developed the methodology and design of this study. The sample included 342 full-time second-year students (59% of girls and 41% of boys), with the mean age of 19, 02±0.48. The research focused on the practical training in Academic Art and Specific Nature of Performing the Chinese Folk Song "Jasmine". The study period was one month, followed by evaluation.

Research tools

The sample population was divided into 2 groups: Group 1 (166 students) studied this composition offline using traditional, including digital methods (audio and video materials, blogs); Group 2 (176 students) attended offline classes with an instructor and used virtual reality techniques (Virtuality Play Station). The purpose of selecting 2 groups was to compare academic achievements when using different learning methods.

An online survey (with Google Forms) was conducted to examine students' attitudes toward digital learning and their awareness of virtual reality tools. To do so, the researchers relied on The Technology Acceptance Model (TAM), which is

widely used to assess the factors that shape the intention to use technology (HOLDEN and KARSH, 2010; GRANIĆ and MARANGUNIĆ, 2019; AL-EMRAN *et al.*, 2018) and, based on its synthesis, identified items from the Attitude and Awareness of Technology (AAT) questionnaire presented in this study. The questionnaire consisted of 10 questions. Students received a link to the questionnaire, which could be accessed from a computer, tablet or smartphone. The survey remained open for almost a month (from April to May 2021). The questionnaire was standardized (formalized) with precise wording of questions. Questions 1, 3-8 were closed-ended and required answers. Questions 2, 9, 10 were open-ended and assumed that respondents would type in answers (Appendix 1). Questions 9 and 10 were answered only by Group 2 students using Virtuality Play Station.

Ehlers' method was used to measure motivation for success. The questionnaire consisted of 41 statements, each of which required answer "Yes" in case of an agreement or "No" in case of a disagreement (Appendix 2). Answers were supposed to be given quickly, without thinking them over. The scores were interpreted as follows:

- 1-10 points - poor motivation to succeed;
- 11-16 points - moderate motivation;
- 17-20 points - moderately strong motivation;
- more than 21 points - very strong motivation to succeed.

The students' academic achievements were assessed based on:

- stage performance (culture, freedom and expression);
- quality of performance (text, continuity and completeness of performance); and

- musicality (trends, sense of rhythm, emotional expression, sound production).

Students' academic achievements were assessed based on the 5-point scale:

- "1" - the student demonstrated poor progress in learning;
- "2" -the student demonstrated mediocre progress in learning;
- "3" - the student demonstrated sufficient progress in learning;
- "4" - the student demonstrated good progress in learning;
- "5" - the student demonstrated excellent progress in learning.

Statistical analysis of data

Statistical analysis of the experimental data was performed using Microsoft Office Excel and included the following steps:

Calculation of quantitative parameters - arithmetic mean and standard error. The following formula was used ($x \pm m$), where x is the arithmetic mean and m is the standard error. Comparison results were considered at a statistical significance of 0.05.

Correlation between the level of motivation and academic performance of students in each of the groups studied was calculated to determine the type of relationship between the variables. The strength of the relationship depends on the absolute value of the correlation coefficient (r):

- up to 0.2 - a very weak correlation;
- up to 0.5 - a weak correlation;
- up to 0.7 - a moderate correlation;
- up to 0.9 - a strong correlation;
- over 0.9 - a very strong correlation.

Research limitations

Students from the Composition Department, Voice & Opera Department, Orchestral Instruments Department, Music and Information Technology, and Institute of Music Therapy were not included in the study because they have other educational programs and standards. Also, a limitation of this study is that the Attitude and Awareness of Technology (AAT) instrument used is not validated by a reliable statistical method such as factor analysis but is an exploratory modification of a previously tested questionnaire, The Technology Acceptance Model. In addition, the study does not include a large geographic coverage and different age groups of students.

Ethical issues

The study was conducted according to the principles of the World Medical Association's Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects". Participants were informed of the goals and methods of the experiment. All members of the representative sample provided written consent to participate. Complete anonymity requirements were also met. There was no conflict of interest. The Bioethics Committee of Guizhou Nationalities University approved the experiment for the 2020/2021 academic year.

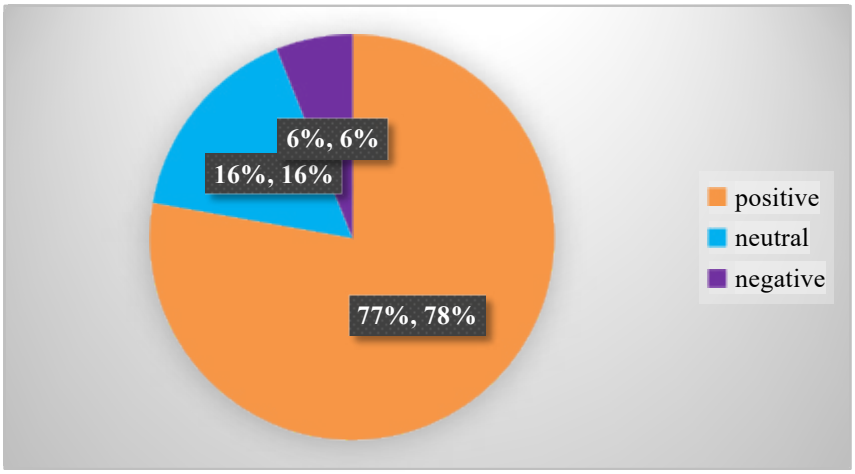
Results

Attitude and Awareness of Technology (AAT) questionnaire

The survey conducted among students to learn their opinions about the opportunities offered by information technology revealed that most respondents positively evaluate digital learning in general (questions 3-5) and are aware of virtual

reality technologies (questions 6-8). The results of the answers to the question about the overall assessment of digital learning are shown in Figure 1. 78% of respondents (263 students) felt positive, 16% (55 students) were indifferent, 7% (24 students) had negative attitudes.

Figure 1 - General student attitudes toward digital learning



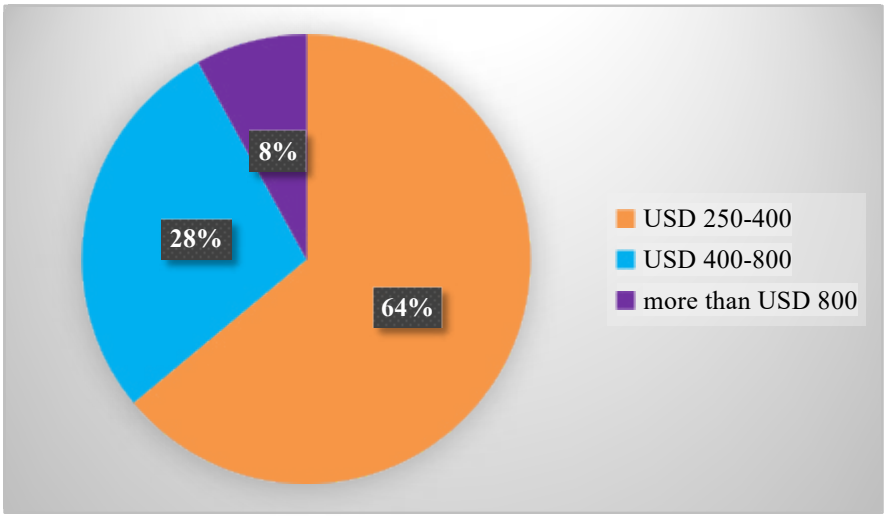
Most students are disposed to continue their digital learning experience, note its accessibility, and do not have virtual reality tools in their personal use (Table 1). At the same time, almost half of them (57%, 195 students) had previously used virtual reality tools.

Table 1 - Results of students' answers to questions Q4-Q7

		Yes, %	No, %
Q4	Do you want to continue the digital learning experience for music education?	89	11
Q5	Is digital music education affordable for you?	85	15
Q6	Have you previously used virtual reality tools?	57	43
Q7	Do you have virtual reality tools?	10	90

219 students (64%) believe a virtual reality headset costs USD 250-400, 96 students (28%) think it is priced at USD 400-800, and 27 students (8%) believe that a virtual reality headset costs more than USD 800 (Figure 2).

Figure 2 - The cost of a virtual reality headset according to students



Respondents point out to the following benefits of innovative digital learning technology (Virtuality Play Station):

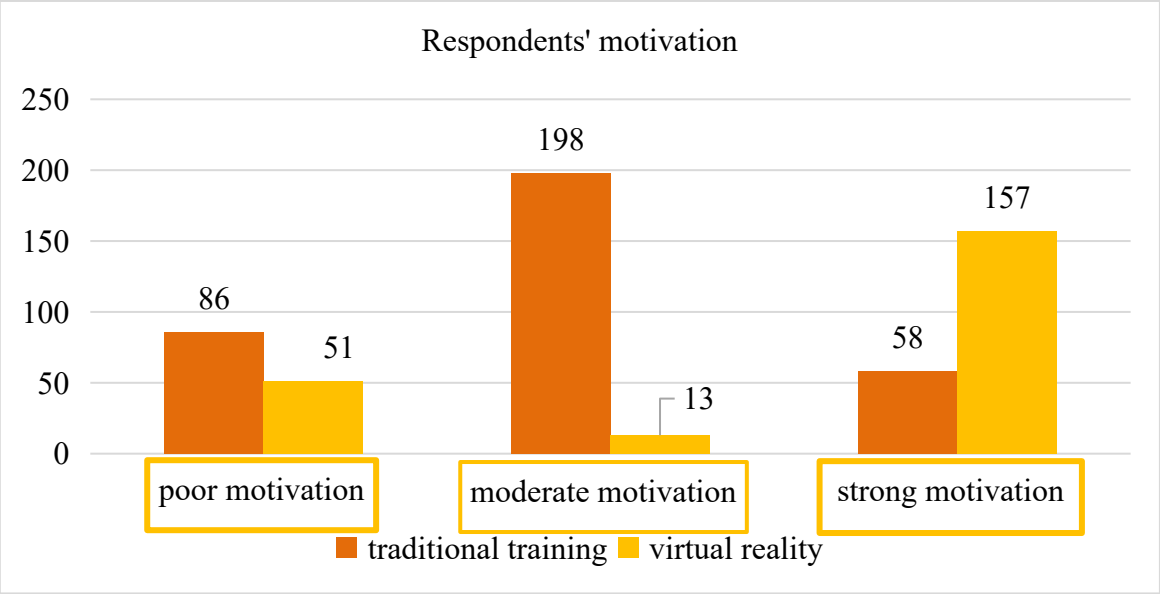
- Wow-effect; 3D measurement and panoramic view;
- immersive experience;
- modern graphics and surround sound;
- convenience and ease of use (ergonomic indicators);
- unlimited content;
- futuristic design.

Students suggest the high cost of equipment, motion sickness, fragility, small number of additional accessories, and sometimes frustration as disadvantages of modern Virtuality Play Station.

Measuring motivation according to Ehlers' method revealed that:

- in Group 1 (166 students who relied on traditional learning methods) 25% of respondents (86 students) had poor motivation to succeed, 58% (198 students) had a moderate motivation, and 17% of respondents (58 students) were strongly motivated;
- in Group 2 (176 students who used Virtuality Play Station) 15% of respondents (51 students) were poorly motivated, 39% (13 students) had a moderate motivation, and 46% of respondents (157 students) were strongly motivated (Figure 3).

Figure 3 - Respondents' motivation with different learning methods



Research revealed different motivation levels among groups: the number of highly motivated students was 170% higher when Virtuality Play Station was used, and the number of poorly motivated students was 40% lower in the group with traditional learning methods. Analysis of academic achievements after learning a musical composition revealed that: the mean score for Group 1 (where students relied on traditional learning methods) was 3.76±0.36; and the mean score for Group 2 (where students used Virtuality Play Station) was 4.32±0.67. Students' academic

achievements differ significantly ($p<0.05$). Students' motivation and academic achievements had close correlation: Pearson correlation coefficient $r_1=0.836$ and $r_2=0.819$ for students in both Group 1 and Group 2, respectively.

Research findings suggested a moderate correlation between the level of motivation and academic achievements. The higher the motivation, the better the academic achievements. Virtual reality technology significantly improves motivation among students.

Discussion

The introduction of innovative digital technology into music was a collaborative effort between the Universities of Bologna and Paris (FERRARI and ADDESSI, 2014). The project focused on the psychological and pedagogical aspects of the implementation of Continuator - an interactive reflective music system developed at SONY Computer Science Labs. The interactive system improves learning of musical compositions, encourages thinking and develops a sincere desire to practice music. This research suggests that a cutting-edge digital device can enhance musical creativity. The study also revealed improved motivation and better achievements when innovative digital technology was used. In addition, participants of the experiment explained the special aspects and rules of learning musical compositions to their friends. The learning function, based on mutual imitation and modeling, was developed. Digital techniques have also enabled the ambitious evolution of improvisation with musical instruments (FERRARI and ADDESSI, 2014).

Cutting-edge music technology, virtual communication, and the development of musical skills have been studied by Australian researchers (KLEIN and LEWANDOWSKI-COX, 2019). The study shows that Australian music technology training programs teach adaptive, computational and design thinking,

the new media literacy. However, there is a lack of employability skills associated with transdisciplinarity and virtual collaboration. Therefore, instructors of innovative music technology are gradually introducing such skills and creating original interactive media products, enabling the interdisciplinary integration of music technology, transdisciplinarity, and Virtual collaboration. Students positively perceive such approach as it contributes to creative skills development, improves listening, musical leadership, and communication (KLEIN and LEWANDOWSKI-COX, 2019). 77% of respondents have a positive perception of digital and virtual technology in music education.

The implementation of the new academic standards in music studies has been addressed by Chinese researchers (YU and LEUNG, 2019). This questionnaire was designed to explore the opinions of students and instructors about possible ways to improve musical competencies. The findings suggest that most instructors face various obstacles in implementing new tools, especially digital ones. Students, on the other hand, prefer modern course content and learning resources, and easily switch to new instruments, which contributes to better students' interest and motivation in music education (YU and LEUNG, 2019). A positive perception of the new formats of training and education was mentioned by 79% of the respondents to the study. The motivation among students who used virtual reality technology was 170% stronger.

The use of virtual reality techniques in vocal training was investigated by Turkish researchers (DOGANYIGIT and ISLIM, 2021). They developed a virtual reality app with music and 360° video (DOGANYIGIT and ISLIM, 2021). When examining the benefits of virtual reality technology in learning music, high effectiveness and ease of use were observed, similarly to the findings of the study. Students mention the high cost of cutting-edge virtual reality devices and apps as a disadvantage. The participants of the experiment also point out to the high cost of equipment as a disadvantage of Virtuality Play Station.

The application of immersive virtual reality techniques in education has been studied by Spanish researchers (LORENZO *et al.*, 2019). The findings suggest that virtual reality can meet the current needs of students and makes it possible for virtual reality to support practicing skills in real-world contexts (LORENZO *et al.*, 2019). Respondents also point to the immersive experience offered by Virtuality Play Station digital learning technology and its positive impact on outcomes.

The impact of virtual reality techniques on the research was analyzed by Turkish authors (ARTUN *et al.*, 2020). Innovative learning technologies, especially virtual reality devices, are becoming more prominent and affordable in education. The experiment revealed significant improvements in Pretest and Posttest academic scores after the application of virtual reality elements (ARTUN *et al.*, 2020). Analysis of the academic achievements also revealed a 15% increase in the average score.

The use of virtual reality for learning was studied by Pakistani researchers (ARIF, 2021). Educational effectiveness requires developing students' understanding of processes so that they can comprehensively understand the practical aspects in accordance with theoretical principles. Visualizing the core principles and elements of learning in a full-scale context is necessary for students to fully understand the various approaches. The new technological learning environment of visualization (virtual reality) creates a sense of the real world in a simulated environment, allowing students to learn, experiment, and feel (ARIF, 2021). The findings suggested that when virtual reality was applied, students demonstrated a higher ability to focus and performed better, which was confirmed in our experiment as well. Virtual reality technology appeared to be easy and comfortable to use, and the respondents also pointed out to ergonomic indicators as a benefit.

The effect of mobile digital tools on students' motivation to learn music was studied by researchers in Hong Kong (CHEN, 2020). The study demonstrated the feasibility and relevance of

using mobile technology and devices to create and learn music. The mean scores of success and intrinsic value, achievement value, usefulness, and motivation were also compared. Research suggests that students have a significant increase in motivation for music when grasping opportunities offered by digital technology in music education. The experiment also showed that digitalization increased the number of strongly motivated students by 170%.

Chinese researchers (BAI, 2021) have studied the specific features of piano learning in the current context. Music education is extremely popular in China. One reason is the fact that Chinese music education relies on innovative digital learning methods and widely exploits the relationship between learning and motivation. Research has suggested that there is a relationship between learning formats and motivation (BAI, 2021). The research findings suggest a relationship between the level of motivation and academic achievements - the stronger the motivation, the better the academic achievements.

Building a motivation to learn and think among students when using virtual reality tools has been studied by Russian researchers (KAPUSTINA and ZIKEEVA, 2021). The study showed the impact of virtual reality software on the learning effectiveness and the learning motivation. Research findings revealed an improved learning effectiveness when virtual reality techniques were employed (KAPUSTINA and ZIKEEVA, 2021). A 15% increase in learning effectiveness was also observed in the study.

Students' perceptions of virtual reality software in education were studied by a Russian researcher (PISKUNOVA and POBOKIN, 2021). The study shows that students are interested in virtual reality technology and software, suggesting that immersion in virtual reality increases interest in learning, satisfaction and motivation. The authors describe that 30% of respondents used virtual reality in training (PISKUNOVA and

POBOKIN, 2021), with 57% of such respondents observed in our study.

Virtual reality technology is widely used not only in music education, but also when performing music. For example, one could attend a classical music concert with a symphony orchestra in Greece (EURONEWS, n.d.) or a concert of a U.S. singer (VARIETY, n.d.).

Music education requires a strong development and application of innovative digital tools and elements of virtual reality. This will produce musicians capable of developing and improving both personally and professionally. The music community and the research findings point out to the need to apply virtual reality tools in music education and music performance.

Conclusions

Music education requires innovative learning methods and digital tools. The application of digital tools and virtual reality techniques will improve training and help future musicians to acquire important musical skills. The study sample consisted of two groups, Group 1 studied the Chinese musical composition using traditional learning methods; Group 2 applied virtual reality techniques (Virtuality Play Station).

A survey of respondents was also conducted to explore Attitude and Awareness technologies used. As expected, students responded well to the digital learning experience and are familiar with the possibilities of virtual reality. Motivation was measured using the Ehlers' method. After studying a musical composition, the researchers assessed the academic achievements on a five-point scale. Students who used virtual technology were more motivated.

Analysis of academic achievements after learning a musical composition revealed that the mean score in the group which relied on traditional learning methods was 3.76±0.36, and the

mean score for the group where students used Virtuality Play Station was 4.32±0.67. Students' academic achievements differ significantly ($p<0.05$). The level of motivation and students' academic achievements have a strong correlation.

The research findings suggest a moderate relationship between the level of motivation and academic achievements - the stronger the motivation, the better the academic achievements.

The research findings also suggest searching for new methods of improving music education using digital solutions to optimize the learning process and performance of music. Further studies might focus on improving student motivation and academic achievements. The findings will contribute to academic programs, making it easier for students to acquire and improve their musical competencies.

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Appendix 1

Dear Musician!

Please answer the questions of the survey conducted by Musicology Department of Guizhou Nationalities University

For your information Mark the answer with a checkmark or another symbol that is convenient for you.

No.	Question
1.	What is your sex?
	☐ Male
	☐ Female
2.	How old are you?
3.	How do you feel about digital learning?
	☐ positive
	☐ negative
	☐ neutral
4.	Do you want to continue the digital learning experience for music education?
	☐ Yes
	☐ No
5.	Is digital music education affordable for you?
	☐ Yes
	☐ No
6.	Have you previously used virtual reality tools?
	☐ Yes
	☐ No
7.	Do you have virtual reality tools?
	☐ Yes
	☐ No

8.	If the answer is "Yes", do you know the cost of the virtual reality headset?
	☐ USD 250-400
	☐ USD 400-800
	☐ More than USD 800
9.	Specify the advantages of Virtual reality devices
10.	Specify the disadvantages of Virtual reality devices

Thank you for your participation in the survey!

Appendix 2

Dear Musician!

Please answer the questions of the survey conducted by Musicology Department of Guizhou Nationalities University

For your information, Please answer "Yes" or "No" to each of the following 41 questions.

No.	Statements	Answer	
		Yes	No
1.	If you have a choice between two options, it's better to make a decision quickly.	Yes	No
2.	If I notice that I can't 100% complete a task, I get annoyed easily.	Yes	No
3.	When I'm working, it looks like I'm putting everything on the line.	Yes	No
4.	If a problem arises, more often than not I am one of the last to make a decision.	Yes	No
5.	If I have no business for two days in a row, I lose my peace.	Yes	No
6.	Some days my progress is below average.	Yes	No
7.	I am more demanding of myself than others.	Yes	No
8.	I am more benevolent than others.	Yes	No

9.	If I refuse a difficult task, I judge myself harshly afterwards, because I know that I would have succeeded in it.	Yes	No
10.	In the course of my work, I need to take small pauses to rest.	Yes	No
11.	Zeal is not my main trait.	Yes	No
12.	My accomplishments are not always the same.	Yes	No
13.	The other job appeals to me more than the one I'm doing.	Yes	No
14.	Censure stimulates me more than praise.	Yes	No
15.	I know that my colleagues consider me a businessperson.	Yes	No
16.	Overcoming obstacles makes my decisions more emphatic.	Yes	No
17.	It's easy to play on my ambition.	Yes	No
18.	If I work uninspired, it's usually noticeable.	Yes	No
19.	I don't count on others to help me get the job done.	Yes	No
20.	Sometimes I put off until tomorrow what I have to do today.	Yes	No
21	You have to rely only on yourself.	Yes	No
22	Few things in life are more important than money.	Yes	No
23.	If I have an important task to accomplish, I never think about anything else.	Yes	No
24.	I am less ambitious than many others.	Yes	No
25.	At the end of my vacation, I'm usually excited about going back to work soon.	Yes	No
26.	If I am disposed to the work, I do it better and more skillfully than others.	Yes	No
27.	I find it easier to communicate with people who can work hard.	Yes	No
28.	When I don't have a job, I don't feel comfortable.	Yes	No
29.	I have to do demanding tasks more often than others.	Yes	No
30.	If I have to make a decision, I try to do it the best I can.	Yes	No
31.	Sometimes my friends think I'm lazy.	Yes	No
32.	My successes depend to some extent on my colleagues.	Yes	No
33.	It makes no sense to oppose the executive's will.	Yes	No
34.	Sometimes you don't know what kind of work you're going to have to do.	Yes	No
35.	If things don't work out for me, I get impatient.	Yes	No
36.	I usually pay little attention to my accomplishments.	Yes	No

37.	If I work together with others, my work is more productive than that of others.	Yes	No
38.	I don't follow through on a lot of things I take on.	Yes	No
39.	I envy people who are not overworked.	Yes	No
40.	I do not envy those who seek power and position.	Yes	No
41.	If I am sure that I am on the right track, I will go to extreme measures to prove that I am right.	Yes	No

Thank you for your participation in the survey!