DLINE JOURNALS

Journal of Multimedia Processing and Technologies

Print ISSN: 0976-4127
Online ISSN: 0976-4135

JMPT 2024; 15 (4)
https://doi.org/10.6025/jmpt/2024/15/4/148-155

# Analysis of the Development and Application of Modern Technology in Music Education Based on Multimedia Features

Gao haiyan
Vietnam National University
Hanoi 44- Xuân Thuy Street - Cau Giay - Hà Noi
Gao Haiyan, Vietnam
Gfdgg3432@foxmail.com

Received: 23 June 2024
Revised: 7 August 2024
Accepted: 15 August 2024


**ABSTRACT**

*This article analyzes the development and application of modern technology in music education based on multimedia features. With the continuous development of technology, multimedia technology has been widely applied in music education and has become an important feature of modern music education. Multimedia technology, with its unique advantages, provides more educational resources and means for music education, enriches the teaching form and content of music education, and improves the quality and effectiveness of music education. This article starts with the characteristics of multimedia technology, analyzes its application in music education, explores the impact and role of multimedia technology in music education, and points out the problems and shortcomings of multimedia technology in music education. Finally, this article proposes measures and suggestions to promote the application of multimedia technology in music education, providing a reference for the modern development of music education.*

**Keywords:** Music Teaching, Multimedia Technology, Optimization, Demand, Experience

## 1. Introduction

More and more universities and colleges have begun to apply modern information technology, represented by multimedia technology, to teaching practice. The application effect has been widely recognized and praised, and teaching with high efficiency and convenience has been realized. Music teaching has become an important part of college music teaching, but the low teaching efficiency has confused the teacher because of the inherent characteristics of music teaching itself [1]. Therefore, how to use modern technology to improve the status quo of college teaching is an important subject of university education. In this case,

the scientific application of multimedia technology in music teaching is a concrete manifestation suitable for the trend of the times, and it's of great significance in promoting the reform of higher education [2].

Multimedia teaching should change the actual interface design according to individual differences. Some studies show that multimedia information is more effective for learners with limited knowledge and ability because students with relevant knowledge can understand and integrate new information through prior knowledge [3].In addition, multimedia teaching is more suitable for learners with good visual memory because learners with good visual memory can maintain visual images in working memory and extract critical information from visual images after analysis [4].

## 2. The Status

Traditional music teaching usually uses the "teacher + piano + material" model, and the effect can't reach the expectation. Under the premise of applying multimedia technology, the development of music teaching will be effective, and students' sensitivity to music should be improved effectively [5]. At the same time, the atmosphere of the classroom will be improved accordingly. From some points of view, the application of multimedia technology not only contributes to music teaching but also has positive significance in realizing the overall goal of college teaching, so it's an important driving force for the continuous progress of China's education [6]. In essence, the application of multimedia technology in college music teaching symbolizes the important transformation of music teaching and education mode in universities, an important embodiment of China's education entering the new era [7].

The application of multimedia technology in music teaching can realize the unity of science and technology and can realize all-round and efficient education, which is helpful to improve the appeal of piano to students. It is of great significance in strengthening students' interests. At the same time, multimedia technology in college music teaching can also convert abstract into concreteness, which is significant for improving students' ability to appreciate music [8]. Therefore, in general, universities and colleges should actively apply multimedia technology, which has great significance in promoting the realization of teaching objectives and improving students' abilities [9].

## 3. Methodology

### 3.1. Analysis Of The Function Of Multimedia Technology In Teaching

With the popularization of multimedia technology in college teaching, the effectiveness and role of multimedia applications are emphasized. From the perspective of music teaching, the application of multimedia technology can greatly promote the completion of teaching objectives and the improvement of efficiency and make the development of teaching more convenient and efficient [10]. At the same time, it can optimize the learning environment and atmosphere of students receiving education to a certain extent and help improve students' quality. From a certain point of view, multimedia technology is equivalent to the auxiliary means of music teaching in colleges and universities [11]. The effective application of multimedia technology can improve the effect of music teaching, as shown in Figure 1. Specifically, the application of multimedia technology in music teaching in universities and colleges can be analyzed from the following aspects.

By using the questionnaire survey method, the survey and analysis of the use of multimedia in music teaching in universities were carried out. To ensure that these questionnaires were highly authentic and efficient, questionnaires should be tested before the formal questionnaires were formed, and the reliability and validity of the test results were analyzed, the questions of the questionnaire were selected according to the analysis results, the structure of the questionnaire was adjusted to improve the reliability and validity of the questionnaire [12]. The questionnaire method can be applied, and through multimedia technology in college music teaching, the rich online resources can be used fully to expand the practical resources of music teaching. In addition, teachers can optimize and design teaching arrangements according to the results so that students can have a broader vision [13].

First, the questionnaire's content was designed, and the questionnaires should start with single-choice questions. Single-choice questions involved the time of multimedia teaching, the adaptability of teachers to multimedia teaching, the difference between advantages and

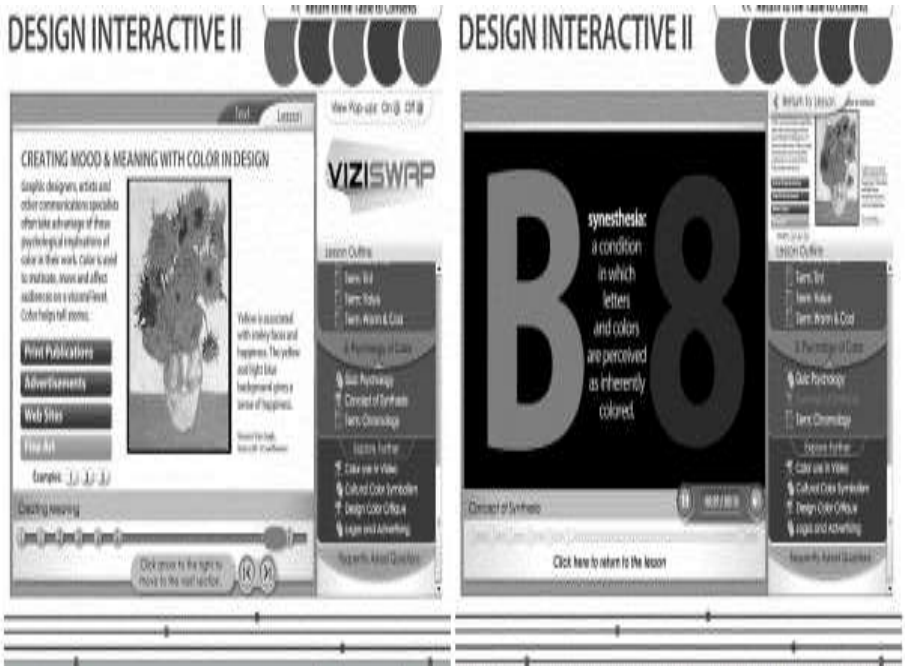


**Figure 1. Interactive gallery on the psychological implications of color**

disadvantages, and the differences between multimedia teaching and traditional teaching methods. Specific questions included "How much do you think the importance of multimedia teaching in your class?", "for multimedia teaching and traditional teaching methods, which one do you agree with?" and so on. The second was opinion evaluation, including the opinions of physical problems that multimedia teaching is easier to be accepted by students compared with traditional teaching; multimedia teaching, digital classrooms and online classrooms are the trends of modern education, both writing on the blackboard and multimedia should be used in the course of teaching, the traditional way represented by writing on the blackboard can't be wholly replaced by new teaching methods at any time, as well as multimedia teaching can be slow down and enable students to keep pace with teaching. The choice included five different degrees: very agree, agree, average, disagree, and very disagree. A high-quality questionnaire was used to investigate and analyze such problems more effectively.

The reliability test of the questionnaire needs the principle of satisfying the same nature, and the reliability test is carried out for structured questionnaires with different kinds. The reliability coefficient is used to indicate the reliability size; the greater the reliability coefficient is, the greater the reliability of the measurement will be. What the value of the reliability coefficient is, it can have high reliability on earth. Generally, the significance of the reliability coefficient is as follows: 0.60 to 0.65 (preferably not); 0.65 to 0.70 (minimum acceptable value); 0.70 to 0.80 (quite good); 0.80 to 0.90 (very good) [14]. As a result, a good reliability scale or questionnaire is more than 0.80, and its acceptable range is between 0.70 and 0.80; the subscales are better than 0.70 and acceptable between 0.60 and 0.70. Suppose the internal consistency coefficient of the subscale is below 0.60 or the reliability coefficient of the total scale is less than 0.80. In that case, the scale should be reformulated, or questions should be deleted or added. In this study, the alpha coefficient was used as a method for the reliability calculating of the questionnaire in the first test; the sum of the variance of each question and the ratio of the variance of an integral scale was used to estimate the reliability of a scale. The formula for testing is calculated as follows:

$$\alpha = \frac{n}{n-1}\left(1 - \frac{\sum s_i^2}{s_H^2}\right) \qquad (1)$$

This formula is the most frequently used reliability index; *s2i* represents the variance of the *ith* question *xi, s2H* represents the variance of a sum of all questions (*H= x1+x2+ ...+xn*), that is, the variance of the whole test score, *n* is the number of questions [15].

Validity is availability, which refers to the accurate degree of something that can be measured by measuring tools or means. The validity is divided into three types: face validity, criterion validity and construct validity. There are many methods of validity analysis, and their measurement results reflect different aspects of validity. The tested class data is chosen for the second test, and predictive validity is used to represent the validity of the questionnaire. There are many classifications of investigation and analysis methods. The SPSS software can be used for validity analysis after correlation and discrimination analysis methods are used to pre-process the obtained data. In SPSS, the module used specifically for test reliability analysis is the Reliability Analysis of Scale, and the module Factor of Data Reduction is used. The main function of the reliability analysis module is to test the reliability of the test, split-half reliability, a coefficient and Hoyt reliability coefficient. The retest reliability and alternate-form reliability use Bivariate of Correlate to obtain the related coefficient after only the data on the score of a sample in two tests is merged to the same data file, that is, retest or duplicate reliability. The rater reliability uses the Spearman rank correlation and the Kendall concordance coefficient. The specific analysis algorithms are as follows:

$$\alpha = \frac{nr}{1+(n-1)r} \tag{2}$$

In the formula, r represents the coefficient of reliability.

The specific method of validity analysis by using SPSS software is: firstly, KMO and Bartlett sphericity tests must be performed; if the two tests are qualified, the data is suitable for factor analysis. Secondly, after the extraction factor, the principal factor explains the percentage of total variation and the factor load of a factor is understood; the structural validity will be good if the percentage of total variation explained by the principal factor is more than 60% and the factor load of a factor is more than 0.6. In factor analysis, whether to output the KMO result isn't relevant to raw data but only serves as a basis for determining whether the original data is suitable for factor analysis. In factor analysis, to output KMO results, the corresponding choices in the check box are needed (in a default state, there is no output of this result); the interface to the SPSS validity test is shown in Figure 2.


**Figure 2. SPSS validity check interface**

The following table shows the validity distribution of the questionnaire according to the first analysis before this calculation.

| | | Class questionnaire |
|---|---|---|
| Validity interval | | (0.355,0.850) |
| <0.4 | Number<br>Percent% | 5<br>2% |
| >0.4 | Number<br>Percent% | 245<br>98% |

**Table 1. Validity distribution of the questionnaire**

It can be seen that whether the application of multimedia technology is reasonable has a great relationship with teachers. In real life, teachers should reasonably apply multimedia technology and scientifically apply it to teaching based on mastering its functions and advantages. As a practitioner of music teaching, college music teachers should make good use of the existing resources for teaching and take multimedia technology as the breakthrough point. Teachers must ensure that the design is reasonable, in line with the course level and learning period, and has a clear goal at different stages. In this way, students can be better integrated into the teaching environment so that better results of the application of multimedia technology can be achieved. In addition, teachers should pay attention to making students fully understand and master the knowledge of the system. Teachers can use multimedia technology to optimize teaching design, realize students' art training, and improve their learning environment. More directly, multimedia teaching can realize the innovation and transformation of the teaching mode, that is, the reform of the traditional teaching mode. On this basis, music teaching can fully use the all-wave audio and video effects, enrich students' emotion and knowledge experience, and make the music classroom more engaging. However, considering the interactive nature of teaching activities in this mode, teachers should start from reality and explore new music teaching ideas.

## 4. Result Analysis and Discussion

To understand the effectiveness of modern multimedia teaching, a research group was set up at the university; the researchers surveyed five universities and seven majors. Four hundred questionnaires were issued, and 370 were recovered, 320 valid. The questionnaire included five major projects and more than 30 questions. Five main projects aimed at the learner's views on multimedia teaching, the degree acceptance of learners for knowledge, and teachers' perceptions of multimedia instruction, the design level of multimedia courseware and the running state of multimedia equipment. SPSS statistical software was used to analyze data and prove the accuracy of cognitive load theory in multimedia design and teaching process to provide a reference for multimedia design and teaching in the future.

To ensure the validity of the research object, the students were consulted about whether they were familiar with the school's network teaching platform. If the students had rich multimedia teaching courses, a questionnaire was issued to the students of A, B, C, and D of the four schools. According to the previous method, the results of the investigation were statistically analyzed, and reliability and validity analyses were carried out.

According to the findings of the survey, there were ten multimedia teaching classes, accounting for 25%; there were seven multimedia teaching classes, which accounted for 16%; there were six multimedia teaching classes, accounting for 16.9%; there were five multimedia teaching classes, accounting for 12.8%; there were four multimedia teaching classes, accounting for 4%. Based on the impact of these teaching, the choice of "very satisfied" accounted for 6.9%;

the choice of "relatively satisfied" accounted for 52.5%; the choice of "generally satisfied" accounted for 36.3%; and the choice of "dissatisfied" accounted for 4%. In the design of multimedia courseware,the choice of "very attractive" accounted for 3.8%; the choice of "relatively satisfied" accounted for 56.3%; the choice of "generally satisfied" accounted for 38.4%; and the choice of "roughly satisfied"

accounted for 1.6 %. 17.8% of the learners believed that the design of multimedia courseware is the main factor affecting multimedia teaching.

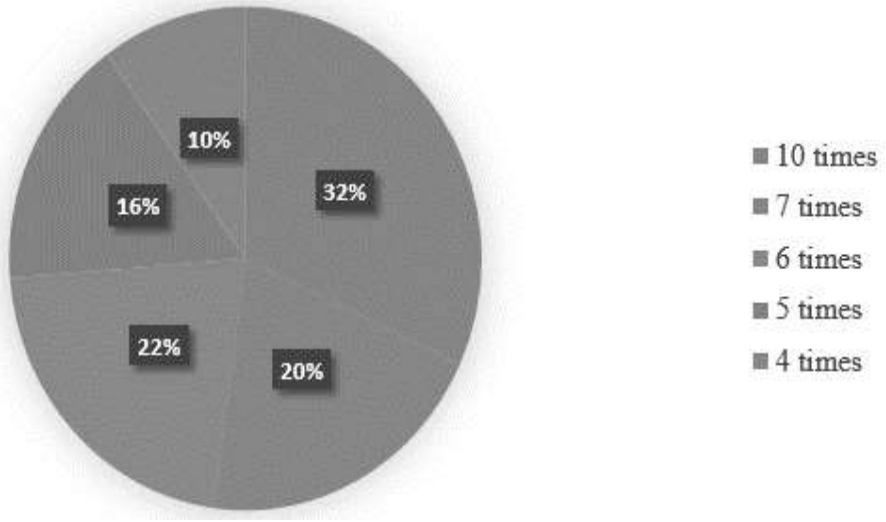


**Figure 3. Design satisfaction of multimedia courseware**

According to the above research, the design principles of multimedia courseware were proposed to help designers improve the design of multimedia courseware and further improve students' learning efficiency. (1) When they were asked which part of the multimedia courseware is most impressive, people who chose "situational image" accounted for 48.8%; people who chose "overview project" accounted for 15.6%; people who chose "theme" accounted for 14.1%; people who chose "keywords" accounted for 12.8%, and people who chose "text" accounted for 7.2%.

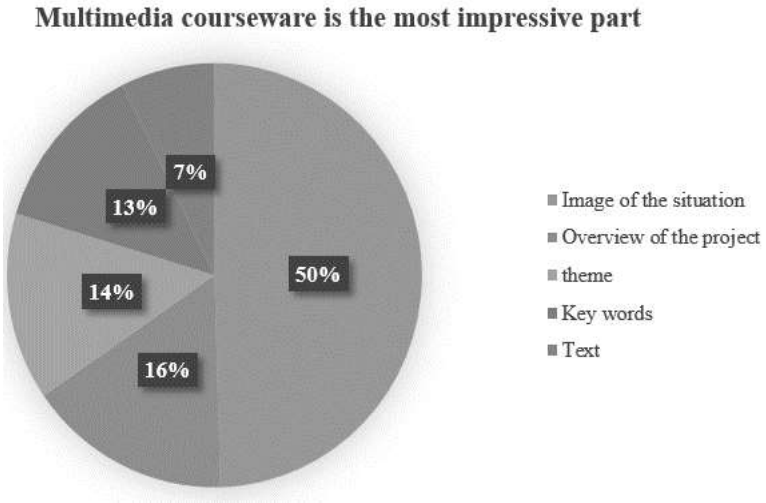


**Figure 4. The most impressive part of multimedia courseware**

In general, images are vivid, while text can provide deeper information. If text and images are presented simultaneously, learners can build links with each other to increase meaningful learning. (2) The principle of versatile voice-assisted text visually provides visual text information. In experiments, when the information presented visually accompanies a series of auditory information, the learners' memory is better than a single visual or auditory performance. When information is presented in text, first of all, the information must be processed using images, animations, and video in the visual system so that the information will compete with auditory information resources and cause visual distraction effects. However, when information is presented in an auditory manner, it's processed in the language channel; therefore, the energy released from the video channel can be used for advanced information processing. For example, if the engine's roar accompanies the aeroplane's take-off description, the learner will understand the image's principles well. However, if there is some additional nonverbal information in the language channel, then as background music, the nonverbal information will also be a competition for auditory information resources, and the learner will be affected by "distracting attention", and their learning will also be influenced. (3) In the multimedia courseware, the corresponding texts and images are better than the individual ones; they appear one after another. Because learners need to acquire and integrate information differently, they will increase their cognitive burden. For example, when students encounter unfamiliar words in the paragraph of multimedia courseware, if the notes and text are separate, they must first find the notes and then return to the paragraph. Therefore, designers should pay attention to putting relevant information together. For example, if the image and sound aren't synchronized in the video, it's difficult for the learner to understand the content of the voice. (4) Designers should eliminate redundant information and maintain the principle of the same elements, use the support of multimedia rather than decorative courseware, and exclude irrelevant materials. The survey shows that 65.6% of students thought that animation and related images are "too few and boring", and 34.4% thought that animation and related images are "so many and flash". (5) The effect of multimedia courseware design differs because of different learners' knowledge levels and abilities. 62.2% of students believed that multimedia teaching offers "some help in learning", 10.6% of students held that multimedia teaching is "very helpful", 25% of students thought that multimedia teaching is "not very helpful", 2.2% of students argued that multimedia teaching is "unhelpful". (6) Regarding learner interaction, interactive multimedia courseware should be selected to achieve good learning results. In the selection of an interactive part of multimedia courseware, students who chose "a few times" accounted for 70.6%, students who chose "often" accounted for 22.2%, students who chose "no" accounted for 4.7%, students who chose "many" accounted for 2.5%. The specific circumstances are shown in Table 1.

| | N | Mean | Typical deviation | Minimum mark | Maximum mark |
|---|---|---|---|---|---|
| 1 | 31 | 70.6% | 22.2 % | 4.7% | 2.5% |
| 2 | 31 | 62.2% | 10.6% | 25.0% | 2.2% |

**Table 2. Results of the group with prior knowledge**

## 5. Conclusions

The practical research of educational software involves engineering and multidisciplinary fields, allowing these areas to work in a common language to obtain products that can solve the problems these teams are trying to solve. The work method and tool were proposed based on the design experience of other educational software or a problem in business or industrial software creation. University music teaching was taken as an example; the influence of the application of multimedia technology on students' music teaching methods was studied, and it was of great significance to improving music teaching. However, multimedia teaching doesn't always bring the desired results. The challenge of cognitive burden often accompanies

multimedia teaching; meaningful learning requires much cognitive processing, but students' cognitive processing skills are limited. Currently, multimedia courseware designers pay more attention to this problem; this problem can be further analyzed in the future research.

## References

[1] Bin, T., Weiwei, Y. (2017). Research on the application of computer-assisted instruction in the teaching of physical education in colleges and universities. *Agro Food Industry Hi Tech, 28*(1), 1533-1537.

[2] Castañeda, A. N., Murphy, J. M. (2013). Teaching and learning about Africana religions through multimedia. *Journal of Africana Religions, 1*(2), 210-250. https://doi.org/10.5325/jafricanareligions.1.2.0210

[3] Wang, X. (2014). Multimedia systems in music teaching of normal university. *Procedia Environmental Sciences, 12*(Part B), 1248-1252. https://doi.org/10.1016/j.proenv.2014.01.161

[4] Zhu, J. (2013). MIDI and music teaching in colleges of multimedia system application. *Key Engineering Materials, 474-476*, 1926-1930. https://doi.org/10.4028/www.scientific.net/KEM.474-476.1926

[5] Mcneil, S. (2015). Visualizing mental models: Understanding cognitive change to support teaching and learning of multimedia design and development. *Educational Technology Research & Development, 63*(1), 73-96. https://doi.org/10.1007/s11423-014-9332-4

[6] Fullam, J. P. (2017). From seeing to believing: Using instructional video to develop culturally responsive teaching. *Journal for Multicultural Education, 11*(2), 131-148. https://doi.org/10.1108/JME-12-2016-0045

[7] Stuart, I. R. (2014). An objective scale rating the physically handicapped for educational purposes. *Personnel & Guidance Journal, 38*(3), 211-216. https://doi.org/10.1002/j.2164-4918.1960.tb01201.x

[8] Nor, M. M., Ilias, K. (2013). Practice teaching and learning using interactive multimedia innovation for non-optional teachers teaching in music education. *Academic Research International, 4*(2), 338-346.

[9] Feng, G. (2014). Research on the influence of multimedia teaching technology of college physical education teaching. *Advanced Materials Research, 1044-1045*, 1652-1654. https://doi.org/10.4028/www.scientific.net/AMR.1044-1045.1652

[10] Petre, I. M. (2014). Experimental research regarding rehabilitation equipment behavior on a recovery program. *Applied Mechanics & Materials, 555*, 689-694. https://doi.org/10.4028/www.scientific.net/AMM.555.689

[11] Garrett, J. J. (2013). The elements of user experience. *School of Government Harvard University, 59*(1), 87-87.

[12] Gay, G. (2013). Teaching to and through cultural diversity. *Curriculum Inquiry, 43*(1), 48-70. https://doi.org/10.1111/curi.12004

[13] Hayes, C. C. (2013). Inquiry and cultural responsive teaching in general music. *General Music Today, 26*(3), 5-6. https://doi.org/10.1177/1048371313481625

[14] Cheng, X. (2014). The effectiveness of multimedia information technology in physical education model. *Advanced Materials Research, 926-930*, 4753-4756. https://doi.org/10.4028/www.scientific.net/AMR.926-930.4753

[15] Feng, G. (2014). Research on the influence of multimedia teaching technology of college physical education teaching. *Advanced Materials Research, 1044-1045*, 1652-1654. https://doi.org/10.4028/www.scientific.net/AMR.1044-1045.1652