Research Article

Film Music Teaching Effect Evaluation from the Perspective of Audience Immersion

Tian Zhang[1]

Zhongnan University of Economics and Law

Abstract

With the continuous improvement of national education level and system, film music teaching method has been greatly promoted in the classroom, especially the audience immersion, as the standard of classroom quality and effect evaluation, which has been recognized by experts inside and outside the education circle. Therefore, this paper uses the analytic hierarchy process to analyze and calculate the teaching objective, content, structure, method and effect, and establishes a reasonable teaching effect evaluation hierarchy model, obtaining the weight and consistency test results of each index element. Finally, the paper quantitatively summarizes the synthetic weight of index layer and obtains the final teaching evaluation results, which have a certain practical reference value to improve the teaching results of education workers.

Keywords

Music Teaching • Analytic Hierarchy Process • Structural Model • Weight • Consistency Test

[1]**Correspondence to:** Tian Zhang, Zhongnan University of Economics and Law School of Journalism and cultural communication, Wuhan 430073, China. Email: zt265@163.com

As the national education commission and the people all over the country pay more attention to the music education, film music teaching mode has gradually entered middle schools and colleges, achieving certain results in class. Classroom teaching quality is an important standard for evaluating the teaching quality of teachers, which reflects not only the quality of music teaching courses, but also the comprehensive strength of teachers and teaching equipment (Cabedo & Díaz-Gómez, Maravillas, 2016). The determination of relevant systems such as teaching methods, concepts and functions in class has a profound impact on the quality of music teaching. With the addition of film teaching elements, the teaching effect evaluation system has not been improved in a timely manner with a lot of problems to be solved (Bonastre, Enrique Muñoz, &Timmers, 2017).

Firstly, the concept of keeping pace with the times is weak. The film music synthesis method usually pays more attention to the direct effects of teaching methods and modes, rather than improving the teaching methods. The film elements are integrated into the music teaching, that failing to produce a resonance between teachers and students and interpret their abilities (Brasche & Thorn, 2016). Secondly, the innovation in teaching evaluation quality standard is poor. Most of teaching quality evaluation is still determined by the subjective and worldly wisdom. The existing standards are quite similar to the standards of other schools, which are neither scientific nor objective. Thirdly, the professional level of teaching personnel is low. The learning and evaluation of theoretical knowledge could not keep up with the knowledge innovation and teaching method improvement. Teachers cannot meet students' requirements in innovation and finding problems (Macrides & Angeli, 2018). Fourthly, the leading role of leaders is not obvious. Many leaders haven't participated in the teaching work for a long time, and have neglected the management of grass-roots work, forming an adverse impact on teachers and students. They indirectly influence the teaching effects.

Therefore, adding film elements into the music teaching imposes a great influence. This paper studies the music teaching objective, content, structure, method and effect under the modern science and technology education environment, and establishes a teaching effect evaluation hierarchy model by the analytic hierarchy process, obtaining the weight and consistency test results of each element. Finally, the paper quantitatively summarizes the synthetic weight of index layer and obtains the final teaching evaluation results, which have a certain practical reference value and a positive impact on music teachers (Árnasonet, Briem & Árnason, 2018).

Establishing Teaching Effect Evaluation System Steps

In the establishment of film music teaching effect evaluation system, it is necessary to clear the objective of evaluation effect, specific theoretical and practical methods, and technical points (Briem, 2018). Specifically, the process of establishing film music teaching effect evaluation system includes five steps, as shown in Figure 1.

Step 1: Clear objectives. This paper takes the music teaching effect evaluation as the research object, which is the target of system construction (Millican, 2016).

Step 2: Building structural models by analytic hierarchy process. There are three layers from the top to the bottom. The top layer is a target layer (Layer A), which shows teaching effects. The middle layer is a criterion layer (Layer B) with the objective, content, structure, method and effect, which are respectively marked as B_1, B_2, B_3, B_4 and B_5. The lowest layer is an index layer (Layer C), which is the influencing factor of indexes in Layer B. There are 20 secondary indexes, which are marked as $C_1 \sim C_2$.

Step 3: Structural comparison matrix. A questionnaire and an interview are used to conduct a survey of experts. According to the survey results, determining the secondary indexes in the structure model is important, which is a qualitative analysis.

Step 4: Quantitative analysis. The weight of each element in the comparison matrix is defined. The consistency test and quantitative filling are completed (Powell & Parker, 2016).

Step 5: General ranking. Based on the importance of evaluation effects on the target layer as the standard, the influencing factors of each layer in the structural model are finally determined and accurately calculated to obtain the final results (Serafin, Adjorlu, Nilsson, Thomsen& Nordahl, 2016).
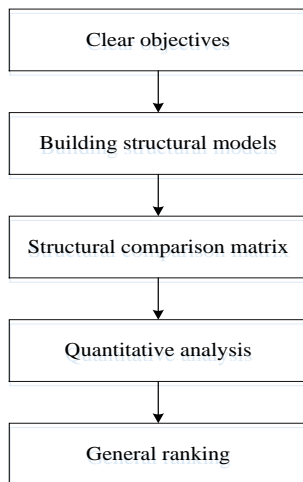
```
┌─────────────────────────────┐
│      Clear objectives        │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│   Building structural models │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│  Structural comparison matrix│
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│     Quantitative analysis    │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│       General ranking        │
└─────────────────────────────┘
```

Figure 1. Flow Chart of Teaching Effect Evaluation System.

Film Music Teaching Effect Evaluation System Establishment

Multi-level Structural Model Establishment

The investment and usage of large-scale mechanical equipment in university laboratories cannot be measured by the realization of economic benefits. However, establishing a multi-level structural model must be based on a sufficient quantity from many aspects and key issues, such as the scope, object and reason. Five elements including teaching objective, content, structure, method, and effect as well as 20secondary indexes are

_____

defined according to the literature reading and expert investigation. The specific classification is shown in Table 1.

Table 1
Classification Table of Important Elements in Teaching

| Objective	①Accurately embodying the requirements of the syllabus ②the purpose of teaching runs through every link ③Feasibility of Teaching Purpose
Content	①Correct understanding and analysis of textbooks, clear concepts, skilled use of knowledge and skills ②Appropriate teaching capacity and prominent emphasis
Structure	①the links of teaching are natural and logical. ②the rhythm of classroom teaching is relaxed and orderly ③Teachers have better comprehensive organizational teaching ability ④Teaching design meets the requirements of teaching content, music emotion and style of works.
Method	①the teaching method is flexible and well combined with artistic practice ②Teachers' teaching language is clear, accurate and concise ③Arrangement and standardization of blackboard writing and spectrogram ④Good at dealing with unexpected situations, strong adaptability ⑤Focus on developing students' interest in classroom ⑥Ability to teach students in accordance with their aptitude in teaching
Effect	①the overall quality of teaching is good ②Teachers can infect students through music image to achieve the goal of aesthetic and ideological education and teaching. ③Cultivation of students' musical aesthetic ability ④Students can master the knowledge and skills learned in class ⑤Cultivation of students' thinking and creativity
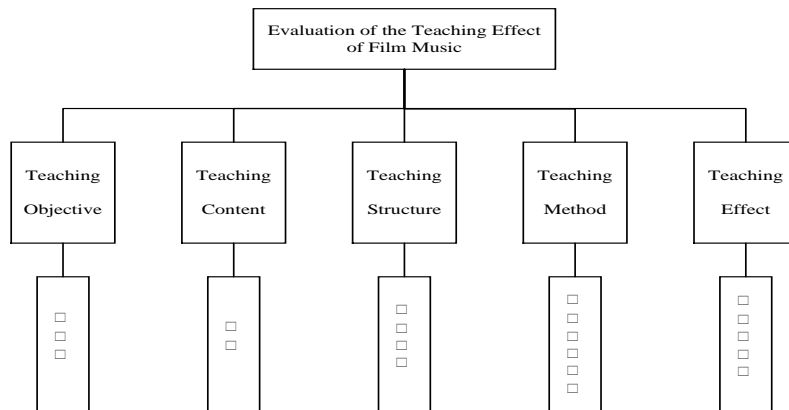
Figure 2. Hierarchical Structure of Film Music Teaching.

It can be seen that there are 20 specific indexes under the five elements of teaching objective, content, structure, method and effect (Garrett, 2016). These indexes at the lowest layer will directly or indirectly affect the effect evaluation of criterion layer and target layer. There is also a certain interaction among indexes at layers. For example, the combination of new teaching structure and new teaching content will achieve a better

teaching effect, while the single teaching mode combined with the boring theoretical knowledge explanation will result in a worse teaching effect, resulting in a two-way negative effect between students and teachers (Westerlund, Partti, &Karlsen, 2015). Therefore, this paper establishes a three-layer structural model with the target layer, criterion layer and index layer. The element relations and logical relations set up in each layer also have a layered structure. The specific hierarchical structure of film music teaching is shown in Figure 2.

Comparison Judgment Matrix Construction

Before constructing the comparison judgment matrix, each element must be evaluated. The paired comparison method is adopted. The scale 1-9 of each index is respectively marked. The scale content is shown in Table2.

$C_1 \sim C_3$ represents ①②③ of teaching objective, $C_4 \sim C_5$ ①② of teaching content, $C_6 \sim C_9$ ①②③④ of teaching objective, $C_{10} \sim C_{15}$ ①②③④⑤⑥ of teaching structure, and $C_{16} \sim C_{20}$ ①②③④⑤ of teaching mean.

Table 2
Index Scale Table

Scale (a_{ij})	Meaning
1	The importance of factor I is the same as that of factor J.
3	Factor I is more important than factor j(I)
5	Factor I am more important than factor j(II)
7	Factor I am more important than factor j(III)
9	Factor I am more important than factor j(IV)
2,4,6,8	The importance of factor I and factor j lie between adjacent grades
Reciprocal	The judgment value obtained by comparing factor I with factor j is the inverse of a_{ij}

In the hierarchical structure of target layer, A, B_1, B_2, B_3, B_4 and B_5 are used to mark the main elements in the criterion layer. The comparison judgment matrix A for the teaching effect evaluation is established, as shown in Table 3.

Table 3
Comparison Judgment Matrix A

A	B_1	B_2	B_3	B_4	B_5
B_1	1	3	1/4	1/7	1/5
B_2	1/3	1	1/5	1/8	1/6
B_3	4	5	1	1/5	1/2
B_4	7	8	5	1	2
B_5	5	6	2	1/2	1

Table 4
Comparison Judgment Matrix B₁

B_1	C_1	C_2	C_3
C_1	1	3	2
C_2	1/3	1	1/2
C_3	1/2	2	1

Finally, the comparison judgment matrix B_1 is constructed for the secondary indexes $C_1 \sim C_3$ of B_1 in the criterion layer, the comparison judgment matrix B_2 for the secondary indexes $C_4 \sim C_5$ of B_2, the comparison judgment matrix B_3 for the secondary indexes $C_6 \sim C_9$ of B_3, the comparison judgment matrix B_4 for the

_____

secondary indexes $C_{10} \sim C_{15}$ of B_4, and the comparison judgment matrix B_5 for the secondary indexes $C_{16} \sim C_{20}$ of B_5, as shown in Tables 4~ 8.

Table 5
Comparison Judgment Matrix B₂

B₂	C₄	C₅
C₄	1	1/3
C₅	3	1

Table 6
Comparison Judgment Matrix B₃

B₃	C₆	C₇	C₈	C₉
C₆	1	1/3	1/2	1/5
C₇	3	1	2	1/2
C₈	2	1/2	1	1/3
C₉	5	2	3	1

Table 7
Comparison Judgment Matrix B₄

B₄	C₁₀	C₁₁	C₁₂	C₁₃	C₁₄	C₁₅
C₁₀	1	6	3	2	5	4
C₁₁	1/6	1	1/4	1/5	1/2	1/3
C₁₂	1/3	4	1	1/3	3	2
C₁₃	1/2	5	3	1	4	3
C₁₄	1/5	2	1/3	1/4	1	1/2
C₁₅	1/4	3	1/2	1/3	2	1

Table 8
Comparison Judgment Matrix B₅

B₄	C₁₆	C₁₇	C₁₈	C₁₉	C₂₀
C₁₆	1	/1/2	2	1/3	3
C₁₇	2	1	3	1/2	4
C₁₈	1/2	1/3	1	1/4	2
C₁₉	3	2	4	1	5
C₂₀	1/3	1/4	1/2	1/5	1

Eigenvalue and Eigenvector Calculation

Eigenvectors reflect the importance of each element at the criterion layer, which can be expressed in the form of vectors. At the same time, eigenvalues can be calculated through eigenvectors to express characteristic indexes of element (Boechler, Ingraham, Marin, Dalen & Jong, 2015). In this paper, the square root method is used to calculate eigenvalues.

Firstly, the product of elements on each row is calculated according to the constructed comparison judgment matrix:

$$W_i = \prod_{j-1}^{m} u_{ij}, (i, j = 1, 2, \ldots, m) \tag{1}$$

_____

The mth root is calculated:

$$\overline{W_i} = \sqrt[m]{W_i} \tag{2}$$

$\overline{W_i}$ is normalized:

$$a_i = \overline{W_i} / (\sum_{j-1}^{m} \overline{W_j}) \tag{3}$$

It is obvious that a_i is the ith index weight coefficient of elements at the layer B in the corresponding matrix.

Finally, the maximum eigenvalue of comparison judgment matrix is calculated:

$$\lambda = \frac{1}{m} \sum_{i-1}^{m} \frac{(TA)_i}{a_i}_{max} \tag{4}$$

Where $(TA)_i$ means the ith element of eigenvector *TA* expressed as:

$$TA = \begin{bmatrix} (TA)_1 \\ (TA)_2 \\ ... \\ (TA)_3 \end{bmatrix} = \begin{bmatrix} u_{11} & u_{12} & ... & u_{1m} \\ u_{21} & u_{22} & ... & u_{2m} \\ ... & ... & ... & ... \\ u_{m1} & u_{m2} & ... & u_{mm} \end{bmatrix} \bullet \begin{bmatrix} a_1 \\ a_2 \\ ... \\ a_3 \end{bmatrix} \tag{5}$$

Consistency Test

The purpose of consistency test is to objectively reflect the hierarchy in the hierarchical structure model, and reasonably verify the weight of elements in each layer (Matei, Broad & Goldbart, 2018). The consistency test is to calculate the consistency rate CR by parameters C, I and R. The specific calculation formula is:

$$CR = CI/RI \tag{6}$$

Where RI is the average random consistent index of the constructed comparison judgment matrix. RI values that are less than the 11th-matrix can be directly referred to the Table 9 through consulting a large number of literatures.

Table 9
RI Value

m	1	2	3	4	5	6	7	8	9	10
RI			0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

CI is the characteristic index in the consistency test. The specific calculation formula is as follows:

$$CI = \frac{1}{m-1}(\lambda_{max} \tag{7}$$

Where λ_{max} is the maximum eigenvalue, and m is the rank of comparison judgment matrix?

Finally, the consistency test is carried out on the teaching effect elements of the target layer and the five main elements of the criterion layer. The calculated CR is less than 0.1. $\overline{W} = \begin{pmatrix} W_1 \\ M \\ W_n \end{pmatrix}$ is normalized through the

consistency test according to the importance of each element's weight. Table 10 is the weight and consistency test results of each index element in matrix A. The results show that the consistency test is passed.

Table 10
The Weight and Consistency Test Results of each Index Element in Matrix A

A	B_1	B_2	B_3	B_4	B_5	W	Index
B_1	1	3	1/4	1/7	1/5	0.0823	Jmax=6.3755
B_2	1/3	1	1/5	1/8	1/2	0.0419	CI=0.0751
B_3	4	5	1	1/5	1/2	0.1620	CR=0.0606<0.1
B_4	7	8	5	1	2	0.4321	Conclusion: Through verification
B_5	5	6	2	1/2	1	0.2818	

Hierarchical Weights General Ranking

The weight vector of one-way ranking for the criterion layer B to target layer A is:

$$w^{(2)} = (w_1^{(2)}, w_2^{(2)}, \Lambda, w_n^{(2)})^T \tag{9}$$

The weight vector of one-way ranking for the index layer C to criterion layer B is:

$$w_k^{(3)} = (w_{k1}^{(3)}, w_{k2}^{(3)}, \Lambda, \omega_{kn}^{(3)})^T, k = 1,2,\Lambda,n \tag{10}$$

$w_k^{(3)}$ is used as column vectors, forming a new matrix:

$$w^{(3)} = (w_1^{(3)}, w_2^{(3)}, \Lambda, w_3^{(3)}) = \begin{bmatrix} w_{11}^{(3)} & w_{21}^{(3)} & \Lambda & w_{n1}^{(3)} \\ w_{12}^{(3)} & w_{22}^{(3)} & \Lambda & w_{n2}^{(3)} \\ M & M & M \\ w_{1m}^{(3)} & w_{2m}^{(3)} & \Lambda & w_{nm}^{(3)} \end{bmatrix}_{m \times n} \tag{11}$$

Therefore, the calculation formula of hierarchical weights general ranking for the index layer C to target layer A is as follows:

$$w^{(3)} = W^{(3)} w^{(2)} \tag{12}$$

Table 11
Target Layer Synthetic Weight Table

	B_1	B_2	B_3	B_4	B_5
First level index	0.0823	0.0419	0.1620	0.4321	0.2818
Second level index	0.5390 0.1638 0.2937	0.2500 0.7500	0.0883 0.2718 0.1575 0.4824	0.3738 0.0430 0.1516 0.2652 0.0649 0.1015 0.1615	0.1611 0.2618 0.0986 0.4162 0.0624
Synthetic weight	0.0444 0.0135 0.0245	0.0105 0.0314	0.0143 0.0440 0.0255 0.0781	0.0186 0.0655 0.1146 0.0280 0.0439	0.0409 0.0664 0.0250 0.1055 0.0158

_____

The weights of the target layer, criterion layer and index layer are calculated according to the above steps, and the synthetic weight of the second and third layers to target layer is finally obtained, as shown in Table 11.

It can be seen that the weight of teaching content and structure is the largest among the general ranking indexes of synthetic weight, that is, film music teaching is still taken teaching content as the main reference target and teaching structure as the secondary reference standard. They are basically consistent with the results obtained in the questionnaire. Therefore, this research is of certain practical value and provides an auxiliary reference for the classroom effect evaluation.

Conclusion

With film elements added into the music education, the teaching effect evaluation should keep pace with the times. From the perspective of audience immersion, this paper establishes a structural model for the film music teaching effect evaluation system by the analytic hierarchy process, emphatically studies and analyzes logical relations and meanings of the target layer, criterion layer and index layer, and completes the weight calculation and consistency test of elements in each layer. Finally, the weights of each index layer are integrated and summarized to obtain the final synthetic weight of target layer. It shows that the teaching content and structure are still important factors affecting the classroom teaching effect. This conclusion is scientific and practical to some extent, and provides help to education workers in the music field.

References

Árnason, K., Briem, K., & Árnason, Á. (2018). Effects of an education and prevention course for university music students on their body awareness and attitude toward health and prevention. *Medical Problems of Performing Artists, 33*(2), 131. https://dx.doi.org/10.21091/mppa.2018.2021

Boechler, P., Ingraham, M., Marin, L. F., Dalen, B., & Jong, E. D. (2015). A framework for designing on-line listening activities for postsecondary music courses: What students' performance and perceptions tells us. *International Conference on Computer Supported Education*. Springer, Cham. https://dx.doi.org/10.1007/978-3-319-29585-5_6

Bonastre, C., Enrique Muñoz, & Timmers, R. (2017). Conceptions about teaching and learning of expressivity in music among higher education teachers and students. *British Journal of Music Education, 34*(3), 14. https://dx.doi.org/ 10.1017/S0265051716000462

Brasche, I., & Thorn, B. (2016). Addressing dimensions of "the great moral wrong": how inequity in music education is polarizing the academic potential of Australian students. *Arts Education Policy Review, 119*(3), 1-13. https://dx.doi.org/ 10.1080/10632913.2016.1201029

Cabedo-Mas, A., & Díaz-Gómez, Maravillas. (2016). Music education for the improvement of coexistence in and beyond the classroom: A study based on the consultation of experts. *Teachers and Teaching, 22*(3), 368-386. https://dx.doi.org/ 10.1080/13540602.2015.1058593

_____

Garrett, B. (2016). Activating diverse musical creativities: Teaching and learning in higher education. *Journal of Education for Teaching, 42*(2), 1-3. https://dx.doi.org/10.1080/02607476.2016.1142228

Kilic, D. B. C. (2018). An investigation of music teacher candidates' performance anxiety levels in piano examinations. *Journal of Education & Learning, 7*(1), 299. https://doi.org/10.5539/jel.v7n1p299

Macrides, E., & Angeli, C. (2018). Domain-specific aspects of technological pedagogical content knowledge: Music education and the importance of affect. *Techtrends,* (4), 1-10. https://dx.doi.org/ 10.1007/s11528-017-0244-7

Matei, R., Broad, S., & Goldbart, J. (2018). Health education for musicians. *Frontiers in Psychology, 9*, 1137. https://dx.doi.org/ 10.3389/fpsyg.2018.01137

Millican, J. S. (2016). Examining pedagogical content knowledge of an expert band director teaching lips slurs. *Journal of Music Teacher Education,* https://dx.doi.org/10.1177/1057083716629610

Powell, S. R., & Parker, E. C. (2016). Preservice music teachers' descriptions of successful and unsuccessful teachers. *Journal of Music Teacher Education, 26*(3). https://dx.doi.org/10.1177/1057083716662689

Serafin, S., Adjorlu, A., Nilsson, N., Thomsen, L., & Nordahl, R. (2017). Considerations on the use of virtual and augmented reality technologies in music education. *K-12 Embodied Learning Through Virtual & Augmented Reality. IEEE.* https://dx.doi.org/10.1109/KELVAR.2017.7961562

Westerlund, H., Partti, H., &Karlsen, S. (2015). Teaching as improvisational experience: Student music teachers' reflections on learning during an intercultural project. *Research Studies in Music Education, 37*. https://dx.doi.org/10.1177/1321103X15590698