Research on the evaluation of Civics teaching in computer courses based on AHP

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Abstract: Now, there are many problems such as imperfect and imprecise evaluation indexes and unclear importance of evaluation indexes in the evaluation of Civics teaching of computer courses, which affect the accuracy and reliability of the evaluation results of Civics teaching of computer courses. A quality teaching evaluation system can accurately evaluate the effectiveness of Civics teaching in computer courses. Thus, this article uses the Analytic Hierarchy Process (AHP) to construct an evaluation model for ideological and political education in computer courses, improves evaluation indicators, clarifies the weight of evaluation indicators, and hopes to provide guidance for the improvement of ideological and political education content and teaching mode in computer courses. Through more accurate evaluation results, it is expected to provide a reliable basis for the effectiveness evaluation of ideological and political education in computer courses, and to maximize the educational function of ideological and political education in computer courses.

1. Introduction
The ideological and political education of computer courses effectively integrates professional courses with ideological and political courses, forming a synergistic educational effect in imparting computer knowledge, cultivating comprehensive abilities, and guiding correct values. Teaching evaluation is an important part of ideological and political education in computer courses, and its completeness directly affects the quality of ideological and political education in computer courses and the effectiveness of coordinating education. In order to improve the effectiveness and quality of ideological and political education in computer courses, this article conducts some research on the teaching evaluation process.

2. Analytic Hierarchy Process

Analytic Hierarchy Process (AHP) is a decision making method that decomposes the complex factors related to decision making into different hierarchical structures such as objectives, criteria and solutions, specifies the priority weights of each factor in each hierarchical structure, and obtains the final weights by weighting and recursive summation, and carries out qualitative and quantitative analysis by this method. It was proposed by T.L. Saaty, an American operations researcher.

(1) Building a hierarchical model

According to the complex decision problem is divided into different hierarchical structures such as objective, criterion and scheme, there are objective level A factors that govern and act on each factor B1, B2 and B3 of the lower criterion level structure, and each factor in the criterion level structure contains each scheme level structure factors C1, C2, C3...C9, as shown in Figure 1.

![AHP hierarchical model](image)
 Establish the judgment matrix

Based on the relationship between the factors and comparing the importance of the same hierarchy, a judgment matrix is created:

\[
A = \begin{bmatrix}
S_{11} & S_{12} & \cdots & S_{1n} \\
S_{21} & S_{22} & \cdots & S_{2n} \\
\vdots & \vdots & \ddots & \vdots \\
S_{n1} & S_{n2} & \cdots & S_{nn}
\end{bmatrix}
\]

(2) Establish the judgment matrix

(3) Calculate the weight vector

The weight vector \( W_r \) corresponding to each index is calculated according to the judgment matrix, and the vector \( W_r = (W_1^r, W_2^r, \cdots, W_n^r) \) is formalized, i.e.

\[
W_r = \frac{1}{n} \sum_{j=1}^{n} \left( \frac{S_{ij}}{\sum_{i=1}^{n} S_{ij}} \right)
\]

Meanwhile, the maximum characteristic root \( \lambda_{\text{max}} \) is calculated based on the above weight vector, where \( r \) represents the rth factor of the vector \( W \), ranging from 1 to \( n \); \( k \) represents the matrix order. The maximum characteristic root is calculated by the formula:

\[
\lambda_{\text{max}} = \sum_{r=1}^{n} (AW)_r
\]

(4) Hierarchical total ranking and consistency test

The test was performed according to the consistency index \( CI \), and the test formula as:

\[
CI = \frac{\lambda_{\text{max}} - n}{n - 1}
\]

Where “\( n \)” is the matrix order, when \( CI < 0.1 \) and close to 0, the consistency test results are more satisfactory. In the hierarchical total ranking, it is necessary to calculate the corresponding pair of weights for a certain level of factors to the highest level, and if \( CR < 0.1 \), it means that it passes the consistency test. That is:

\[
CR = \frac{CI}{RI}
\]

3. AHP-based Civics Teaching Evaluation Model for Computer Courses

3.1 Construction of evaluation index system

The evaluation of Civics teaching in computer courses is influenced by various factors, and it also needs to be evaluated from multiple directions and perspectives. By analyzing the research of related scholars, the quality of Civics teaching of computer courses is evaluated from four dimensions of teaching objectives, teaching contents, teaching process and teaching methods, and each dimension is subdivided into specific index scheme layers to build a perfect Civics teaching evaluation index system of computer courses, as shown in Table 1.

| Tab.1 Evaluation index system of Civics teaching in computer courses |
|------------------|------------------|------------------|
| Source layer | Indicator layer | Code |
| Effectiveness of teaching Civics in computer courses (A) | Teaching Objectives | B1 |
| | Reflecting the unity of professional education and ideological education | C11 |
| | Cultivate moral and talented people | C12 |
| Teaching content | B2 | Reflecting the unity of professional education and ideological education |
| | Full and complete | C13 |
| | Accurate concept | C14 |
| Teaching process | B3 | Seamless integration of computer science and Civics content |
| | Compact process | C15 |
| | Rigorous structure | C16 |
| Teaching Method | B4 | Consistent with teaching principles |
| | Combining theory and practice | C17 |
| | Consistent with teaching principles | C18 |

3.2 Construction of AHP judgment matrix

In order to obtain more accurate and effective evaluation results, 16 experienced expert professors were invited to assess the importance of teaching evaluation index factors and determine the index weights, and construct an AHP judgment matrix, as shown in Table 2.

| Tab.2 AHP judgment matrix scalar importance analysis |
|----------------|----------------|
| Scale | Importance |
| 1 | Two factors are equally important |
| 3 | The former is slightly more important than the latter |
| 5 | The former is significantly more important than the latter |
| 7 | The former is intensely more important than the latter |
| 9 | The former is extremely important than the latter |
| 2, 4, 6, 8 | Intermediate value of judgment between the two factors |
| Countdown | The importance ratio of the two factors is opposite |
3.3 Calculating index weights and consistency tests

According to the AHP hierarchical analysis method, the weights of each index were calculated and tested for consistency, and the A-B judgment matrix was constructed and tested for consistency using the four indexes of criterion level B as an example, as shown in Table 3.

<table>
<thead>
<tr>
<th>A</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>B4</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>1</td>
<td>3/4</td>
<td>2/3</td>
<td>4/3</td>
</tr>
<tr>
<td>B2</td>
<td>1/2</td>
<td>1</td>
<td>1/4</td>
<td>1/2</td>
</tr>
<tr>
<td>B3</td>
<td>3/2</td>
<td>2/3</td>
<td>1</td>
<td>1/3</td>
</tr>
<tr>
<td>B4</td>
<td>1/3</td>
<td>1/4</td>
<td>3/2</td>
<td>1</td>
</tr>
</tbody>
</table>

According to the A-B judgment matrix, the corresponding weight can be calculated:

\[
W = \begin{bmatrix}
W_1 \\
W_2 \\
W_3 \\
W_4 \\
\end{bmatrix} = \begin{bmatrix}0.267 \\ 0.446 \\ 0.069 \\ 0.128\end{bmatrix}
\]

\(\lambda_{\text{max}}=4.016\) is calculated according to the calculation method of maximum characteristic root.

According to the consistency index CI calculation formula, when \(n=4\), CI=0.005; When RI is 0.814 and CR=0.006 < 0.1, it meets the requirements of consistency test.

3.4 Teaching evaluation results

(1) The consistency test shows that the AHP hierarchical analysis method can be used to evaluate the teaching quality of computer courses in Civics, and the weight distribution of each weight of the teaching evaluation index system based on four criterion layers is reasonable and effective, and a complete teaching evaluation index system can be derived.

(2) According to the weighting of the four target layers, \(w = (0.267, 0.446, 0.069, 0.128)\), it can be concluded that \(B_2>B_1>B_4>B_3\). It shows that in the computer course Civics teaching, the teaching content index is a crucial evaluation index, which has an important influence on the quality of the computer course Civics teaching; followed by the teaching objectives, which is conducive to actively promoting the high quality development of the computer course Civics teaching by formulating precise teaching objectives. Teaching methods and teaching process evaluation indexes are also relatively important, which are conducive to mobilizing teaching enthusiasm and creating an efficient classroom atmosphere. The degree of importance of different teaching evaluation indexes can reflect the key contents and the parts that need to be improved and enhanced in the teaching of Civics and Political Science of computer courses.

4. Conclusions and Recommendations

4.1 Conclusion

AHP-based Civics teaching evaluation of computer courses not only has a perfect evaluation index system, but also can obtain real and reliable evaluation results, while clear teaching objectives and teaching contents are the core and important indicators of current Civics teaching evaluation of computer courses. In addition, teaching process and teaching methods are also important elements in teaching evaluation. In this regard, in order to further improve the effectiveness of teaching Civics in computer courses, it is also necessary to start from the dimensions of teaching objectives, teaching contents, teaching process and methods, in order to precisely improve the teaching strategy of Civics in computer courses, enhance its teaching effectiveness and provide reference for the reform of Civics teaching in computer courses.

4.2 Recommendation

In order to analyze the teaching evaluation of computer course Civics based on AHP, we can focus on the teaching objectives, teaching contents, teaching process and methods of computer course Civics, and reasonably formulate corresponding improvement strategies according to the importance degree of the four evaluation indexes.

(1) Precise positioning of Civics teaching objectives of computer courses

The teaching goal of computer course Civics is the guiding light of the whole teaching. By precisely positioning the teaching goal, it is conducive to the smooth development of computer course Civics teaching and the nurturing effect of computer course Civics. In this regard, it is necessary to precisely locate the teaching objectives of computer course Civics. The current society urgently needs compound talents with both moral and talent, especially in the information age, the demand for compound talents with both moral and talent in computer science is large. In this regard, teachers can precisely position the teaching objectives according to the development needs of the computer industry and job professionalism, and cultivate computer professionals with both virtues and talents in order to meet the needs of social development.

(2) Using information technology to dig deeper into the content of computer science and politics

As teaching content index plays an important role in the evaluation of ideological and political teaching of computer courses, under the current extensive application of information technology, it is necessary to use various information technologies to dig deeply into the ideological and political content of computer courses and enrich the ideological and political teaching content of computer courses. On the Internet platform, by mining the hot topics in the computer industry, current political hot spots, the latest development trends of the industry, and the requirements for the professional literacy of the computer profession, students can obtain learning knowledge from the actual teaching resources in life, and shape the correct
career view, career planning view, professional literacy, etc.

(3) Optimize the teaching process of Civics and Politics of computer courses

The teaching process of computer course Civics needs to be more rigorous, with a clear and hierarchical teaching structure. In this regard, teachers need to reasonably design the Civics course system of computer course, strengthen the interaction between teachers and students in the classroom, and guide students to learn in depth. Through a good exchange of ideas to stimulate students' learning drive, so that students recognize their main position, independent inquiry into the knowledge of computer and Civics. Teachers can take action to provide students with learning tasks or projects, and in this process integrate Civic Education into them, so that students can take the initiative to learn according to the projects and tasks, actively explore the problems they encounter, communicate and cooperate with each other to ensure a smooth and rigorous teaching process.

(4) Improve the teaching method of Civics and Political Science in computer courses

In view of the current problems of curing old methods in the teaching of Civics in computer courses, it is necessary to innovate diversified teaching methods in order to stimulate the vitality of teaching Civics in computer courses and mobilize students' learning motivation. First, focus on practical teaching. In the teaching of computer science and politics, the proportion of practical teaching should be increased, and theoretical knowledge should be transformed into practical skills in practical teaching, and students should be guided to actively participate in social practice activities, volunteer services, innovation and entrepreneurship competitions, etc., so as to help students shape correct values and develop good moral cultivation. Second, make full use of information technology to enrich teaching forms. Under the Internet technology and big data technology, the online teaching platform is built, and students can learn computer professional and Civic Science knowledge anytime and anywhere through live classes and micro classes.

References

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