Impact of Digital Audio Techniques and Software Technology on Students' Engagement and Participation in Music Classes

Ji Lu

Ji Lu

https://orcid.org/0009-0005-4990-6342?lang=en

School of MusicJimei University
Xiamen, Fujian, 361021, China
jonathanlu0622@163.com

Abstract

Educational institutions teaching music have recently switched over to digital and modern tools of software and technology, expecting music teachers too to adopt modern techniques to teach music to the students. The objective of this study is to investigate the impact of digital audio equipment, interactive software and online learning platforms on students' engagement and participation in music classes. This study used a 7-point Likert scale questionnaire where the data was collected from students of different colleges and universities in China. This study employed RStudio for the analysis of data for robust findings. The finding of this research revealed that digital audio equipment, interactive software and online learning platforms have a significant and positive impact on students' engagement and participation in music class. This contribution of the study is novel as previous studies have paid little attention to understand these relationships. This study provides practical implication for practitioners to facilitate music teaching to both teachers and students with modern software and technology equipment to improve their engagement and participation in the class

Keywords

Music Teaching, Student Engagement, Digital Audio Equipment, Modern Software, Interactive Technology.

1. Introduction

Music is rightly considered as food of the soul as it motivates the artist to excel their performance with rejuvenated energy (**Alburqueque *et al.***, 2022). Music is important for the artist because they can perform in different events in front of the public. Every culture and tradition has a different kind of music that is associated with that culture and which people enjoy (**Buonviri**, 2023). Apart from learning music, teaching of music is also passionate for the people as it proves the cultural transformation of emotions and feelings (**García-Gil *et al.***, 2024). In educational institutes the music teaching has become a significant factor which improves the behaviour of people toward music. At the same time, learning of music is not easy because it is based on complicated tasks which reduce the competency of students sometime (**Benjamins *et al.***, 2022). However, the students are recommended to be motivated to learn music which is important if they are participating in music classes. The music teachers are transforming the cultural things to the students of the future generation which can impact on their life, and it is beneficial for their learning (**Bennett; Sena Moore**, 2023).

The teaching of music in the traditional way is based on different challenges which reduce the productivity of students (**Bolden; DeLuca**, 2022). However, modern techniques of music teaching are reported to improve the overall behaviour of students we can improve the productivity and their performance over time. The significant importance of music is the necessary for improving the behaviour of people which can help them to participate in learning approaches (**Danso *et al.***, 2021). Similarly, in schools and colleges, the teaching of music has gained a significant attention and music collective art introduced years before to teach the students. The involvement in the music courses by the students is

not guaranteed to learn the music because it is based on different difficult steps (**Crowther *et al.***, 2023). With the passage of time, the digital transformation also effected teaching where the modern tools and technology is used to teach their students. However, the music teachers are left behind to adopt the model technology to teach music to the students (**Espigares-Pinazo *et al.***, 2022). In different universities and colleges in China, the old method of music teaching with old teaching techniques and instruments are used (**Gaillard *et al.***, 2024).

Due to the use of old instrument and methodology of music teaching, it has become significant challenge for the students to learn music in the digital era (**Çimen; Özevin**, 2021). However, music teaching is also transformed to the better learning of music in the modern time with the use of digital instruments and modern technology. Learning music with the help of technology is important for students as they can understand it in a better way. It is also argued that teachers should develop effective strategies to teach the music to the students which can improve their understanding and better learning approach(**Carrión Candel; Colmenero**, 2022). Similarly, teaching music should be improved by the teachers which can improve their impact on students that is necessary to overall improve their performance (**Fernández-Aguayo *et al.***, 2021). Therefore, music digital is admitted using the modern technology that can help them to advance their practises and improve the learning of the students (**Byrne *et al.***, 2024). Despite many studies conducted on the learning of music by the students, there is less attention paid to students' engagement and participation in music class.

To address this gap, the objective of this study is to investigate the impact of digital audio equipment, interactive software and online learning platforms on students' engagement and participation in music classes. This study used a 7-point Likert scale questionnaire where the data was collected from students at different colleges and universities in China. This study employed JASP statistical software for the analysis of data for robust findings. The finding of this research revealed that digital audio equipment, interactive software and online learning platforms have a significant and positive impact on students' engagement and participation in music class. The contribution of the study is novel as previous studies have paid little attention to understand these relationships. This study provides practical implication for the practitioners to understand the music teaching to the students to improve their engagement and participation in the class with the help of modern technology and software.

2. Literature Review

Students' participation in music class is significant in their learning (**Hu *et al.***, 2023), while the role of teachers is to motivate students to participate in music classes. Apart from the motivation by teachers, it is necessary to use modern equipment which can help students to better perform in cultural music (**Hendriks; Cruywagen**, 2024). The equipment designed to teach music to students should be available to teachers as well and they should teach the use of these equipment to students. It is therefore necessary for students to participate in a music class when teachers are supporting them with modern tools and technology (**Björk *et al.***, 2021). The use of computers and other artificial intelligence-based devices are necessary that can attract students towards their performance in a music class. However, it is also important for students to learn music by passion which can help them to participate in the music class with their effective role (**da Fonsêca Barros; Penna**, 2023).

The participation of students in music class become important when they have active role to deal with digital audio equipment (**Bennett; Sena Moore**, 2023). The necessary factor to improve the understanding of students with music class is to behave in a better way which can help students to utilise the board and tools and equipment (**Kladder**, 2021). The teachers are supposed to use the modern tools and colleges administration should work to provide these modern tools to the teachers. It is important for students to improve their understanding and performance when they are introduced with important tools of teaching that can help them to improve their performance (**Buonviri**, 2023). In this way, students would be attracted to modern equipment which they believe as a significant factor to improve their music learning. The music learning of the students would be improved with modern tools introduced to them that are necessary to advance their performance (**Byrne *et al.***, 2024). Therefore, it is significantly required to provide better learning tools to the students for music class that are important to engage them in better performance. This necessitates to test the following hypothesis:

H1: Digital audio equipment has an impact on students' engagement and participation.

The interactive software based on artificial intelligence algorithm and techniques are important for music learning (**Kladder**, 2021). Music learning become effective for students when they have active participation in the classroom, and they learn to use the modern software. The teachers are required to upgrade their methodology of music teaching that can be improved with the help of modern equipment that are necessary to advance the performance of students (**Li**, 2022; **Sai**, 2024). It is necessary for teachers to support students with music learning that can be helpful for them to effectively improve their performance. The music class should be based on entertainment where the skills related to music of the students should be improved (**Ismail *et al.***, 2022). The utilisation of modern software and tools can help the students to understand the music equipment and practise by themselves. This practise can help them with the opportunity of training again and again even without the presence of teachers.

It is necessary for students to understand their potential for their learning performance in a better way (**Ismail *et al.***, 2023). The teachers should also be highly motivated to use modern tools and software of music teaching, so that they teach students to effectively improve their performance of music learning. At the same time, the software developers

and expert musicians should work on significant software development that can help students to improve their music (**Duarte; Constantinidi**, 2021). Besides, students can also improve their overall music skills which is helpful for them for a long term. There should be use of modern software and technology in music class, otherwise it becomes difficult for the students to learn music as compared to other students who are using modern technology (**Cuervo et al.**, 2023). Therefore, the rule of teaching with software and technology is helpful for students to improve their engagement of music learning. However, this should be facilitated engagement and participation of students for their learning and active performance (**Immonen et al.**, 2021). This requires to study the following hypothesis:

H2: Interactive software has an impact on students' engagement and participation.

There are different online learning platforms that are helpful for students to understand music (**Karkina et al.**, 2023). These platforms are based on the initiative taken by different individuals to train students in music. The educational institutes are required to provide opportunities to the students to subscribe to these online platforms or get access to freely available platforms (**Crowther et al.**, 2023). The learning of building related techniques by online platforms are important for the students that can help them to self-improve their skills of music (**Ismail et al.**, 2023), particularly when students are highly motivated to improve their learning performance to develop effective strategy that can engage them to improve their participation in music learning (**Gaillard et al.**, 2024). The strategic approach of students and the online learning platforms recommended to motivate the students which can effectively improve their performance (**Danso et al.**, 2021). The music learning techniques based on the online platform should be shared by the teachers to the students to improve their understanding of the music.

In the classroom activities, the training of students with online platforms should be emphasised by the teacher which can help them to improve the understanding of students for music (**Fernández-Aguayo et al.**, 2021). It is a significant factor for students in a music class that becomes their prior interest. When students who are interested in music participation (**Aum et al.**, 2023), the teachers and parents have important role for providing them access to the online platforms of music learning. It is a significant factor for students to improve their learning and understanding of music. In addition, online learning platforms are helpful for students to improve their productivity in music performance which is necessary to their success (**Alburqueque et al.**, 2022). Therefore, online learning platform should be emphasised by teachers and parents for music learning of students. It will affect the engagement and participation of students in music classes.

H3: Online learning platforms have an impact on students' engagement and participation.

3. Methodology

The findings of this study are based on a quantitative research design, which measured the relationships between variables. A self-structured questionnaire was developed to collect the data, which was adapted from the scales provided in previous studies. The questionnaire was submitted to five music experts to determine its face validity. The recommendations of these experts were considered to modify the questionnaire items. The population comprised students of colleges and universities providing music education in two regions of China, Shanghai and Beijing. The purposive sampling technique was used to collect the data, as it suits when exact information about participants is required. A total of 600 printed questionnaires were distributed to all participants. Finally, 445 questionnaires were collected, out of which 9 questionnaires were turned invalid due to bias. A sample of 436 respondents was considered final for this study, which is more than the threshold of 384 usually accepted for social sciences studies (**Krejcie; Morgan**, 1970).

The data collection mode for this study was based on cross-sectional design. One time data was collected from the respondents to reach on the findings of this study. The respondents were thanked for their time and contribution to the study. In addition, this study was conducted to investigate the impact of independent variables on dependent variable. Therefore, the robust analysis with RStudio was conducted to reach on research findings (**Murad et al.**, 2024). The findings of data normality, validity, descriptive and regression analysis were performed to reach on research findings.

4. Findings

In the process of data analysis, the normality of data distribution was investigated at the first stage. The findings of skewness and kurtosis were investigated for this purpose. The skewness and kurtosis value should be less than ±2 and ±7 respectively to confirm the normality of data distribution (**Royston**, 1992). The findings in Table 1 confirmed that the normality of data distribution was significantly achieved.

Table 1: Normality of Data Distribution.

	Skewness		Std. Error of Skewness	Kurtosis	Std. Error of Kurtosis
Digital Audio Equipment	-0.296		0.117	0.389	0.234
Interactive Software	-0.039		0.117	-0.157	0.234
Online Learning Platforms	-0.139		0.117	-0.210	0.234
Engagement and Participation	-0.206		0.117	0.145	0.234

The findings of Cronbach's alpha and composite reliability were determined to investigate the normality of research data. The value of Cronbach's alpha > 0.70 and composite reliability > 0.70 confirm the significance and validity of data (**Hair et al.**, 2011).

The findings in Table 2 confirmed both thresholds were significantly achieved. The mean value and standard deviation of the data were also checked. Since this study used a seven-point Likert scale, the mean value ±5 was acceptable. The findings in Table 2 confirm that all thresholds were significantly achieved and mean and standard deviation was accepted.

Table 2: Cronbach Alpha, Composite Reliability, Mean and Standard Deviation.

	Cronbach's Alpha	Composite Reliability	Mean	Std. Deviation
Digital Audio Equipment	0.733	0.707	5.640	0.863
Interactive Software	0.879	0.837	5.677	0.832
Online Learning Platforms	0.891	0.788	5.635	0.861
Engagement and Participation	0.901	0.865	5.573	0.923

Pearson's correlation analysis was performed to measure the correlation between variables of this study. It is determined to check the direction and nature of the relationship between variables. The p value of less than 0.05 was considered significant for accepting a correlation between variables. Table 3 confirms that all correlations were accepted and the direction for all relationships was positive.

Table 3: Pearson's Correlations.

		Pearson's r		p
Digital Audio Equipment	Interactive Software	0.715	***	< .001
Digital Audio Equipment	Online Learning Platforms	0.685	***	< .001
Digital Audio Equipment	Engagement and Participation	0.667	***	< .001
Interactive Software	Online Learning Platforms	0.704	***	< .001
Interactive Software	Engagement and Participation	0.610	***	< .001
Online Learning Platforms	Engagement and Participation	0.668	***	< .001
* $p < .05$, ** $p < .01$, *** $p < .001$				

The findings of model summary were investigated with R, R^2 and adjusted R^2. The R value highlights the correlation between independent and dependent variables. This value should be above 0.40 for significant correlation between variables. Furthermore, R^2 value is used to explain the variance in dependent variable based on independent variables. Its value should be above 0.50. The findings in Table 4 shows that the R2 value was above the recommended threshold. The findings of adjusted R^2 were determined to investigate the generalization of the results. There should be a minimum difference between R^2 and adjusted R^2 for significant model. The findings in Table 4 confirm that the model summary was significantly accepted.

Table 4: Model Summary - Engagement and Participation.

Model	R	R^2	Adjusted R^2
M_0	0.000	0.000	0.000
M_1	0.731	0.534	0.531
Note. M_1 includes Digital Audio Equipment, Interactive Software, Online Learning Platforms			

Analysis of variance was also investigated to determine the quality of model if it is significant to analyze the relationships between variables. The F value in analysis of variance highlights an improvement in the prediction of the variable by fitting the model after considering the inaccuracy present in the model. It should be above 1 for significance variance. Furthermore, p value or probability is accepted when it is 95%. The findings shown in Table 5 confirm that analysis of variance was significantly confirmed.

Table 5: ANOVA.

Model		Sum of Squares	df	Mean Square	F	p
M_1	Regression	196.628	3	65.543	164.114	< .001
	Residual	171.330	429	0.399		
	Total	367.958	432			
Note. M_1 includes Digital Audio Equipment, Interactive Software, Online Learning Platforms						

Table 6 explains the findings of coefficients where the relationships between variables are investigated. According to findings of H1, digital audio equipment has a significant impact on students' engagement and participation. Furthermore, H2 highlighted that interactive software has a significant impact on students' engagement and participation. Thirdly, the study confirmed that H3 is accepted and online learning platforms has a significant impact on students' engagement and participation. The findings are reported in Table 6.

Table 6: Coefficients.

Model		Unstandardized	Standard Error	Standardized	t	p
M_0	(Intercept)	5.573	0.044		125.648	< .001
M_1	(Intercept)	0.648	0.228		2.844	0.005
	Digital Audio Equipment	0.365	0.054	0.341	6.735	< .001
	Interactive Software	0.132	0.058	0.119	2.291	0.022
	Online Learning Platforms	0.376	0.053	0.351	7.034	< .001

5. Discussion and Conclusion

The findings related to H1 clearly suggest that digital audio equipment has a significant impact on students' engagement and participation. These findings resonate with previous studies which supported this relationship. For instance, **Hu et al.** (2023) discussed that there is an important role of music learning in a university curriculum. **Immonen et al.** (2021), too, agreed that when students are motivated to learn music, there is a need to introduce effective strategies like digital equipment availability, which can improve the music performance of students. The students should be trained to utilise the music in a better way with modern equipment that can help them to improve their overall performance (**Ismail et al.**, 2023). This study also found that it is the responsibility of teachers to train students with music learning that can help to improve their effectiveness in learning. **Aum et al.** (2023), too, argue that modern tools should be used and it is the accountability of educational institutes to provide modern equipment to teachers for music teaching. This will help increase the music performance of students because they are supported with modern technology. The students of developed countries are also recommended to learn music where the teachers are required to use the modern equipment (**Björk et al.**, 2021). According to **Ismail et al.** (2022), modern equipment helps students to understand their music learning strategies which can improve their overall performance of music lyric. Therefore, music learning is considered as a significant factor which can improve the performance of students when they are supported by their teachers.

Furthermore, H2 highlighted that interactive software has a significant impact on students' engagement and participation. The findings of previous studies also supported this relationship. According to **Ismail et al.** (2023), the role of interactive software is important in music learning of the students. The software is designed in a user-friendly way where the students can have different application and modules. The music learning of students can become effective that they are strategically learning the music with modern software and techniques. The artificial intelligence-based algorithm can help the students according to their customized profile (**Karkina et al.**, 2023). The training plan for teaching the music education to students with the help of online learning platforms can effectively increase the student's participation in music class. According to **Benjamins et al.** (2022), the higher level of student participation in music class can improve their productivity with the help of online learning. However, the role of parents and teachers is to support students for music learning which can effectively improve their performance in a better way (**Cuervo et al.**, 2023). The higher level of motivation to the students is also required if they need to be trained to learn music with the help of online software. According to **García-Gil et al.** (2024), the user-friendly software is designed for students to effectively understand the importance of music. In this way, the learning opportunities of the students are increased where they can effectively learn music and perform better. **Bolden and DeLuca** (2022), too, agreed that participation of students in music class can improve their productivity which is helpful for their music performance. In this way, the students should be introduced with the modern software that can help them to learn music in a productive way.

Thirdly, the study confirmed that H3 is accepted and online learning platforms has a significant impact on students' engagement and participation. The findings of previous studies also supported this relationship. **Hendriks and Cruywagen** (2024) reiterate that the role of online learning platforms is important for students to self-practise music. The appropriate opportunities available to students by utilising the online platforms can help them to improve their productivity in music learning. The online platforms should be free and different kinds of tutorials should be uploaded to teach music (**Carrión Candel; Colmenero**, 2022). It is considered as an effective way which is necessary to improve the performance of students that is appropriate for their overall learning. **Çimen and Özevin** (2021) emphasized that music students should be requested to develop their strategies effectively which can help them to improve their performance with the help of online platforms. The trend of online music learning platforms is also supported in the developed countries where the teachers motivate to the students to use the model tools and online platforms (**Duarte; Constantinidi**, 2021). It provides the opportunity to students for self-learning which is necessary for their overall performance in music. When students are highly motivated to improve their performance, the support with online learning platforms help them to deal with challenges in learning (**da Fonsêca Barros; Penna**, 2023). Therefore, it is considered that the role of online learning platforms is important in music learning and performance (**Espigares-Pinazo et al.**, 2022). On the other hand, if the students are not encountered with online learning platforms of music, it would affect their capabilities to perform in a better way.

5.1. Implications and Future Directions

The study comes with both theoretical and practical implications, both significantly contributing to the domain of music learning. Theoretically, the study highlights that there is a significant influence of digital audio equipment on students' engagement and participation in music classes. This relationship is new in the body of knowledge because previously there is no empirical evidence to discuss this relationship in literature. Second, the study also contributed that interactive software is a significant interference of students' engagement and participation in music class. In addition, this relationship also indicated that there is lack of evidence in literature regarding this relationship prior to this research. Thirdly, the study adds to the body of knowledge that online learning platforms have a significant impact on students' engagement and participation in the music class. The previous research lacks empirical evidence regarding these relationships. Therefore, these findings significance contribute to understanding of theoretical and empirical discussion.

The study also has practical value for practitioners to improve the engagement of students in music class based on their participation. The study highlights that educational institutes should include digital audio equipment to teach music to students which is helpful for them. This digital audio equipment should consist of artificial intelligence and innovations, which can help students to improve their understanding of music. Similarly, teachers are also recommended to use software that can help them teach music at any levels. Apart from it, teachers are also recommended to use online learning platforms to students which can help them to understand the extracurricular activities of music. It would be helpful for students to develop their passion for music learning and improve their understanding for music performance. In this way, the students would engage with music class and their participation would be fruitful that is necessary for the college and university administration. By working on the practices, the teachers and the management of colleges and universities can improve the participation of students at their engagement in music class.

This study faced some methodology-based limitations which can be highlighted. First, this study used cross-sectional data to investigate the relationship between the variables of this research which provided a limited understanding of students' engagement and participation in music classes. There is a need of future studies which can collect data with longitudinal design that would be helpful to understand the findings in very detailed way. Secondly, this study investigated only the direct relationship between variables and paid no attention to the psychological health of students. It is important to understand the psychological health of students for their engagement and participation in music class. Therefore, future studies should investigate the psychological health of the students and interpret findings accordingly. Finally, this study used quantitative data to reach on the findings and achieve the objectives. Future studies can use qualitative data and interview-based approach to collect subjective information from students to interpret the findings in a different way.

References

Alburqueque, I. L. V.; Romaní, Y. L. H.; Yupanqui, G. M. C.; Abollaneda, R. C.; Aedo, M. I. R. (2022). "Improvisation of Music Therapy with Repertoire of Marineras Trujillanas in Online Higher Education Learning". *International Journal of Emerging Technologies in Learning,* v. 17, n. 15, pp. 171-187. *https://doi.org/10.3991/ijet.v17i15.31843*

Aum, J.; Kim, J.; Park, E. (2023). "Can we predict the Billboard music chart winner? Machine learning prediction based on Twitter artist-fan interactions". *Behaviour and Information Technology,* v. 42, n. 6, pp. 775-788. *https://doi.org/10.1080/0144929X.2022.2042737*

Benjamins, L.; Roland, S. L.; Bylica, K. (2022). "The complexities of meaningful experiential learning: Exploring reflective practice in music performance studies". *International Journal of Music Education,* v. 40, n. 2, pp. 163-176. *https://doi.org/10.1177/02557614211043224*

Bennett, C.; Sena Moore, K. (2023). "Norm-disruptive learning and music teacher competency development: A thematic synthesis". *International Journal of Music Education,* v. 41, n. 1, pp. 20-37. *https://doi.org/10.1177/02557614221093699*

Björk, C.; Ruthmann, S. A.; Granfors, M.; Högväg, J.; Andersson, S. (2021). "The potential of a mixed-methods approach for research on learning to theorise music". *Music Education Research,* v. 23, n. 3, pp. 374-390. *https://doi.org/10.1080/14613808.2020.1853085*

Bolden, B.; DeLuca, C. (2022). "Nurturing student creativity through assessment for learning in music classrooms". *Research Studies in Music Education,* v. 44, n. 1, pp. 273-289. *https://doi.org/10.1177/1321103X211054793*

Buonviri, N. O. (2023). "Educating Ears: The Role of Sound in Music Learning". *Music Educators Journal,* v. 110, n. 2, pp. 30-36. *https://doi.org/10.1177/00274321231202621*

Byrne, R.; Murphy, R.; Ward, F.; McCabe, U. (2024). "Playful (music) teaching and learning in Irish primary school classrooms". *Irish Educational Studies,* v. 43, n. 4, pp. 1479-1499. *https://doi.org/10.1080/03323315.2024.2330886*

Carrión Candel, E.; Colmenero, M. J. R. (2022). "Gamification and mobile learning: innovative experiences to motivate and optimise music content within university contexts". *Music Education Research,* v. 24, n. 3, pp. 377-392. *https://doi.org/10.1080/14613808.2022.2042500*

Çimen, M.; Özevin, B. (2021). "Turkish Folk Music Lessons with Phenomenon-Based Learning: Preliminary Lessons and Results". *IAFOR Journal of Education,* v. 9, n. 6, pp. 71-88. *https://doi.org/10.22492/ije.9.6.04*

Crowther, G. J.; Adjapong, E.; Jenkins, L. D. (2023). "Teaching science with the "universal language" of music: alignment with the Universal Design for Learning framework". *Advances in Physiology Education,* v. 47, n. 3, pp. 491-498. *https://doi.org/10.1152/ADVAN.00006.2023*

Cuervo, L.; Bonastre, C.; Camilli, C.; Arroyo, D.; García, D. (2023). "Digital Competences in Teacher Training and Music Education via Service Learning: A Mixed-Method Research Project". *Education Sciences,* v. 13, n. 5, pp. 459. *https://doi.org/10.3390/educsci13050459*

da Fonsêca Barros, M. H.; Penna, M. (2023). "Problem-based learning (PBL) in music teacher education". *International Journal of Music Education,* v. 41, n. 4, pp. 585-597. *https://doi.org/10.1177/02557614221130526*

Danso, A.; Rousi, R.; Thompson, M. (2021). "Novel and experimental music technology use in the music classroom: Learning performance, experience and concentrated behavior". *Human Technology,* v. 17, n. 1, pp. 81-112. *https://doi.org/10.17011/HT/URN.202106223979*

Duarte, A. M.; Constantinidi, N. P. (2021). "Learning and music composition: An analysis of composers' testimonies". *Research Studies in Music Education,* v. 43, n. 3, pp. 513-527. *https://doi.org/10.1177/1321103X19879513*

Espigares-Pinazo, M. J.; Bautista-Vallejo, J. M.; García-Carmona, M. (2022). "Evaluations in the Moodle-Mediated Music Teaching-Learning Environment". *Technology, Knowledge and Learning,* v. 27, n. 1, pp. 17-31. *https://doi.org/10.1007/s10758-020-09468-0*

Fernández-Aguayo, S.; Pino-Juste, M.; Domínguez-Lloria, S. (2021). "Drama and Music for Integration and Intercultural Learning in Educational Contexts with Gypsy Culture". *International Journal of Learner Diversity and Identities,* v. 29, n. 1, pp. 1-13. *https://doi.org/10.18848/2327-0128/CGP/v29i01/1-13*

Gaillard, J. C.; Gampell, A.; Joe, M.; Skuse, Z.; Young, C. (2024). "Learning to the rhythm: On the potential of music in fostering relations in the classroom". *New Zealand Geographer,* v. 80, n. 2, pp. 100-108. *https://doi.org/10.1111/nzg.12395*

García-Gil, D.; Cuervo, L.; Bonastre, C.; Camilli, C. (2024). "Music for Hospitalized Children in Service-Learning: Academic and Personal Implications for Teachers in Training". *Harmonia: Journal of Arts Research and Education,* v. 24, n. 1, pp. 105-121. *https://doi.org/10.15294/harmonia.v24i1.43375*

Hair, Joe F; Ringle, Christian M; Sarstedt, Marko. (2011). "PLS-SEM: Indeed a silver bullet". *Journal of Marketing theory and Practice,* v. 19, n. 2, pp. 139-152. *https://doi.org/10.2753/MTP1069-6679190202*

Hendriks, M.; Cruywagen, S. (2024). "Mathematics in South Africa's Intermediate Phase: Music integration for enhanced learning". *South African Journal of Childhood Education,* v. 14, n. 1, pp. a1535. *https://doi.org/10.4102/sajce.v14i1.1535*

Hu, J. X.; Song, Y.; Zhang, Y. Y. (2023). "Adoption of Gesture Interactive Robot in Music Perception Education with Deep Learning Approach". *Journal of Information Science and Engineering,* v. 39, n. 1, pp. 19-37. *https://doi.org/10.6688/JISE.202301_39(1).0002*

Immonen, K.; Kilpeläinen, J.; Alku, P.; Peltola, M. S. (2021). "Does studying in a music-oriented education program affect non-native sound learning? — effects of passive auditory training on children's vowel production". *Journal of Language Teaching and Research,* v. 12, n. 5, pp. 678-687. *https://doi.org/10.17507/jltr.1205.06*

Ismail, M. J.; Anuar, A. F.; Loo, F. C. (2022). "From Physical to Virtual: A New Learning Norm in Music Education for Gifted Students". *International Review of Research in Open and Distributed Learning,* v. 23, n. 2, pp. 44-62. *https://doi.org/10.19173/irrodl.v23i2.5615*

Ismail, M. J.; Chiat, L. F.; Ying, L. F. (2023). "An Active Learning Study: Mastering Music Coordination Skills through Kompang and Dalcroze Eurhythmics among Primary Students". *International Journal of Instruction,* v. 16, n. 1, pp. 191-204. *https://doi.org/10.29333/iji.2023.16111a*

Karkina, S.; Mena, J.; Valeeva, R.; Yarmakeev, I.; Dyganova, E.; Bhullar, M. (2023). "Fostering future music teachers' professional skills: developing a signature pedagogy using e-learning". *Frontiers in Education,* v. 8, pp. 1162748. *https://doi.org/10.3389/feduc.2023.1162748*

Kladder, J. (2021). "Digital audio technology in music teaching and learning: A preliminary investigation". *Journal of Music, Technology and Education,* v. 13, n. 2-3, pp. 219-237. *https://doi.org/10.1386/jmte_00024_1*

Krejcie, Robert V; Morgan, Daryle W. (1970). "Determining Sample Size for Research Activities". *Educational and Psychological Measurement,* v. 30, n. 3, pp. 607-610. *https://doi.org/10.1177/001316447003000308*

Li, Renli. (2022). "Chinese Folk Music: Study and Dissemination Through Online Learning Courses". *Education and Information Technologies,* v. 27, n. 7, pp. 8997-9013. *https://doi.org/10.1007/s10639-022-11003-w*

Murad, Muhammad; Othman, Shahrina Binti; Kamarudin, Muhamad Ali Imran Bin. (2024). "Three stages of entrepreneurial university support and students' entrepreneurial behavior: A statistical analysis using R Studio". *Journal of Education for Business,* v. 99, n. 6, pp. 400-407. *https://doi.org/10.1080/08832323.2024.2417292*

Royston, Patrick. (1992). "Which Measures of Skewness and Kurtosis are Best?". *Statistics in Medicine,* v. 11, n. 3, pp. 333-343. *https://doi.org/10.1002/sim.4780110306*

Sai, Y. (2024). "Online Music Learning Based on Digital Multimedia for Virtual Reality". *Interactive Learning Environments,* v. 32, n. 5, pp. 1751-1762. *https://doi.org/10.1080/10494820.2022.2127779*