

# The Application of Formative Evaluation System in Clinical Laboratory Teaching

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**Abstract:** Theoretical education and practical education are very important in clinical laboratory teaching. The teaching evaluation system is one of the important means to test the quality of course teaching. The traditional summative evaluation needs to be improved in terms of scientificity and impartiality, and its guiding effect on teaching reform is limited. Therefore, this paper proposes to apply formative evaluation to clinical laboratory teaching to remobilize students' learning enthusiasm and provide valuable guidance for the subsequent teaching reform, hoping to achieve the purpose of improving the quality of laboratory teaching.

**Keywords:** Formative evaluation; Clinical test; Application path; Application effect

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## 1. Introduction

The key to the talent quality evaluation mechanism is whether the teaching goal can be achieved, which depends on the completion of the teaching results every day. Therefore, teachers should have a proper criterion for judging whether students' learning achievements have reached or what degree they have reached, that is process evaluation criteria. As an important index to measure students' learning outcomes and teachers' teaching quality, scientific evaluation standards are not only conducive to the scientific evaluation of students but also conducive to students finding their learning methods. Ways to build a scientific and fair teaching evaluation system have always been a key topic of exploration in the field of education <sup>[1]</sup>. However, the construction of a teaching evaluation system for clinical laboratory disciplines is more difficult. Because theory teaching is only one part of clinical laboratory teaching, the proportion of clinical laboratory practice in teaching is higher. However, the traditional summative evaluation method is not suitable for clinical laboratory teaching because of its more content, longer time, and students' comprehensive quality. Formative evaluation has been an upsurge in the education sector in recent years and has played a significant role in the evaluation of practical teaching <sup>[2]</sup>. Based on the teaching needs of clinical examination, this paper analyzes the specific application strategies of formative evaluation.

## **2. The concept of “formative assessment”**

Formative evaluation refers to the evaluation of the whole process of teaching activities, not just the evaluation of teaching results. Its main goal is to find out the problems in teaching by analyzing the attitude and achievement of students in the teaching process to promote the continuous in-depth development of teaching reform. Therefore, the study can also say that the goal of formative evaluation is not only to evaluate students' academic performance but also to give timely feedback on the problems in the teaching process to improve teaching.

Formative evaluation according to different professional courses and teaching activities to formulate the evaluation content, evaluation methods and standards. As far as a course is concerned, the normal teaching activities mainly include: classroom teaching, classroom homework, practical training (experiment), course design and so on. Formative evaluation focuses on classroom work, experimental (training) learning results, and students' activeness in class. In addition, while emphasizing the process evaluation, formative evaluation should not only emphasize students' learning results and academic achievements but also strengthen the cultivation of students' innovative thinking and core qualities to give full play to the advantages of the talent training evaluation mechanism<sup>[3]</sup>.

As the teaching content of the clinical examination is rich and the design scope is wide, the summative examination only reflects the students' learning results through the final examination, and cannot cover all the learning content. On the other hand, for the problems existing in the teaching process, the summative evaluation is also difficult to find, it can only get the result, and it is difficult to find the crux through the result. Formative evaluation, on the other hand, pays close attention to teaching activities, finds problems, and gives feedback in time.

## **3. The concrete application of formative assessment method in inspection teaching**

### **3.1. Clarify the course assessment method**

At the beginning of teaching, a clear evaluation system should be established to let students understand the evaluation system. The assessment methods of this course are: class participation 10%, periodic test 20%, clinical case discussion and operation skills 20%, learning attitude 10%, and final test 40%. By clarifying the evaluation method of the course, students can better adapt to the teaching work to complete the examination efficiently. This evaluation method emphasizes the importance of ordinary scores and summary scores, thus stimulating students' enthusiasm for learning<sup>[4]</sup>.

### **3.2. Strengthen the implementation of formative evaluation in the teaching process**

The formative evaluation consists of three steps: evaluation, feedback, and correction. According to the synchronization of evaluation, formative evaluation can be divided into pre-evaluation, synchronous evaluation and lagging evaluation<sup>[5]</sup>. All these steps are intended to provide direction for teaching reform and effectively achieve teaching objectives.

#### **3.2.1. Preliminary evaluation**

The pre-evaluation is to design the teaching reform plan in advance according to the problems found in the previous evaluation and emphasize the important and difficult points and error-prone contents to avoid the same mistakes. For example, in clinical examination, samples of cerebrospinal fluid and subserosal fluid are often

confused in the process of fluid extraction. Therefore, in the teaching process, it is necessary to focus on explaining this content, and then strengthen students' memory by asking questions <sup>[6]</sup>.

### **3.2.2. Evaluation of synchronicity**

In the teaching process, evaluation is accompanied by teaching and it can get feedback from different sources and adjust it. Synchronous evaluation is also an important link in the evaluation process <sup>[7]</sup>.

#### **(1) Emphasizing review before class**

Pay attention to review before class, ask questions about the knowledge points of the last class ten minutes before class, understand students' mastery of the previous knowledge points, and comment on students' answers in time to quantify the learning effect of the previous class.

#### **(2) Emphasizing questions and observing students' status during class**

First, asking questions in class is an important means to test students' understanding of current knowledge points. By asking questions, teachers can learn about students' grasp of knowledge points in time, and adjust teaching strategies according to students' answers. At the same time, observing the state of students is also an important part of evaluating the teaching effect <sup>[8]</sup>. By observing students' expressions, movements and other details, teachers can judge students' interest in and acceptance of the teaching content to further adjust the teaching method and rhythm. For example, when explaining complex technology in clinical examination, teachers can test whether students understand it by asking questions and observing their reactions. If students show confusion or incomprehension, teachers can timely add explanations or adopt more intuitive teaching methods to help students better understand and master knowledge points <sup>[9]</sup>.

Second, observe students' learning state, expression and action in class. The students' emotions are high, indicating that the teaching activities are going smoothly, and the teachers can continue to teach with the same teaching method; If the students frown, sigh, or even wander off, it indicates that the knowledge point is difficult. The teacher should adjust the teaching progress and teaching methods in time to lead the students to understand the knowledge point. For example, when the clinical significance of eosinophil detection is applied in the evaluation of adrenal cortex function, students can't keep up with the teacher's thinking and are relatively silent in class <sup>[10]</sup>. To this end, teachers can lead students to consolidate the relevant knowledge of the "pituitary-adrenal cortex axis" in physiology, and further understand the relevant knowledge of eosinophilia detection in combination with the illustrations until the students become suddenly clear.

#### **(3) Training of experimental skills**

Experimental skills training is an important part of clinical laboratory teaching, requiring students to complete relevant operations in a standardized manner and complete each experimental project independently. In the evaluation of experimental skill training, on the one hand, it is necessary to observe whether the students' operation has been standardized. On the other hand, it is necessary to ask the key notes of the operation, experimental principle and result analysis, etc., and score the students' operation and answers <sup>[11]</sup>.

## **3.3. Hysteresis evaluation**

### **3.3.1. Phased test**

According to the unit, module, and other stages of the test, mainly the key content of the course, through the test paper detection, question types including experimental analysis, noun interpretation, short answer, and so on. For example, in the "hematology general examination" as a module, after explaining the knowledge points of the

module, stage test is carried out, including the test content of red blood cells, white blood cells and platelets quality control and clinical significance. Phased tests can provide timely feedback to students, let them understand their learning situation at this stage, adjust their learning status and learning methods in time, and check and fill in the gaps to help students improve their abilities<sup>[12]</sup>. At the same time, with the help of phased testing, teachers can also find out the problems in teaching and correct the problems.

### 3.3.2. Comprehensive trial clinical test based on clinical case discussion

The teaching evaluation of comprehensive experiments is very important, and clinical case discussion should also rely on comprehensive experiments. For example, in “Laboratory Diagnosis of Neonatal Hemolytic Disease,” teachers provide case data, students form a group to carry out clinical case discussion and propose a feasible experimental diagnosis plan, and then the group conducts experiments to complete the diagnosis work. The comprehensive experiment is the content closest to clinical practice. In the evaluation of a comprehensive experiment, attention should be paid to the accuracy of diagnostic results, students’ ability to apply theory to practical problems, and the cultivation of students’ teamwork ability<sup>[13]</sup>.

## 4. Initial practical results

After the course, teaching and evaluation work, design a questionnaire to understand the feedback of students on formative evaluation. The number of respondents was 41, and 41 valid questionnaires were collected, and the results were analyzed. The results show that students generally recognize the role of formative assessment, and believe that it plays a positive role in helping them to find learning problems, improve their comprehensive literacy, and enhance their problem-solving ability (Table 1).

**Table 1.** Results of the formative assessment questionnaire [ $n(\%)$ ,  $n = 41$ ]

Evaluation content	Good	Average	Poor
Strengthen basic theoretical knowledge learning	40 (97.6)	1 (2.4)	0 (0.0)
Cultivate self-study and innovation	37 (90.2)	2 (4.9)	2 (4.9)
Improve analytical and problem-solving skills	40 (97.6)	1 (2.4)	0 (0.0)
Develop a team spirit	40 (97.6)	(2.4)	(0.0)
Arouse interest in learning	38 (92.7)	2 (4.9)	1 (2.4)
Improve learning efficiency	40 (97.6)	1 (2.4)	0 (0.0)

## 5. Advantages and problems of formative evaluation

### 5.1. The advantages of formative evaluation

#### 5.1.1 It is helpful to evaluate students’ learning effect

- (1) From the perspective of teachers, formative evaluation helps them to grasp students’ learning situation in time and find ways to adjust teaching plans, which has positive significance for teachers to control the whole teaching progress and teaching process.
- (2) From the perspective of students, in the formative assessment system, through regular periodic tests, students can form a more comprehensive and objective understanding of their learning, find their



weaknesses in learning, and actively adjust their learning behaviors to effectively improve learning efficiency. Formative evaluation always pays attention to the growth of students in the classroom, regards students as the subject of the class, and students are encouraged and driven to fully learn, think, analyze and solve problems, and effectively improve the learning effect. In this process, the student-centered teaching concept has been fully reflected <sup>[14]</sup>.

### **5.1.2. It is helpful to the improvement of teachers' teaching ability**

In various daily formative evaluations, teachers can sort out the feedback data of students on the whole teaching process to make corresponding adjustments to the teaching process and teaching methods, so that the teaching content and methods of teachers can adapt to the actual situation of students, thus forming a virtuous circle of evaluation-feedback-improvement.

### **5.1.3. It is helpful to develop students' good learning habits**

Compared with the final assessment, the formative assessment system focuses more on the learning process. It uses multiple aspects of evaluation and supervision to guide students to correct learning. This can prevent students from attending classes to cope with attendance, which may lead to a lack of solid understanding of knowledge. Only by cramming before the exam can they get good grades and develop a habit of practical learning over time <sup>[15]</sup>.

## **5.2. Problems in formative evaluation**

Because formative evaluation focuses on the teaching process, the evaluation work is more complicated, and compared with the traditional evaluation mode, it also adds two links of feedback and correction, so it is more difficult to carry out. At present, there is still little research on formative assessment, and no unified guiding standards have been formed. As a result, when teachers apply formative assessment, the evaluation system is not comprehensive, the evaluation indicators are relatively few, and some teaching links are not accurate in the application of evaluation methods, and finally they cannot give correct teaching feedback.

## **6. Conclusion**

To sum up, formative evaluation plays a positive role in promoting clinical laboratory teaching. It makes up for the shortcomings of the traditional summative evaluation, which is one-sided and static, pays attention to the teaching process, and provides positive guidance for teaching reform through feedback and revision. It can be said that formative evaluation enriches and improves the evaluation system of basic clinical laboratory courses and guarantees the teaching quality of clinical laboratory courses. In future teaching work, formative evaluation will continue to play a role and will continue to improve with the development of teaching and achieve teaching goals more efficiently.

## **Disclosure statement**

The authors declare no conflict of interest.

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