

## LETTER TO THE EDITOR

## The Establishment of a Classroom Teaching Effect Evaluation Model for Environmental Specialty Based on Cognitive Neural Theory

Zhi-Yong Chen<sup>1</sup>, Ting-Kui Lin<sup>2\*</sup>

<sup>1</sup>Educational Technology and Information Center, Guangdong Medical University, Zhanjiang 524023, China

<sup>2</sup>Affiliated Hospital, Guangdong Medical University, Zhanjiang 524023, China

\*E-mail: lintingkui@163.com

In order to define the teaching orientation of environmental specialty in colleges and universities, this paper emphasizes the consistency and similarity between teaching and practice, and turns to promote and encourage the development of characteristics, advantages and differences of environmental specialty teaching in colleges and universities. This paper proposes a classroom teaching effect evaluation model for environmental specialty based on cognitive neural theory. According to the analysis of current environmental professional classroom teaching, the introduction of different types of colleges and universities in teaching environment in the level of the special teaching mode, using the PLS - SEM statistical techniques to determine the effect of classroom teaching evaluation, on the basis of the understanding of theory, the effect of classroom teaching evaluation model is set up, and to evaluate the effect of classroom teaching. The experimental results show that the evaluation accuracy of the model is higher.

Cognitive neuroscience; Environmental courses; Teaching effectiveness; Evaluation model

### 1 Introduction

Evaluation of classroom teaching effect is indispensable in modern educational practice. Yoshida said in his theory and practice of educational evaluation that the relationship between guidance and evaluation is like the two wheels of a car in today's school education. Without evaluation there is no education, and without educational evaluation there is no educational practice. Therefore, the reasonable and regular evaluation of classroom teaching effect can make educational and teaching activities become a structured, systematic, spiral and controllable process. Environmental major is a subject that requires students to have strong practical ability. Therefore, the evaluation of classroom teaching effect of environmental major plays a crucial role in the cultivation and improvement of students' practical ability.

Larisa A. Apanasyuk published an article entitled "Factors and Conditions of Student Environmental Culture Forming in the System of Ecological Education" in the journal of Ekoloji (Issue 107, 2019). This paper (Apanasyuk et al. 2019) aims to analyze various approaches for the formation of ecological culture and the factors and conditions affecting its formation effect. The results show that ecological culture is a kind of human culture interacting with biosphere and social sphere. The characteristics of modern environmental education are based on the concept of north circle and sustainable development. The main factors to improve the effectiveness of

ecological culture formation in the aspects of cognition, reflexive value and activities are determined. The main condition for the formation of environmental culture is the improvement of the importance of environmental education and the dynamic interaction among the subjects. Practical significance: the material in this paper is the development of theoretical and practical values of education and methodical compounds in ecology and ecological pedagogy, teacher training and retraining programs, and programs aimed at the formation of new environmental ideologies and values and behavioral skills of students.

Literature (Jiang and Ye 2017) proposes that environmental professional education, to some extent, determines the quality of citizens, the level of environmental protection of a country, and even the comprehensive national strength of a country. The education quality of environmental specialty is related to the survival and development of ecology in the future. Improving quality is the eternal theme of education. This paper holds that the management of teaching effect evaluation is an open management system without feedback mechanism. At the same time, evaluation is also regarded as a purposeful, planned and open organizational learning activity. Systematic and frequent use of evaluation methods can improve the quality of teaching and the value of higher education.

Literature (Li et al. 2017) points out that when the enrollment rate of higher environmental professional education in a country is lower than 15%, it belongs to the stage of elite higher education. The stage of higher education popularization is 15%-50%; More than 50 percent is the stage of higher education popularization. According to Trow's theory, China's higher education has entered the popular stage in terms of quantity. Quality is the foundation of a school. While the scale of "quantity" is expanding, the problem of "quality" has also become the focus of the whole society. Related reports and comments are also common in some news media. The outline of the national plan for medium - and long-term education reform and development (2010-2020) clearly states that "improving quality is the core task of higher education development and the basic requirement of building a strong country in higher education". With the acceleration of the popularization of higher education in China, how to guarantee and improve the teaching quality of environmental majors and coordinate the development of quality and scale is one of the main problems facing us.

In order to solve the above problems, a classroom teaching effect evaluation model of environmental specialty based on cognitive neural theory is proposed (Hsueh and Su 2017, Mousakhani et al. 2017).

## **2 Idea description**

### **2.1 Analysis of classroom teaching status of environmental specialty**

At present, most of the teaching materials for environmental majors are related to pollution control theory and chemical theory, but few of them incorporate the characteristics and requirements of environmental engineering design (Zhao and Yu 2018). Such teaching materials often make students of environmental majors feel that what they have learned is not very close to their future work, and they are not easy to be interested in. Basically use in addition, the existing teaching contents to teaching as the center of the traditional teaching mode, teaching most also only 32 hours or so, causes the teaching process is given priority to with in detail the various commands, students can only carry on the related software basic operation, lack of practical technology in environmental engineering and environmental engineering design of learning and training, the teaching content does not meet the needs of the professional engineering environment(Ren 2017). Therefore, it is necessary to reform the classroom teaching mode and content of environmental specialty.

### **2.2 Construction of evaluation index of teaching effectiveness**

Before establishing the evaluation model of classroom teaching effectiveness, we should determine the evaluation

index of classroom teaching effectiveness. A scale based on constructivism is developed for the evaluation of practical classroom teaching effectiveness; the reliability and validity of the scale is verified and analyzed with PLS-SEM statistical technology (Lv et al. 2019). According to the results of PLS-SEM statistical verification, the evaluation index system of teaching effectiveness is established with the latent variable as the primary index and the explicit variable as the secondary index.

Under the framework of constructivism, the expert interview method constructs 4 primary indexes from four aspects: practical teaching process  $\gamma_{pro}$ , practical teaching teacher  $\gamma_{teachers}$ , practical teaching environment  $\gamma_{enviro}$  and practical teaching quality monitoring  $\gamma_{quality}$ .

In order to further verify the influence of the teaching effect evaluation index system on students' practical teaching satisfaction, the pls-sem statistical technology was used to make a statistical analysis of students' satisfaction. The reliability, convergent validity and discriminant validity of the questionnaire were verified, and the external-load values of the explicit variables were removed from the 0.7 threshold. Finally, the measured value of the index is obtained.

### 2.3 Evaluation model of classroom teaching effectiveness

Calculate the connection weight correction between hidden layer and input layer  $w_{ij}(N+1)$ :

$$w_{ij}(N+1) = w_{ij}(N) + \beta e_j x_i \quad (1)$$

In the formula,  $\beta$  is a momentum factor,  $e_j$  is a correction error,  $x_i$  is the input value,  $w_{ij}$  is the connection weight between the input layer and the hidden layer. The threshold correction  $\theta_j(N+1)$  between the hidden layer and the input layer is calculated:

$$\theta_j(N+1) = \theta_j(N) + \beta e_j \quad (2)$$

Calculate the error  $E_k$   $E$   $k$  samples and the average error  $E$  of all test samples:

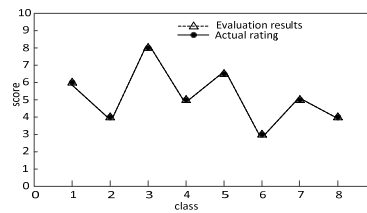
$$E_k = \frac{1}{2} \sum_{t=1}^q (z_t - y_t)^2 \quad (3)$$

$$E = \frac{1}{n} \sum_{k=1}^n E_k \quad (4)$$

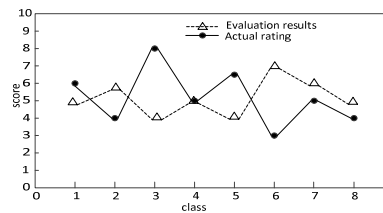
When the average error  $E \leq \varepsilon$ , the whole training is over, otherwise the above process is repeated, and the weights and thresholds are constantly revised. After a number of cyclic calculations, the actual output of the network is gradually approaching to the corresponding hope output. After repeated iteration, when the error is less than the allowable value, the training process of the network ends, and the evaluation result of classroom teaching effectiveness is  $X_k = (x_1, x_2, \dots, x_m)$ .

### 3 Results

In order to verify the overall effectiveness of the classroom teaching effectiveness evaluation model under the support of cognitive neural theory, the model needs to be tested. 100 students, 10 teachers and 5 leaders were randomly selected to evaluate the classroom teaching effectiveness of eight classes, with a total score of 10 points. Evaluation model of classroom teaching effect supported by cognitive neural theory, teaching quality evaluation model based on the BP neural network and teaching quality evaluation model based on AIHP are used to evaluate the classroom teaching effectiveness, and the results of the evaluation are compared with the results of the comprehensive score. The comparison results are shown in Figure 1.



**(a) Test results of classroom teaching effectiveness evaluation model supported by cognitive neural theory**



**(b) Test results of teaching quality evaluation model based on AIHP**

**Figure 1 Test results for three different models**

Figure 1(a) is the evaluation result of the classroom teaching effect evaluation model supported by the cognitive neural theory. Figure 1(a) analysis shows that the evaluation results of the classroom teaching effect evaluation model supported by the cognitive neural theory are consistent with the actual comprehensive scores. Figure 1(b) is the evaluation result of the teaching quality evaluation model based on AIHP. According to the analysis of Figure 1(b), there is a big difference between the evaluation result obtained by the above model and the actual comprehensive score. By comparing the evaluation results of two different models, it can be seen that the evaluation results of the classroom teaching effect evaluation model supported by the cognitive neural theory have higher accuracy.

#### 4 Discussion

In this paper, qualitative research and quantitative research methods are used to do some relatively in-depth research and exploration on some aspects of classroom teaching effectiveness evaluation in universities. However, there are still many problems that have not been solved in the evaluation of teaching effectiveness in universities. It is necessary to further explore and improve the theoretical and practical aspects to enrich and deepen the research in this field.

- (1) Research on the standard system of classroom teaching effectiveness of higher education in China.
- (2) The design of characteristic teaching effectiveness evaluation projects of different types of universities.
- (3) University classroom teaching effectiveness evaluation method and technology innovation.

#### 5 Conclusion

We should adhere to the following principles in dealing with the evaluation results of classroom teaching results:

- (1) Overall presentation of the evaluation results. After the end of the evaluation, we should combine the quantitative data and the qualitative description, present the overall evaluation results of the teacher's classroom teaching effectiveness and the individual evaluation scores, put forward the main direction and specific suggestions of the teachers' future efforts, and supplement the other problems that need to be explained.
- (2) Make rational use of the results of evaluation. Teaching management departments set up a platform for teachers' group learning and communication, so that teachers with higher scores can analyze and summarize their

successful experiences and stimulate them to move towards higher goals. For the teachers with lower grades, it should strengthen the tracking and comprehensive understanding of the teaching situation, let the teachers with rich teaching experience give guidance and help in the form of listening classes to improve the teaching effectiveness in time and gradually improve the teaching effectiveness.

(3) A correct view of the results of the evaluation. Due to the quality problems of the evaluators, the psychological effects of various evaluations the interference of many human factors in the evaluation process, and the impartiality of the evaluation results are sometimes difficult to guarantee. The evaluation of the effect of the classroom teaching can easily lead to the tension of the interpersonal relationship among the participants, the enthusiasm of the teachers and the initiative of the teachers. Teachers should strengthen communication and communication with evaluators, and treat the evaluation results correctly.

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