

# The Construction of Teaching Evaluation Index System of Programming Courses in Primary and Secondary Schools Based on AHP

Xing Chen

Information technology teacher of Binjiang primary school, Shapingba district, Chongqing.400030

**Abstract:** Teaching evaluation is an important part of education and teaching activities. It is particularly important to construct a scientific evaluation index system to guide and promote the teaching quality of programming courses in primary and secondary schools. This paper mainly uses the Analytic Hierarchy Process (AHP) to study the evaluation index system of programming course teaching in primary and secondary schools from the perspective of students' deep learning. The research results show that the evaluation index system of programming course teaching in primary and secondary schools includes four first-level indicators and sixteen second-level indicators. Among them, thinking structure and motor skills are the two first-level indicators, expanding structure and association structure are the two second-level indicators, which have the greatest impact on the teaching evaluation of programming course in primary and secondary schools.

**Keywords:** Analytic hierarchy process; Programming courses; Teaching evaluation

## 1 Introduction

With the application of technology to promote the development of education, the trend of students' learning mode changing to deep learning has gradually emerged. Deep learning refers to that students actively learn new knowledge and skills with critical thinking on the basis of comprehensive understanding of existing knowledge according to courses and learning needs, and deeply process the expanded knowledge and information by adopting diversified learning strategies, and establish a personal knowledge system integrating different subject knowledge, different professional skills and new and old knowledge information, and effectively transfer applied to real situations to solve complex problems of learning methods<sup>[1]</sup>. Programming education has strong knowledge and practicality as an emerging courses in primary and secondary schools, teaching evaluation from the perspective of students' deep learning not only conforms to the goal of programming education courses, but also conducive to the development of students' organizational innovation and thinking ability. The scientific and reasonable evaluation index system of programming course teaching in primary and secondary schools not only promotes the teaching quality of programming course in primary and secondary schools, but also provides a certain reference standard for the evaluation and research of maker education and other related courses. Therefore, from the perspective of deep learning, it has certain innovation and practical significance to construct the classroom teaching evaluation index system of programming education.

## 2 Research on teaching Evaluation Index System of Programming Courses in Primary and Secondary Schools

### 2.1 Research Ideas

The construction of teaching evaluation index system of programming course in primary and secondary schools is mainly carried out through the combination of qualitative analysis and quantitative analysis. In the first stage, through the use of the literature analysis and expert interviews to conduct qualitative analysis of the research to effectively control the breadth of the research; In the second stage, through the use of analytic hierarchy process analysis, in order to ensure the research of scientific and accurate ; In the third stage, through the use of mathematical statistical analysis of the relevant data for statistical analysis, draw scientific and reasonable conclusions and suggestions.

### 2.2 Analytic Hierarchy Process

Analytic Hierarchy Process (AHP), also known as AHP, is a kind of decision analysis method combining qualitative and quantitative methods. It is applicable to the uncertain problems that are difficult to be quantified in teaching evaluation and can make up for the deficiencies of existing teaching evaluation<sup>[2]</sup>. In the process of applying to the teaching evaluation system of programming course in primary and secondary schools, firstly, according to the overall goal of the problem, the complex problem is decomposed into several ordered levels, and the hierarchical structure model is constructed. Secondly, according to the objective facts and the results of expert investigation, assigns a value to the construction of the judgment matrix. Finally, the judgment was made according

to the results of hierarchical single sorting and consistency inspection and hierarchical total sorting and consistency inspection [3].

## 2.3 Research Results and Analysis

### 2.3.1 Construction of evaluation index system

This study believes that any learning behavior starts with basic cognition. If you want to conduct deeper and more meaningful learning, you must have a knowledge base that derives from shallow learning, and there is continuity between deep learning and shallow learning in the time dimension [4]. Therefore, in this study, the middle and low level thinking occurred in the learning process was fully considered, and based on Bruner's classification of educational goals and Biggs's solo classification, this study protocoled four main deep learning evaluation indexes and twenty secondary evaluation indexes. Questionnaires and interviews were conducted to seek opinions from twenty experts and front-line teachers. After two rounds of screening and supplement, the evaluation index system (A) of programming course teaching in primary and secondary schools was finally obtained, as shown in Figure 1, including four first-level evaluation indexes and sixteen second-level evaluation indexes.

Table 1 Primary and Secondary School Programming Courses Teaching Evaluation Index System(A)

Final Target	Level 1 Target	Level 2 Target
Teaching Evaluation of Programming Courses in Primary and Secondary School(A)	Cognitive Goal (B1)	Understanding the Memory (C1)
		Analytic Application (C2)
		Reflective Evaluation (C3)
		Association Creation (C4)
	Motor Skills (B2)	Guide Imimitation(C5)
		Independent Imitation (C6)
		Adjust adaptation (C7)
		Independent Innovation (C8)
	Emotion (B3)	Willing to accept (C9)
		Positive response (C10)
		Value Evaluation (C11)
		Organizational Creation (C12)
	Mindset Structure (B4)	Single Structure (C13)
		Multiple Structure (C14)
		Association Structure (C15)
		Expand structure (C16)

### 2.3.2 Construction and Assignment of Judgment Matrix

The construction of judgment matrix is the key to realize the combination of qualitative analysis and quantitative analysis. The numerical value of judgment matrix indicates the importance of factors of the same level. Six senior experts of programming education were consulted for the study, and determined the weight of each indicator according to the expert rating, and then the value of each index judgment matrix was constructed by referring to sadi's relative importance rating table.

Table 2 Level 1 Index Judgment Matrix Table

A	Cognitive Goal B1	Motor Skills B2	Emotion B3	Mindset Structure B4
Cognitive Goal B1	1	1/3	1/2	1/4
Motor Skills B2	3	1	1	1/2
Emotion B3	2	1	1	1/3
Mindset Structure B4	4	2	3	1

According to the principle and steps of AHP, the first step is the first-level index of the teaching evaluation index system of programming courses in primary and secondary schools, and it is included in the matrix, as shown in Table 2. The second step is to compare the second-level indicators of the teaching evaluation index system of programming courses in primary and secondary schools and list them into a matrix table, The details of the matrix table are not shown here.

### 2.3.3 Determine the weight of the hierarchical single ranking index and consistency inspection

(1)Hierarchical single sort. In this study, the sum product method is used to calculate the weight of the first-level and second-level of the teaching evaluation index system of programming courses in primary and secondary schools, and the results are shown in Table 3.

Table 3 Single Ranking Index Weight of Programming Teaching Evaluation in Primary and Secondary Schools

Level-I index	Weight factor	Secondary indicators	Weight factor	Level-I index	Weight factor	Secondary indicators	Weight factor
Cognitive goals	0.0970	Understanding the Memory	0.0814	Emotional goals	0.1931	Willing to accept	0.1133
		Analytic Application	0.1402			Positive response	0.1328
		Reflective evaluation	0.3788			Value evaluation	0.2500
		Association Creation	0.3996			Organizational Creation	0.5039
Action skills	0.2381	Guide Imimitation	0.0922	Thinking Structure	0.4717	Single structure	0.0669
		Independent imitation	0.1037			Multiple structures	0.1370
		Adjust adaptation	0.2755			Association structure	0.2812
		Independent Innovation	0.5286			Expand structure	0.5149

(2)Consistency Inspection. The calculation results of the consistency inspection are shown in Table 4, and the consistency inspection indicators are less than 0.1, which means that the constructed judgment matrix has a strong logical rationality, and then

ensure that the subsequent research results are reasonable and effective.

Table 4. Consistency Inspection Table

Conformity inspection of Level I index	A: 0.0155<0.1			
Conformity inspection of Level II index	B1: 0.0058<0.1	B2: 0.0370<0.1	B3: 0.0329<0.1	B4: 0.0716<0.1

(3)Determining the weight of the hierarchical total ranking index and consistency inspection

Hierarchical total ranking is to further calculate the influence ranking on the higher level on the calculation results of the hierarchical single ranking. Thus there is a specific relationship between the second-level indicators and the first-level indicators in the teaching evaluation index system of primary and secondary school programming course, by calculating the product of the weight of the second-level indicators and the weight of the first-level indicators in the teaching evaluation index system of primary and secondary school programming course, we can get the relative influence weight of all the second-level indicators on the teaching evaluation of primary and secondary school programming course. The weight and inspection of consistency are determined as shown in Table 5.

Table 5 Hierarchy Total Ranking Index Weight and Consistency Inspection Table

	Total weight factor	Secondary indicators
Hierarchy total sort consistency inspection CR=0.0155<0.1	0.0079	Understanding the Memory
	0.0136	Analytic Application
	0.0367	Reflective evaluation
	0.0387	Association Creation
	0.0220	Guide Imitation
	0.0247	Independent imitation
	0.0656	Adjust adaptation
	0.1259	Independent Innovation
	0.0219	Willing to accept
	0.0257	Positive response
	0.0483	Value evaluation
	0.0973	Organizational Creation
	0.0316	Single structure
	0.0646	Multiple structures
	0.1326	Association structure
0.2429	Expand structure	

Analysis and summary

Both the hierarchical single ranking and the hierarchical total ranking have passed the consistency inspection, which indicates that the constructed judgment matrices have a strong logical rationality, and the research results of analyzed and summarized are reasonable and effective.

**3.1 As can be seen from tables 3 and 5**

the first-level index weight of the teaching evaluation index system of programming courses in primary and secondary schools is ranked as follows: mindset structure (0.4717), motor skills (0.2381), emotional goal (0.1931), cognitive goal (0.0970). Among them, the mindset structure has the greatest influence. The top four secondary index systems of programming courses teaching evaluation index system in primary and secondary schools are: expanded structure (0.2429), association structure (0.1326), independent innovation (0.1259), organizational creation (0.0973).Therefore, in the process of programming teaching in primary and secondary schools, people should pay more attention to the cultivation of students’ mindset structure, especially the expanded structure and association structure. At the same time, people should also strengthen the cultivation of motor skills and independent innovation. In addition, people should also pay attention to the importance of emotional goal and organizational creation.

**3.2 The ranking of index weight at all levels shows the importance of “organizational**

innovation” and “thinking expansion” ability in the teaching process of programming course in primary and secondary schools, which is highly in line with the connotation of students’ deep learning, and also shows the significance of setting up programming education course, indicating that the teaching evaluation index system of programming course in primary and secondary schools has a high reference value, it can play a positive role in promoting the teaching of programming course.

**3.3 The important embodiment of organizational innovation and thinking expansion in**

developing programming courses in primary and secondary schools teaching in the evaluation index system, and further suggests that students by any optimization approach to learning,assessment of innovation ability is still programming courses quality of teaching the important index, so teachers who are working in programming education still need to strengthen the cultivation of students’ innovation ability and promote the development of students’ innovative thinking.

**References:**

[1] Hao Zhang,Xiujuan Wu,Jing Wang.The Objectives and Evaluation System Construction of Deep Learning[J].China Video Education,2014,(7):51-55.  
 [2] Jianguang Liao, Fangyan Zeng,Xin Cai,De Guang Li.Analysis on Fuzzy Comprehensive Evaluation of Classroom Teaching Quality from the View of Education Ecology[J].Higher Science Education, 2018,(4):94-106.  
 [3] Sumei Zhang.The Fuzzy Comprehensive Evaluation of Teacher Teaching Quality Based on AHP Method[J].Higher Science Education,2009,84(2): 51-55.  
 [4] Juan Du,Zhaojun Li,Liwen Guo .Strategic Research on the Design of Information Teaching in Deep Learning[J].Research on Electrification Education,2013,34(10):14-20.