The Use of Information and Communications Technologies in Musical-Rhythmic Education: A Case Study

Nedelcuț Nelida [1], Ciprian Gabriel Pop [2], Hristina Mârza [3]

[1,2] National Academy of Music, Gheorghe Dima" Cluj-Napoca.

[3] College of Music, Sigismund Toduță" Cluj-Napoca.

Email: [1] nelida.nedelcut@amgd.ro, [2] ciprian.pop@amgd.ro, [3] hristina.spanu@yahoo.com

Abstract

The need to use digital resources in the teaching and assimilation of knowledge in the music field is determined by the evolution of digital technology, of online communication, as well as the desire to use alternative interaction tools in education. With the aim of carrying out an investigation on the interest in using ICT in music education, the skills that people in pre-university education possess, the present study presents a comparative analysis between the opinion of high school students and teachers, aiming to evaluate the need to integrate specialized software in musical-rhythmic education. A quantitative analysis was carried out based on a questionnaire that allowed a comparison between the manner of use, the level of knowledge in creating applications as well as the interest of the two groups in the use of digital tools. The results obtained from the analysis of the responses from the questionnaires revealed useful information for the integration of ICT in music education, and the need to create applications aimed at developing the rhythmic parameter was evaluated by a higher education institution with a musical profile. The introduction of applications intended for rhythmic education into school curricula was envisioned, the level of skills related to the use of technologies being high among musical students.

Index Terms— digitalization, musical rhythm, students, teachers, quantitative analysis.

1. Introduction

The introduction of ICT means in music education presents the advantage of exploring the possibilities of using various didactic methods in the training of students [1]. Rhythmic education is a necessity for the development of a musician and the benefits that ICT integration brings to the development and improvement of the rhythmic sense are considered to be major [2]. The creators of the educational platforms such as Coursera, EdX, Mooc, TEAMS in the vocational field highlight the need to develop the students' digital skills, technical socialization, these constituting basic skills of communication in the 21st century [3] and experts in the field of education have highlighted the multiple possibilities of digital technologies in the musical-rhythmic training of students [4]. To justify the need to integrate ICT in rhythmic training, we mention the situations in which many composers use mathematical formulas that, once introduced into the computer, generate musical sounds and rhythmic formulas, so that by combining them it is possible to create songs [5]. At the Yong Siew Toh Conservatory in Singapore, subject matters that combine mathematics and music are studied and aim to translate mathematics into music with the help of modern technology and all their operating systems [6]. Many international musical institutions employ now Vuza canons [6], which consist of certain mathematical algorithms and which, when introduced into the computational system, generate images, sounds and rhythm, all of which can be developed and used to produce complex melodies. The possibilities of combining some pre-set fragments from software such as GarageBand, Groovepad, BandLab, are often preferred by composers and educators in the music field due to the improvisation facilities needed in music education [7].

2. Case Study: Analysis on the Level of Use of ICT in Vocational Music Education

With the aim of carrying out a survey to assess the need and interest of creating computer applications aimed at developing aural skills, researchers from the National Academy of Music in Cluj-Napoca initiated an analysis on the level of use of ICT in vocational music education. This started from the premise that online communication is very popular among students and the multitude of social networks allows them to create accounts for various interest groups, as students are used to communicate individually, in groups, or with the aim of solving some necessary tasks in the educational system. This type of communication is not as familiar among teachers; it is known that even if most of them use social media, they do not exploit synchronous communication as much as students do. In addition, by posting information and didactic materials on dedicated platforms, databases are created that the students access to a small extent, interactivity representing a requirement that both groups prefer, both in training as well as in didactic activities. Moreover, the information on school websites is usually of an administrative nature and belongs to structures where neither the students nor sometimes the teaching staff belong, they remain informative for people outside the institution.

3. Research Mehodology

In order to carry out a quantitative analysis on the need to introduce computer-mediated interactive rhythmic applications, an analysis was carried out following the application of a questionnaire, with numerous questions regarding the use and the usefulness of technology integration, both within specialized classes (theory-solfege-dictation, harmony, choir, history of music, etc.) and outside them. This questionnaire was completed by students aged 15 to19 years and teachers aged 25 to 62 years, in order to be able to make a comparison between the way of using and adapting technologies in music education. A total of 103 questionnaires were completed, 40 belonging to high school students were processed, while 40 were completed by teachers, the exclusion criterion being related to the incomplete form of the questionnaire or erroneous/exaggerated answers of the respondents. Belonging to the category of quantitative data, the results of the questionnaires were interpreted by using graphs and diagrams in Microsoft Excel that visualize the opinions of the two interviewed groups. The questionnaire presented 12 questions, grouped into closed questions that were answered only with the pre-set options, which in turn were:

- "dichotonic" questions (in which only two answers could be given);
- semi-open questions (with answers to choose from a limited number of answers);
- open questions (with multiple answer options).

4. Results

The first two questions were configured with the purpose of establishing the age and gender of those questioned, in which it was found that among the participating students, the majority were girls, a fact that did not influence the final result in any way. The teachers' ages ranged from 25 to 62 years; of those questioned, seven teachers were between 25-29 years old, five members of the teaching staff were between 30-39 years, 16 respondents were between 40-49 years, and the remaining 12 teachers fell into the age range between 50-62 years.

During the lecture hours, the integration of ICT means is intended to be done differently, taking into account the specifics of the discipline taught. If the teachers consider the use of ICT in music education to be very useful, the students are more prudent, in the majority of them, accepting only at an average level the introduction of technology in ear and rhythmic training.

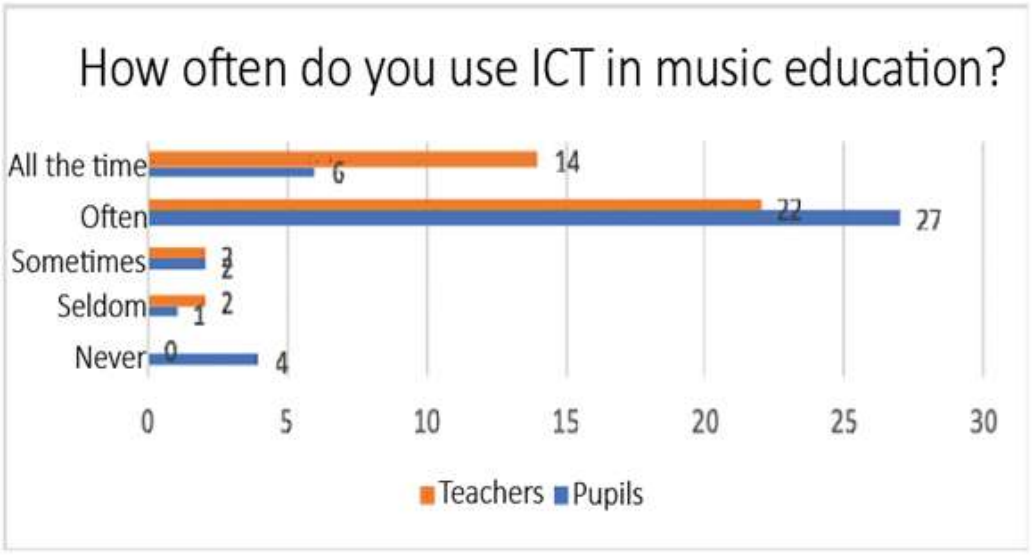

Fig. 1 The level of use of ICT in music education

From the responses to the questionnaire, it resulted that teachers use online communication more often for school work, due to accessing numerous sources. The interviewed groups present this skill in a differentiated manner, while students are reluctant to access information online, possibly also because they are not informed how to document themselves correctly. Gathering information, with the help of the internet, is common practice, and this allows us to find out a lot of data about a certain subject, thanks to the multitude of sources. Even if not all information is true, it can be verified by documenting the provenance of several references.

Fig. 2 Accessing information through the internet

Solving certain tasks is facilitated by group activity, the virtual space conferring the possibility of establishing collective ties, as students can collaborate in some mutual activities. Through online activities, tasks can be completed in a shorter amount of time and efficiently. Examining the level of acceptance of group activities, it was found that to a greater extent students prefer this type of activities.

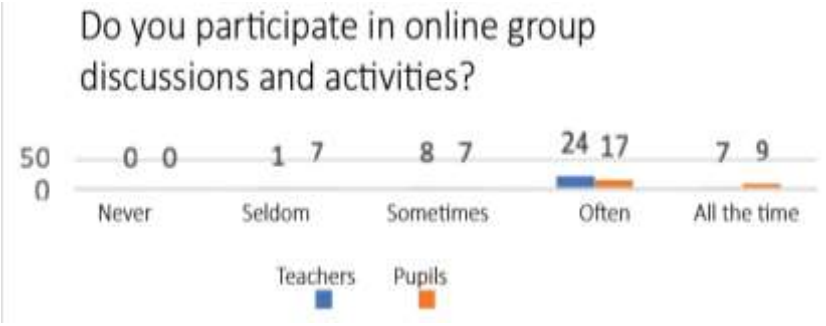

Fig. 3 Level of participation in group discussions of online games

For school work, online means of communication are often employed, because this way of solving tasks is useful for both interviewed groups. Online communication for the school activity is preferred by both groups, a fact that is due to the activities that involve the collaboration of those involved. The establishment of interest groups is common in all social networks. Each group is created with a specific purpose, for one or more common activities involving a target group concerned with achieving the purpose for which the group was created.

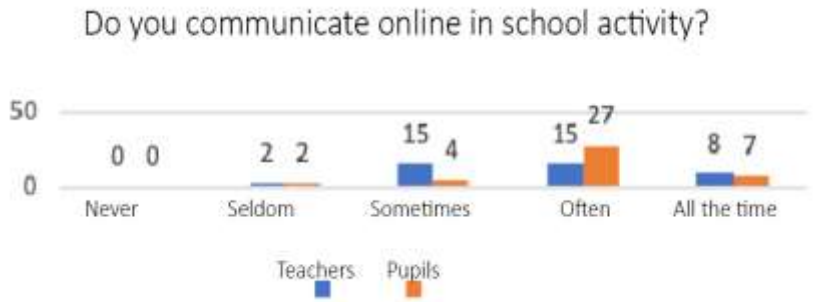

Fig. 4 Level of online communication with didactic purpose

In the music field, the collection and storage of data from the internet, for the realization of a project, is preferred by both surveyed groups. In this sense, 62.5% of the students and 82.5% of the teachers use the computer for information, but also for the activity of storing information. However, storing the collected data as well as interpreting it requires more complex devices.

Digital music applications are often used to carry out projects or teaching tasks, with teachers showing a greater openness to using the computer in school activities due to the types of requirements. Most of the tasks that need to be solved with the help of technology are much easier to achieve on a computer-type device than on a smaller device, which generally does not have all the necessary tools to complete projects.

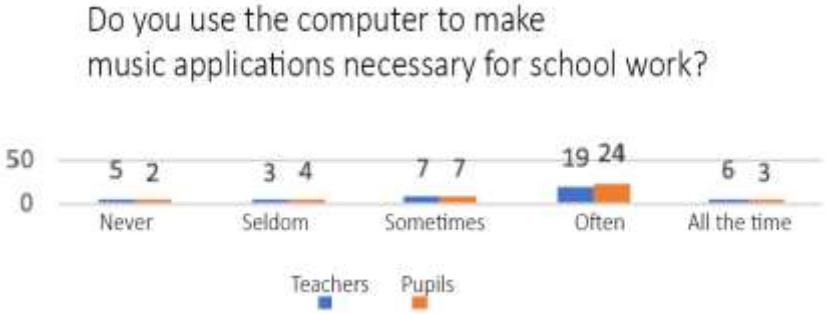

Fig. 5 Level of use of musical applications in the school activity

The predilection of teachers for collecting and organizing in files the information obtained online is evident, with 90% of them engaging in such activities often or all the time. The students' answers for the same concern are different, 10% do not collect information online, 50% collect it rarely or sometimes and only 40% often or all the time perform these tasks in computer-mediated form.

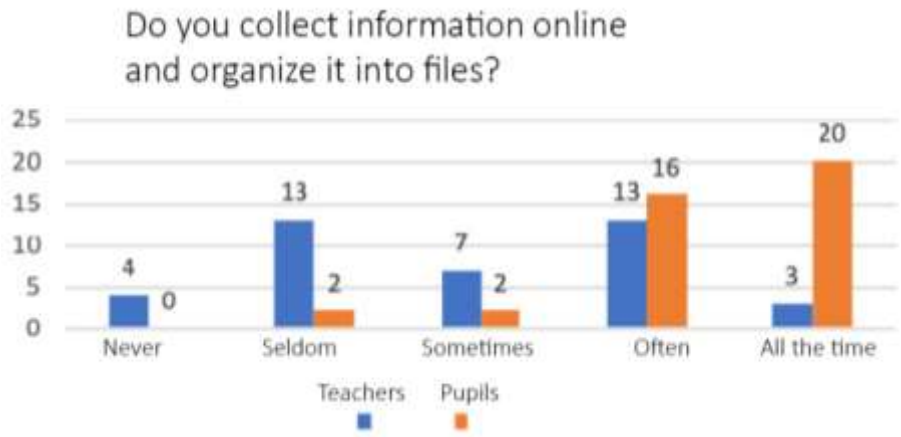

Fig. 6 Collecting and organizing files

The recent evolution of technology, but also the emergence of high-performance devices (phones, tablets, laptops, etc.), challenges teachers and students alike to turn to learning through educational programs. The beginning of the pandemic period revealed certain deficiencies in the level of training of teachers, who were not trained to teach online. During the pandemic, specialized courses were organized for teachers, and they, in turn, trained the students. Therefore, all the participants in the questionnaire had to turn to different educational programs in order to be able to complete their tasks.

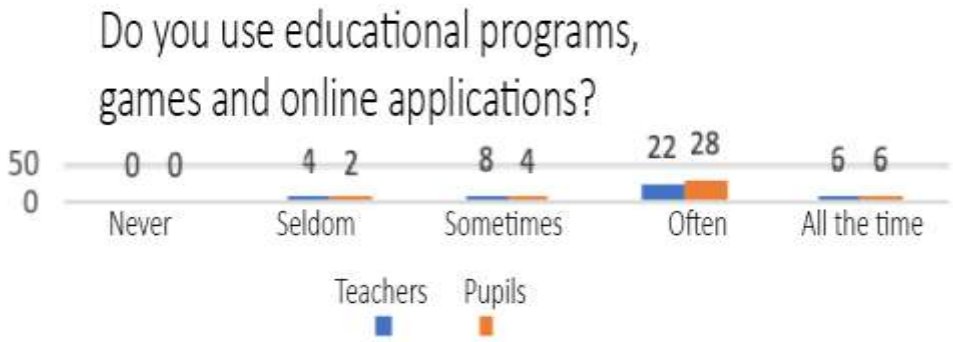

Fig. 7 The level of use of educational programs

Browsing the internet for some interactive activities is extremely widespread today. The multitude of networks and websites that provide diverse materials for all types of users attract ever more followers. In general, these types of relaxation are used by both interviewed groups, even if not equally. The difference between the two groups in terms of engaging in such activities is caused by the differences in age and the topics presented. In the music field, watching videos and downloading music files has become a necessity, with music recording platforms representing a frequently consulted source students and teachers alike. These applications are also used to compare recorded performances.

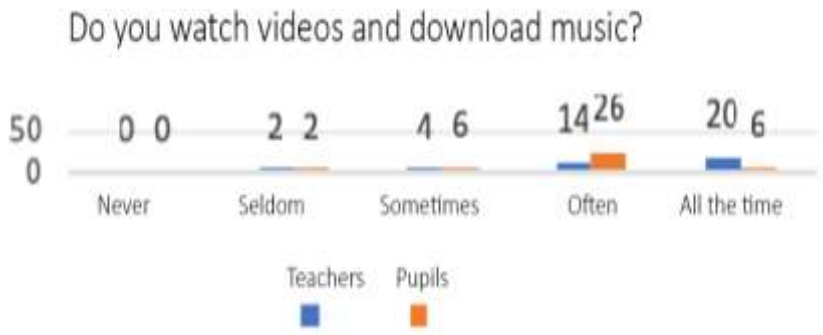

Fig. 8 Level of use of online music materials

Managing your personal blog, *Facebook* page, *Instagram*, or your own *website* has become a necessity in a digital age. Even if not all teachers create their own such applications, they are still largely found in this survey because social media platforms represent interactive online environments, they create a virtual space that can present their own creations, which can stimulate the achievement of professional goals (especially in the case of teachers).

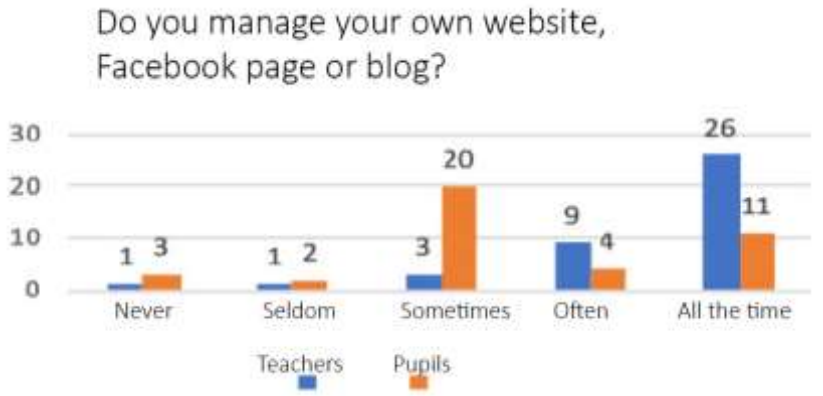

Fig. 9 Use of personal blogs

n the issue of having the skills to create online applications, most respondents answered negatively, 85% of teachers and 65% of students do not use the computer to create their own programs, citing the fact that the programming knowledge they have is minimal or non-existent. Only a small part of the subjects stated that they are concerned with creating their own applications, but in general they are self-taught.

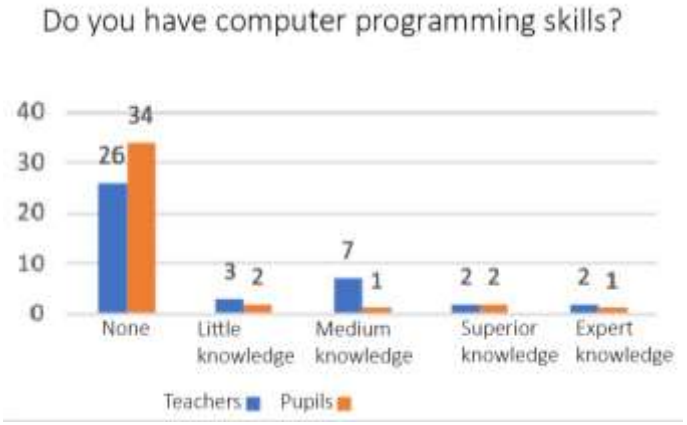

Fig. 10 The level of knowledge of some online tools

The use of the computer when working in a group in the musical field is not accepted by students, 27% never use computers when they work together on musical topics and 45% very rarely. Even teachers do not prefer the use of computers in music theory classes, when they work in groups, 67% answered that they use the computer rarely, or sometimes. This may be due to the fact that in the musical field, through the practice used, one's own instruments are employed (the musical instrument, the voice, the ear, notebook, etc.).

Table no.1 Using the computer in group musical activities

Q 9.7	Do you use computers in music activities when working in groups?					Total
	never	seldom	sometimes	often	always	
Students	11	18	9	2	0	40
Teachers	0	16	11	7	6	40
Students	27.5%	45%	22.5%	5%	0%	100%
Teachers	0	40%	27.5%	17.5%	15%	100%

The questionnaire also included open questions, one of them referring to the level of knowledge of computer applications for the study of musical rhythm. Among the student respondents, approximately one third do not know programs that help them develop their aural skills or sense of rhythm, however, a considerable part have accessed applications that include rhythmic patterns specific to certain dances (*Garage band*). Tutorials containing demonstrations of different rhythmic formulas, at beginner level (*Youtube*), applications that allow learning specific rhythms of certain current music genres (pop, rap, hip-hop, house, dubstep, trap, electronic, etc.) are watched. These applications are little known to both groups of respondents (8 students and 7 teachers), one of the reasons why they are not used may be the incompatibility of the applications with certain devices.

5. Discutions

The information from the online environment represents an alternative for both teachers and students, and regarding the digital tools used by the two groups, it was found that the students have greater skills and interests to communicate in the virtual environment, through their own web applications (*facebook, instagram, whatsApp* pages). Due to the fact that teachers realize that the purpose of school is not only to form skills and bring information from different fields, but also to allow students to express their own ideas, their interest to create exercises, teaching materials, educational applications through electronic tools is increased.

The applications intended for the development of musical hearing (*Solfy, Teoria.com, Tonaly: write&practice music, Ear trainer*) but also those for the development of the rhythmic sense (*Groovepad, Garageband, Youtube*) can be of a real support, both for students and teachers, through in view of the fact that they can have them at any time, whenever and wherever, each having the opportunity to choose the right application or software [8]. In addition, by using ICT means in the development of the rhythmic sense, students have possibilities for permanent study and accelerated progress [9].

A separate question in the questionnaire referred to the type of applications used in music education, and the responses of the groups surveyed indicated that:

- The musical activities in which the computer/phone/laptop/tablet are used are mainly those in which music is listened to, both by teachers and students. The score writing process is equally necessary for both interviewed groups, however teachers use these applications more frequently.
- Programs for the development of the aural skills should be used to a greater extent by students, but from the answers to the questionnaire it appears that they are better known among teachers. It should be emphasized that a considerable number of the surveyed teachers specified that their use is strictly necessary for their testing, so that they can be recommended to students for study, there is no access to specialized programs or the choice of study materials, but it is an aspect which the teacher sets. However, 12 students out of a total of 40, and 7 teachers mentioned that they use such applications. Here we mention the platforms (*Solfy, Ear trainer, Teoria.com, Tonaly: write&practice music*).
- The use of applications aimed at the development of rhythm were equally claimed results and there is a limited number of users (8 students and 7 teachers) possibly due to the lack of knowledge of dedicated applications. It was mentioned, however, that teachers are frequently asked to recommend some instruments that contribute to the development of the rhythmic sense.

6. Conclusions

The survey carried out in the form of a questionnaire distributed to distinct groups - one for students and one for teachers, aimed to compare the level of knowledge of how to operate a computer with software dedicated to music education, especially rhythmic, in order to integrate ICT in education rhythm through a dedicated program. The results obtained from the comparison between the teachers' and the students' questionnaires highlighted the following conclusions:

1. The integration of ICT means in the teaching of rhythmic education classes provides increased accessibility of information;
2. The advantage of interactive communication is obvious, students can opt for interaction with other participants, accessing various applications online;
3. The use of programs with facilities dedicated to the development of the sense of rhythm gives students the possibility of learning at their own and constant pace, being desirable both for individual study and in the classroom.

The predominant use of ICT means in the process of teaching rhythmic education classes contributes significantly to the development of the students' rhythmic sense, through the abundance of information and the variety of exercises available to them [10].

The use of digital tools in contemporary teaching can transform the educational activity, through the emphasis on the visual and interactive; the lack of skills on the part of teachers to design their own materials can lead to didactic shortcomings. It is necessary to organize training

sessions dedicated to teachers, as only in this way they can coordinate activities with students aimed at developing rhythmic education.

References

[1] Jonathan Savage, Reconstructing Music Education through ICT, Research in Education, Manchester University Press, ISSN: 0034-5237

[2] Mârza, Hristina, Comparative Analysis on ICT Integration in Rhythm Education, ICT in Musical Field, XI/2020, page 37-45, ISSN 2069-654X

[3] Kirik, Vladimi; Leshkevich, Tatiana, The semantic shift in educational technologies in the digital age, Proceedings of the 3rd International Conference on the Contemporary Education, Social Sciences and Humanities, ICCESSH, Atlantis Press, 2018, vol. 233, p. 93-96.

[4] Marza, Hristina; Samohvalova, Svetlana, Yurevna, Education of teaching under the conditions of technologization, information and digitalization of the company, Vishaia Shkola: Opit, problemi, perspectivi, RUDN, Moscva, 2019, pag. 309.

[5] Jøran Rudi, Computer Music Composition for Children [DSP Education], IEEE Signal Processing Magazine 24(2):140 - 143, 2007, DOI: 10.1109/MSP.2007.323280

[6] Szatrowski, Kiril, Elearning as an auxiliary method for conducting classes on musical training of studentsteacher. Materials of the XII international scientific and practical conference, Moscow, RUDN, vol. 2. 2019 p. 153.

[7] Vuza, Dan, Tudor, Supplementary Sets and Regular Complementary Unending Canons, Perspectives of New Music, Vol. 29(2), p. 22-49, 1991.

[8] Nico Schüler, Modern Approaches to Teaching Sight Singing and Ear Training, Facta Universitatis. Visual Arts and Music, Vol. 6, No 2, p. 83-92, 2021 DOI: 10.22190/FUVAM2002083S

[9] Wang, Lin, The Skill Training of Reading Music in the Teaching of Solfeggio and Ear Training in the New Media Environment, Applied Bionics and Biomechanics 2022(4):1-11, DOI: 10.1155/2022/8209861

[10] Hong Yang, Research on the Application of Computer Music Software in Piano Rhythm Teaching, Journal of Physics Conference Series, 2021, DOI: 10.1088/1742-6596/1992/3/032072.