

Construction of the Evaluation System of Classroom Practice Teaching in Colleges and Universities Driven by 5G Network Communication Technology

Zhigang Guo^{1,2,a,*}

¹*School of Education, Philippine Women's University, Ermita Manila, Metro Manila, Philippine*

²*Department of Culture and Creativity, Yantai Vocational College of Culture and Tourism, Yantai, Shandong, China*

^a*2021t1193@pwu.edu.ph*

**Corresponding author*

Keywords: 5G Network Communication Technology, Classroom Practice Teaching, Teaching Evaluation, Evaluation System

Abstract: As higher education reform continues to progress, university classrooms are making continuous efforts to cultivate well-rounded and high-quality talents. In order to follow the path of socialist modernization with Chinese characteristics and implement the national quality education policy, improving practical teaching and its teaching evaluation is a major breakthrough to realize the construction of the road of higher education reform. The importance of practical teaching can be imagined as an irreplaceable teaching link in the teaching process. In particular, under the current situation of education reform, classroom teaching practice has gradually been emphasized. In the past, more attention was paid to students' mastery of theoretical knowledge, while the requirements of modern teaching quality for college classroom no longer stay at the level of theoretical teaching. However, the modern college classroom does not really combine teaching with happiness and classroom with action. For the evaluation of practical teaching, there are also a series of problems. In order to optimize the teaching evaluation system and truly integrate the classroom into practice, this paper introduced 5G network communication technology and conducted a comparative experiment. The teachers and students of the experimental class jointly scored the classroom practice teaching evaluation system before and after the experiment. The experimental data showed that the teachers and students' rating of the evaluation subject has risen from 4.3 to 8.3; the score of the evaluation index rose from 5.6 to 9.1; the change of scoring results can show the satisfaction of teachers and students with 5G network communication technology. On this basis, an interview survey was conducted. The survey results showed that after the introduction of 5G network communication technology, the evaluation indicators were more optimized and the evaluation process became more scientific. The proposed research provided a value of reference for the construction of classroom practice teaching evaluation system in universities driven by 5G network communication technology and provided a direction for the future development of practice teaching evaluation.

1. Introduction

For the realization of the demands of the new era of socialist road for the high quality personnel training, it is necessary to realize the comprehensive development of quality education, make contributions to the cultivation of successors of socialism with both ability and morality, constantly improve the education and teaching evaluation system, and constantly make efforts to improve students' practical ability and comprehensive quality. Only by following the national policy path can people make steady progress in the action of education reform. As a farsighted breakthrough, teaching practice is very important to promote teaching reform. In the current form, it is especially important to build a systematic and standardized evaluation system of practical teaching in college classrooms. For verifying the promotion of a qualified practical teaching evaluation system for the reform of quality education, this paper proposes the construction of a 5G network communication technology driven college classroom practical teaching evaluation system, and conducts relevant comparative experiments and questionnaires. This paper also hopes that the use of 5G network communication technology can provide inspiration for college classroom practical teaching evaluation, so as to make the evaluation of college classroom practice teaching more perfect and promote the quality education reform policy.

The rapid change of teaching development has put forward a deeper requirement for practical teaching, which has also attracted the attention of many scholars. Korthagen F A J argued that the disconnect between doctrine and praxis in teacher education has resulted in many criticisms of the effects of teacher education [1]. Gess-Newsome J tried to measure the potential changes in teachers' knowledge and practice after intervention [2]. Poulou M S argued that teachers' sense of self-efficacy is just one of the small number of individual traits that forecast teachers' practice, while there is very limited research linking teachers' sense of self-efficacy to actual classroom practice [3]. Kaymakamoglu S E studied convictions, perceived practices and real classroom experiences related to conventional (teacher-centered) and constructed (student-centered) teaching [4]. Sadaf A investigated teachers' beliefs about classroom practices on the basis of the theory of scheduled behavior [5]. Barendsen E explored the relationship between teachers' knowledge and classroom practices within the context of innovation in education [6]. Practical teaching is particularly important to the education system, and the evaluation of practical teaching has a far-reaching impact on the implementation of educational reform.

The evaluation of practical teaching is an important link in practical teaching, and the existing evaluation forms of practical teaching are solidified, which cannot fully meet the teaching needs of practical classes. The promotion of 5G network communication technology on the construction of teaching evaluation system has attracted the research of many scholars. Andersson C said that forming evaluations have been shown to have the possibility of dramatically improving student performance [7]. Xue G said that students have a high evaluation of cooperative learning assisted by network technology, which has a positive impact on learning [8]. Almutairi T S analyzed the evaluation of teachers in schools to determine their accurate and objective evaluation degree [9]. Stroebe W believed that students' teaching evaluation did not measure teaching effect. While students need to get good grades, teachers need to be evaluated for good teaching. Thus, teaching evaluation empowered students to mold teachers' actions [10]. Dincer S said that many researchers have studied technology to ensure the integration of technology in the practical classroom [11]. Pisarov J introduced the concept of 5G technology, reviewed the evolution of 5G technology, and understood the working principle of 5G networks [12]. It is evident that, with the continuous growth of web technology, 5G network communication technology would also be gradually applied to the establishment of practical teaching evaluation system in college classrooms.

Reflecting the positive role of 5G network communication technology in promoting the building

of a practical teaching evaluation system in college classrooms and fostering students' learning attitudes, this paper uses a controlled experiment to conduct a study to verify the effects of 5G network communication technology through teachers' and students' ratings of the evaluation system. The results show that the score of teachers and students for the evaluation process has changed from 5.9 to 8.2, and the score for the evaluation results has also increased from 4.5 to 7.9. The increase in the score shows that 5G network communication technology can effectively improve the classroom practice teaching evaluation system, make its structure more complete, and fully mobilize the enthusiasm of students for learning.

2. Evaluation of College Classroom Practice Teaching

2.1 Overview of Classroom Practice Teaching

The construction of classroom practice teaching should follow three principles.

① Characteristic principle

Teaching characteristics are the purpose and development power of the school. The principles of classroom practice teaching should follow the development model of industries, scientific institutions and talents with high-quality education, and technical skills application training as the center, emphasizing the training of improvisation ability, and combining the foundation.

② Principle of practicality

The establishment of classroom practice teaching system should meet the needs of professionals and be formulated according to practical systems, so as to build a guiding principle with strict grades and clear division of labor. Practicality is the basic requirement of the practice teaching system.

③ Blending principle

The principle of mixing refers to the mixing between teacher types, between theoretical teaching and practical teaching, and between classroom and laboratory. This principle weakens the boundaries between them, breaks the layout of traditional teaching, and forms an integrated mixed practical teaching model.

2.2 Overview of Teaching Evaluation

2.2.1 Principle Classification of Teaching Evaluation

① Objectivity principle

The principle of objectivity refers to that when conducting teaching evaluation, whether it is the evaluation criteria, methods, and the attitude and evaluation results of the evaluators, they should be evaluated objectively, and subjective assumptions and personal feelings should not be added.

② Principle of integrity

The principle of integrity means that the teaching evaluation system is evaluated as a whole when the teaching evaluation is conducted. It cannot be one-sided evaluation of a certain aspect, nor can it be generalized. Due to the complexity of teaching and learning systems, they are composed of many factors. Therefore, to evaluate the teaching effect, people should evaluate the overall teaching quality and distinguish the secondary key points.

③ Guiding principles

The principle of integrity refers to that when teaching evaluation is carried out, it is not about the facts, but through careful analysis. It is to determine the cause and effect of the evaluation object from different angles through careful analysis, confirm the cause of the results, and make clear

analysis and guidance for the future direction of the evaluator through timely feedback and inspiration.

④ Scientific principle

The scientific principle refers to that when conducting teaching evaluation, people should formulate reasonable and unified evaluation standards from the perspective of education, and strictly deal with various data obtained by using advanced statistical methods according to the process of scientific evaluation.

⑤ Developmental principle

The principle of development refers to that teaching evaluation should be a means of encouraging teachers and students to learn, focusing on the progress and dynamic development of learning and the cultivation of teachers' education and ability.

⑥ Principle of simplicity

Simplicity is an important indicator to measure the ultimate comprehensibility of evaluation criteria. Generally speaking, simplicity is actually a reverse indicator to measure evaluation criteria. For the abstract level, the higher the level of abstraction contained in the evaluation content, the easier it is to understand, and vice versa.

The number of the last item to be evaluated is specified as one item, and the abstract level of the content is determined by the knowledge of concept stratification. In this way, the number of the first few items of the evaluation content, the arithmetic average of their respective abstract levels, and the weighted average of the number of the last item can be calculated by using the principle of simplicity of evaluation. The reason why the weighted average is adopted in the evaluation is that the attributes of the evaluation content are in order, and the importance of the content is different. Therefore, the importance difference of the evaluation content and the selection of the weighted value should also be considered in the evaluation.

2.2.2 Evaluation of Influencing Factors

In order to better reflect the impact of factor A in content $A \Rightarrow B$ on the occurrence of event B during evaluation and avoid meaningless evaluation, research and calculation are carried out based on the concept of each degree of evaluation.

The correlation of the evaluation can be expressed by the formula:

$$P_c(A \Rightarrow B) = \frac{P(B/A)}{P(B)} = \frac{P(AB)}{P(A)P(B)} \quad (1)$$

The correlation of $A \Rightarrow B$ describes the influence of factor A on event B .

① When $P_c(A \Rightarrow B) = 1$, it means that A has no influence on B , that is, A and B are independent of each other, which is called irrelevant evaluation;

② When $P_c(A \Rightarrow B) < 1$, it indicates that the occurrence of A reduces the possibility of the occurrence of B , which is called negative correlation evaluation;

③ When $P_c(A \Rightarrow B) > 1$, it indicates that the occurrence of A increases the possibility of the occurrence of B , which is called positive correlation evaluation.

The degree of interest reflects the difference between the probability $P(B/A)$ of B 's appearance under the condition that A occurs and the probability $P(B)$ of B 's appearance under no preconditions, that is, the difference between $P(B/A)$ and $P(B)$. If there is a large difference between the value of $P(B/A)$ and $P(B)$, it indicates that the appearance of A has a great impact on B , which can provide very meaningful guidance information for the evaluation process.

The interest degree based on probability difference can be expressed as:

$$P_{I1}(A \Rightarrow B) = P(B/A) - P(B) \quad (2)$$

The degree of interest of the evaluation can also be expressed by the definition of interestingness:

$$P_{I2}(A \Rightarrow B) = \frac{P(B/A) - P(B)}{\max(P(B/A), P(B))} \quad (3)$$

- ① When $P_i(A \Rightarrow B) = 0$, A and B are not related, that is, A and B are independent of each other;
- ② When $P_i(A \Rightarrow B) > 0$, then A is positively correlated with B ;
- ③ When $P_i(A \Rightarrow B) < 0$, A is negatively correlated with B .

If $P(A)$ is used to represent the probability of the occurrence of factor A , and $\bar{P}(A)$ is used to represent the probability of the non occurrence of factor A . The support and confidence of the evaluation content association rule $A \Rightarrow B$ can be expressed as $P(AB)$ and $P(AB)/P(A)$ respectively, and then the expression of the validity of definition $A \Rightarrow B$ is:

$$P_V = (P(AB)/P(A)) \times P(A) - (\bar{P}(AB)/\bar{P}(A)) \times \bar{P}(A) \quad (4)$$

It can be simplified as:

$$P_V = P(AB) - \bar{P}(AB) \quad (5)$$

Considering the possibility of B appearing when A does not appear, $P(A)$ represents the probability of A appearing; $P(B)$ represents the probability of B appearing; $P(AB)$ represents the probability of A and B appearing at the same time; $P(\bar{A}B)$ represents the probability of \bar{A} and B appearing at the same time. The expression of matching degree of definition $A \Rightarrow B$ is:

$$P_m = \frac{P(AB)}{P(A)} - \frac{P(\bar{A}B)}{P(\bar{A})} \quad (6)$$

To facilitate understanding and calculation, Formula (6) can be transformed into:

$$P_m = \frac{P(AB) - P(A)P(B)}{P(A)(1 - P(A))} \quad (7)$$

When the value of an evaluation content is $0 < P(A) < 1$, it is considered that it has no correlation with any other evaluation content, and the matching degree between this content and other content would not be examined. The probability of occurrence of any evaluation content A is $0 < P(A) < 1$. As there are $0 < P(AB)/P(A) \leq 1$ and $0 < P(\bar{A}B)/P(\bar{A}) \leq 1$, it can be seen from Formula (7):

- ① If $P_m > 0$, then $P(AB) > P(A)P(B)$, indicating that A and B are positively correlated;
- ② If $P_m = 0$, then $P(AB) = P(A)P(B)$, indicating that A and B are independent;
- ③ If $P_m < 0$, then $P(AB) < P(A)P(B)$, indicating that the negative evaluation of evaluation may be of research value.
- ④ If $P_m = 1$, then $P(AB) = P(A)P(B)$, indicating that A and B appear or do not appear at the same time in content G .

It can be seen from the formula that the definition of matching degree includes not only the correlation factor, but also the factor of $P(B)$. Therefore, the matching degree can fully reflect the

effectiveness of evaluating $A \Rightarrow B$.

2.2.3 Functions of Teaching Evaluation

Colleges and universities need to formulate education plans in accordance with the national education policy. The teaching contents, objectives and tasks specified in the education plan are the basis for teaching evaluation. The functions of teaching evaluation fall into six categories, as shown in Figure 1.

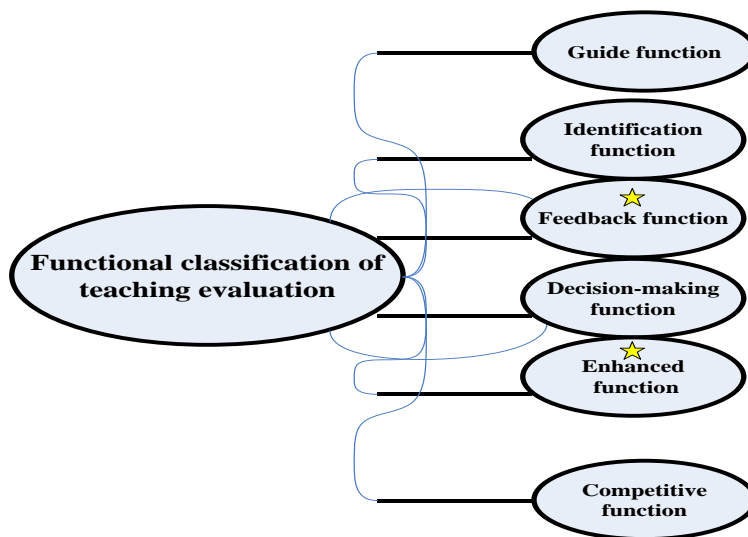


Figure 1: Functional classification of teaching evaluation

① Guidance function

The teaching content can be divided into several parts, and the evaluation criteria can be planned according to the curriculum plan formulated by the education policy. The criteria can be used to judge whether the teaching content is implemented according to the curriculum plan, so as to ensure that the teaching always follows the correct path. Therefore, the teaching evaluation and education teaching have the guiding function.

② Identification and selection function

Through the teaching evaluation, people can clearly understand the teaching situation of teachers, thus facilitating the professional guidance of teachers' teaching. Teaching evaluation is also a path for teacher recruitment and performance assessment, which is helpful to help teachers learn and improve their professional standards on the basis of understanding their teaching level. Teaching evaluation can also identify students' mastery of knowledge and skills, and provide a reference for the country to select high-quality talents. It is also an effective basis for understanding students' learning.

③ Feedback function

Through teaching evaluation, teachers and students can understand the effectiveness of teaching and thus provide timely feedback. Feedback has an essential function in teaching and learning. Teachers and students can be aware of the teaching and learning situation, and adjust the teaching behavior and learning plan according to the information feedback, so as to achieve the goal efficiently.

④ Consultation and decision-making function

Scientific teaching evaluation is the basis of teaching decision-making. Only when people have a comprehensive and accurate understanding of the teaching work can people make a correct decision.

⑤ Enhancing functions

Teaching assessment can motivate teachers' teaching work, stimulate students' intrinsic power to learn, and keep the appropriate tension between teachers and students in the teaching process, so that both teachers and students can concentrate on the important aspects of the teaching task.

⑥ Competitive functions

It is more inclined to horizontal comparison among students, classes, teachers and disciplines, so that teachers and students can understand their own advantages and disadvantages and find their own position in the overall. Therefore, teaching evaluation objectively has a competitive function.

2.3 Overview of 5G Network Communication Technology

5G represents the fifth-generation mobile communication technology (5G). It is a kind of new generation bandwidth mobile technology with short time, fast speed and wide connectivity domain, which is an online facility for human-computer interaction [13]. 5G includes the key technologies of 5G wireless and 5G network. The strict requirements of 1000 times data traffic increase and 1 millisecond round trip delay make limiting potential huge energy consumption one of the most challenging problems in the upcoming 5G network design [14]. On the basis of the diversity of 5G features, 5G network telecommunication technologies are already being used in various areas of daily life. The significant growth of mobile data traffic has led to encourage the development of more efficient network designs by researchers and system designers [15]. 5G application fields are shown in Figure 2.

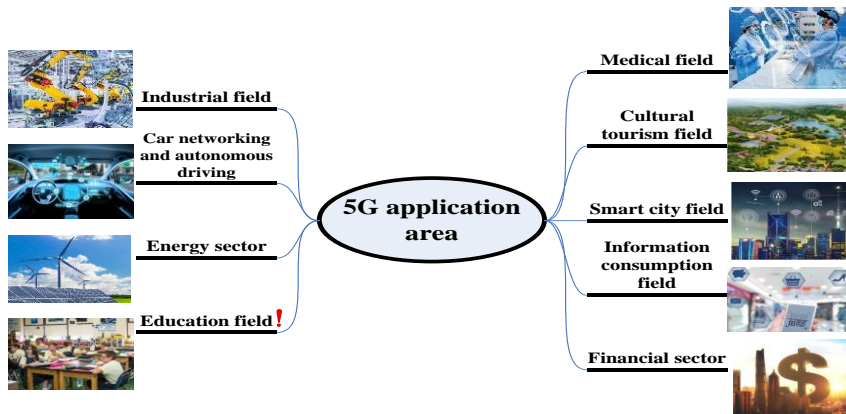


Figure 2: Classification chart of 5G application areas fully shows the wide range of 5G technology.

3. Evaluation of College Classroom Practice Teaching Based on 5G Network Communication Technology

3.1 Questionnaire Investigation

① Analysis of the objects of the questionnaire survey

This study conducted a questionnaire survey on 300 members of a university, including 46 English teachers and 254 students. Because different disciplines have different characteristics, this study also investigated the subject's professional disciplines. The survey results are shown in Figure 3.

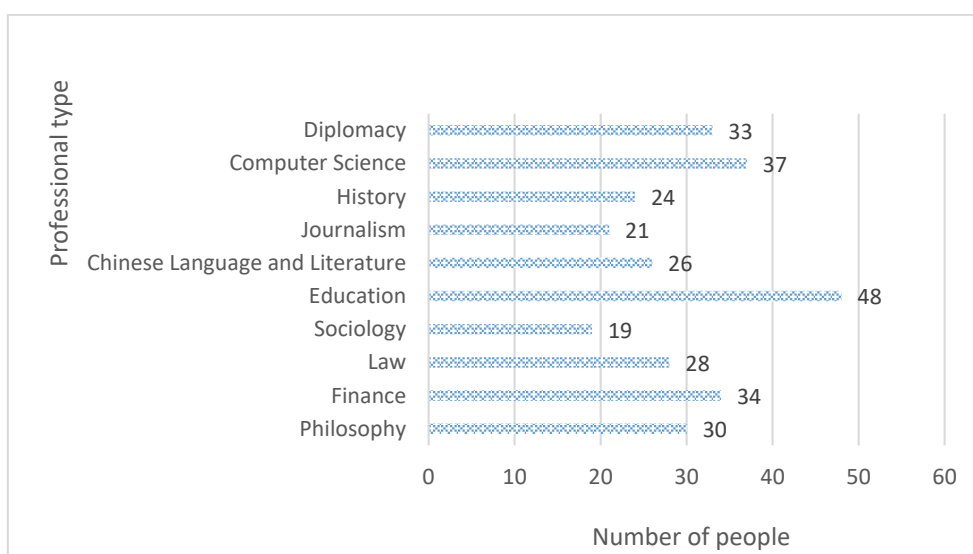


Figure 3: Map of specialty distribution of survey respondents

② Questionnaire reliability

There were 400 questionnaires issued in this study, of which 336 were collected, with a recovery rate of 84%. 36 questionnaires with many missing questions were deleted, and finally 300 valid questionnaires were counted. The results of the questionnaire were performed by Statistical Products and Services Solutions (SPSS) software for analysis, and the Cronbach coefficient α was selected as the reliability coefficient. The evaluation of college classroom practice teaching was investigated from four aspects, and the reliability of the questionnaire was shown in Table 1. The figures indicated that the questionnaire in this study had good reliability.

Table 1: Reliability of questionnaire survey

Reliability Statistics	
	Cronbach's Alpha
Evaluation subject	0.87
Evaluation index	0.89
Evaluation process	0.91
Evaluation results	0.88

③ Questionnaire results

This survey was conducted to address the issues in the assessment of classroom practice teaching in colleges and universities. The findings of the survey are shown in Figure 4 (multiple choice allowed).

From the questionnaire results, it can be seen that most people agreed that there were problems in the evaluation of college classroom practice teaching; 221 people thought that the evaluation results were not properly handled; 235 people thought that the evaluation process was not standardized; 208 people thought that the evaluation indicators were too quantitative; 213 people agreed that the evaluation subject was too single. Ignoring a small number of people with neutral attitudes, this questionnaire is enough to show that the problems in teaching evaluation have been very serious. Therefore, it is particularly necessary to introduce 5G network communication technology into the evaluation of college classroom practice teaching.

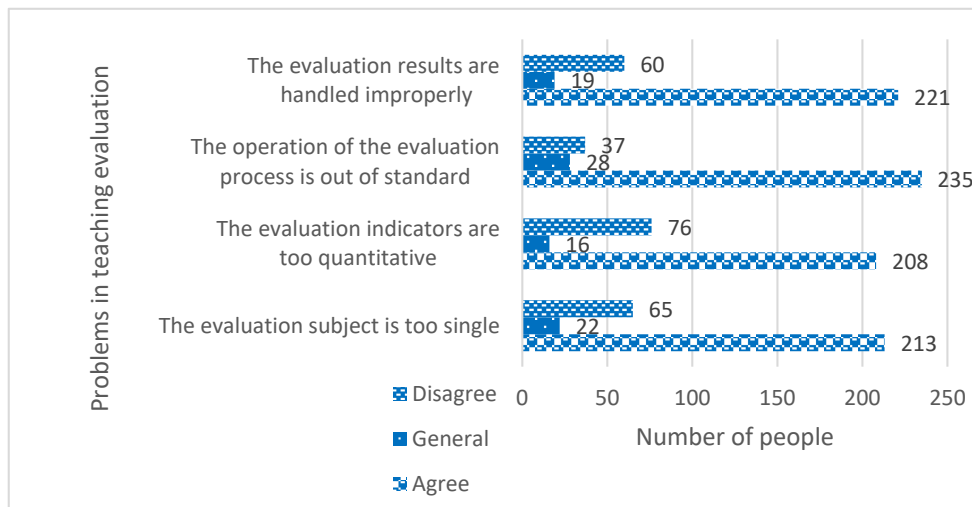


Figure 4: Results of questionnaire survey

3.2 Evaluation of the Role of 5G Network Communication Technology in the Evaluation of College Classroom Practice Teaching

There were 51 teachers and students in this class. Before the experiment, teachers and students in this class were asked to rate the existing evaluation system of classroom practice teaching. The system factors include the evaluation subject, indicators, process and results. After introducing 5G network communication technology into practical teaching for one semester, teachers and students of the class were asked to rate the evaluation system of practical teaching again. Figure 5 and Figure 6 are the comparison charts of this experiment.

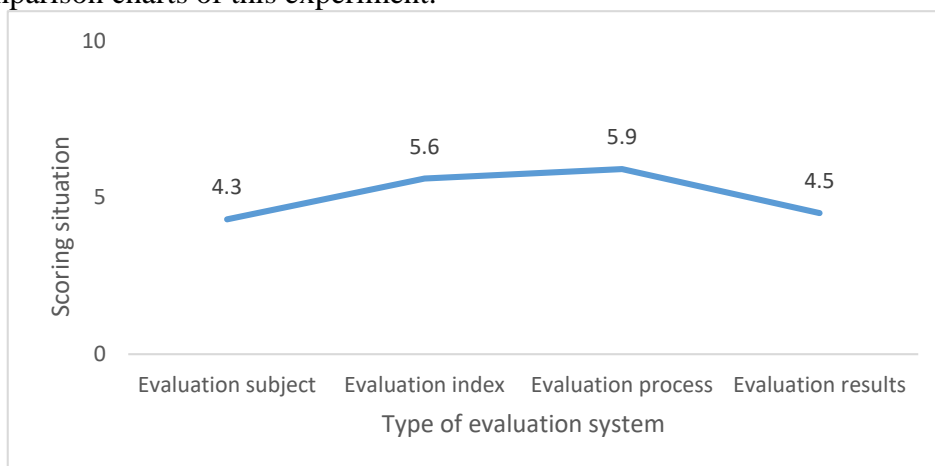


Figure 5: Scoring chart of the valuation system before the experiment

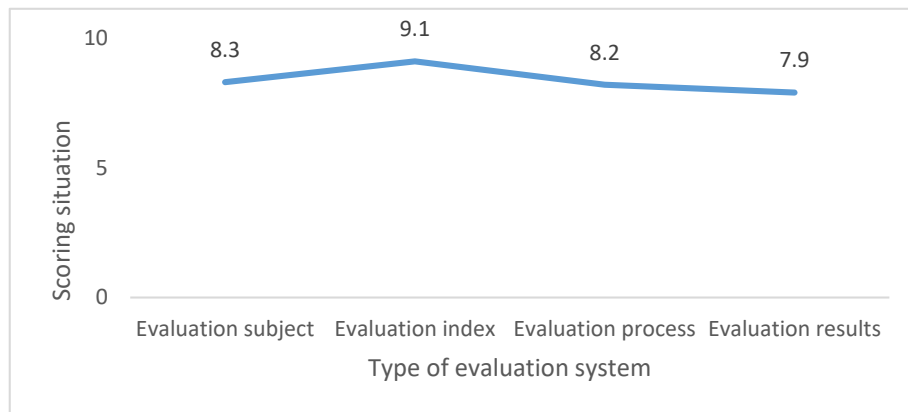


Figure 6: Scoring chart of the evaluation system after the experiment

Looking at the two groups of experimental data, it can be seen that after the introduction of 5G network communication technology in the experimental class, the classroom practice teaching evaluation system was more perfect. The score of teachers and students on the subject of evaluation increased from 4.3 to 8.3; the score of the evaluation index rose from 5.6 to 9.1; the score of the evaluation process changed from 5.9 to 8.2, and the evaluation result also increased from 4.5 to 7.9. The scores of the four factors were rising. It fully showed that teachers and students were more satisfied with the classroom practice teaching evaluation system after the introduction of 5G network communication technology. In response to the scoring, this article conducted questionnaire interviews among the students and faculty of the class to ask about the results of the construction of a practical teaching evaluation system for classroom practice driven by 5G network communication technology. The changes in the evaluation system are shown in Figure 7.

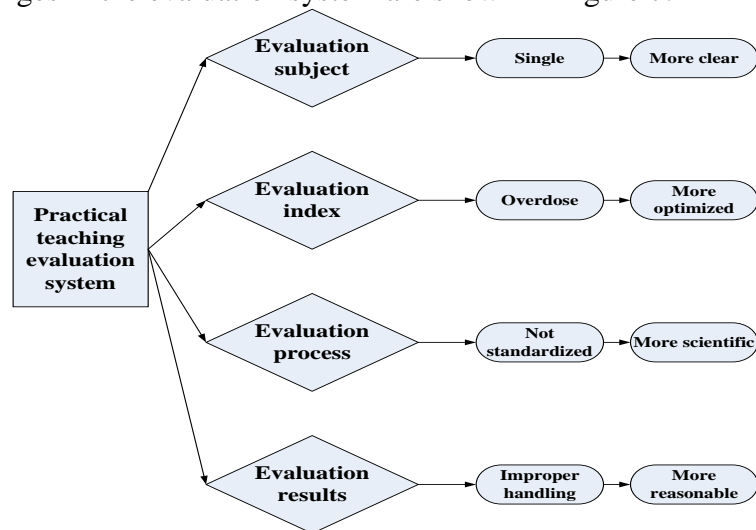


Figure 7: Chart of changes in the evaluation system

After the introduction of 5G network communication technology, the teachers and students of the experimental class considered the evaluation system more specific and improved according to the analysis of the experimental data. The evaluation subject has changed from too single to more clear, and the evaluation indicators have been more optimized. The 5G network communication technology not only made the evaluation process more scientific from the original lack of standardization, but also made the evaluation results more reasonable. In conclusion, 5G network communication technology has obviously promoted the establishment of a practical teaching evaluation system in college classrooms.

4. Conclusions

The pace of quality education reform and renewal is constantly advancing. College classrooms are also getting better and better on the road of education reform. The research on classroom practice teaching evaluation has a long history, and even there are relatively mature theories to demonstrate it. However, teaching evaluation without technology support would always stay at the traditional classroom level. It is of great significance to apply 5G network communication technology to college classroom practice teaching evaluation to drive the construction of college classroom practice teaching evaluation system, which is an inevitable choice in the practice era. The experimental data can prove that 5G network communication technology plays an extraordinary role in promoting the evaluation of practical teaching. It is only a matter of time before it is fully applied to teaching. It is also crucial to constantly improve the education and teaching system and improve the professional quality of students. However, due to the time constraints, the experimental results may have some errors due to the short duration of this experiment. Moreover, the problems existing in the evaluation of classroom practice teaching in colleges and universities have a long history, and cannot be solved overnight. However, following the path of socialism with Chinese characteristics, these problems would eventually be solved. In order to better understand the impact of 5G network communication technology in the evaluation of college classroom practice teaching, the analysis results would be further improved in the follow-up research.

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