Research on Improving Teaching Quality in Higher Vocational Colleges Based on Intelligent Data

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Abstract: Based on the concept of "student development as the center" and the purpose of cultivating high-tech and skilled talents, this paper discusses the establishment of a relatively independent quality assurance mechanism in five horizontal levels, such as school, major, curriculum, teachers and students. Combined with the application of artificial intelligence technology, the "student-teacher-supervisor PDCA feedback communication system" based on the real-time feedback and interaction between teachers and students was developed. It has achieved obvious results in improving the school teaching quality and promoting the individual development of students.

1. Introduction

1.1 Research Background

There are three major problems in the process of teaching quality management in higher vocational colleges: first, the feedback of evaluation results is not timely, the teaching quality data is scattered and incomplete, and the data analysis ability is low. Second, the process monitoring of teaching quality is weak, and the lack of diagnosis and analysis of key links in the implementation of majors and courses makes the state data diagnosis point monitoring from special diagnosis and reform of professional courses, and fails to realize the connection of teaching quality points (classroom), line (course), surface (major) and body (quality of talent training).[1]Third, there is a lack of information system with high fit with the process management of teaching quality, which cannot help the quality management department to realize data decision-making, nor can it realize the interaction and communication between teachers, students and supervisors. The core of the three difficult problems is the acquisition, analysis, feedback, diagnosis and improvement tracking of big data of the whole process of teaching quality, that is, putting forward higher requirements for the evaluation and diagnosis of the whole process of teaching quality management.

1.2 Study Methods

1.2.1 Research methods of the social system

As an important part of it, the research method of social system naturally has these

characteristics, but its emphasis is different. It emphasizes the relationship between elements, system and environment, and focuses on the three pairs between elements and elements, system and elements, system and environment. The social system research method holds that human society, like natural society, is a complex system composed of numerous interconnected and interacting factors with certain structures and levels.[2]Moreover, this system is not closed and static, and it has always been in the dynamic and open process of material, energy and information exchange with the external environment. It can be seen that the system has the characteristics of integrity, structure, hierarchy and openness. It is these characteristics that enable the system to change dynamically, self-regulate, and play a unique function in its own internal organization and adaptation to the external environment. The social system research methods are used to investigate many systems in the society, and the focus is to clarify the system elements, grasp the system characteristics, take into account the system operation law and the external environment conditions, predict the evolution process of the system, and achieve the optimization of the system function.

1.2.2 Education quality assurance system of higher vocational colleges

The quality assurance of education in higher vocational colleges belongs to the category of education quality assurance, but due to the particularity of students in higher vocational colleges, the specific connotation of education quality assurance in higher vocational colleges is unique compared with other educational stages.[3]A different quality of teaching content, higher vocational college education wang activity is not to impart knowledge and skills as the main purpose, more is in the natural activities and the game process of physical, emotional, cognitive and social development, so the direct education result is not easy to investigate, the focus should be the biggest influence on the results, the most direct process quality.

1.3 The components, structures and functions of the education quality assurance system in higher vocational colleges

The reason why the social system research method is adopted to explore how to construct the education quality assurance system in higher vocational colleges is that, in essence, the teaching quality system is a system composed of many elements, such as teaching quality subject, teaching quality object and teaching quality content. According to the analysis of the social system research methods, the decomposition of the system is the primary task of investigating the system.[4] Specifically, "decomposition" includes clarifying the elements of the system, clarifying the structure between the elements and clarifying the functions of the system.

1.3.1 Elements of the education quality assurance system in higher vocational colleges

1.3.1.1 Subject of teaching quality

It refers to the organization, organization or department that has the main responsibility for the quality of teaching quality activities, that is, the problem of "who will be the teaching quality". As an important social public welfare cause in higher vocational college education, the state should play the leading role in its quality teaching activities. However, the teaching quality at the national level can only be dominant and generalized, and the main body of the specific improvement of education quality in higher vocational colleges is the teachers and administrators within the system of higher vocational colleges.[5]In addition, as the most basic part of the national education system, the effect of this education activity has an important impact on students themselves, every family and even the society, and is a topic of common concern to families, professionals, social organizations and the media and the public. To sum up, the teaching quality subject of the education

quality assurance system in higher vocational colleges should not only cover multiple subjects such as teachers, students, families and social organizations, but also adhere to the leading position of government agencies.[6]

1.3.1.2 Objects of teaching quality

It refers to the question of which institutions and departments should accept the teaching quality, that is, "who receives the teaching quality". The development of education in higher vocational colleges obviously not only depends on the efforts of higher vocational education institutions themselves. Due to the public welfare of higher vocational education education, the government is duty-bound for its development. Therefore, all kinds of higher vocational colleges education institutions and relevant government departments should be included in the teaching quality object. According to the actual situation in China, the educational institutions of higher vocational colleges can be divided into private and public higher vocational colleges; according to the service object, the institutions can be divided into two categories: providing education services for college students.[7]As the objects of teaching quality, the relevant government institutions have different vertical levels, such as provincial education administrative departments, local education administrative departments, etc.

1.3.1.3 Teaching quality and content

It refers to the evaluation and supervision of the object of teaching quality, that is, "what is the teaching quality". From the macro level, the quality assurance of higher vocational education should involve the performance of higher vocational education, including financial input, management system and standard setting; From the micro level, the education quality assurance of higher vocational colleges is mainly the teaching quality of higher vocational education institutions. Education quality is usually divided into structural, process and result quality, which mainly includes site equipment and class size of higher vocational colleges; process quality mainly includes interpersonal relationship and curriculum implementation; and outcome quality reflects the degree of development in all aspects.[8]At present, the evaluation of structural quality and process quality is mainly used in the education stage of higher vocational colleges.

1.3.1.4 Teaching quality method

It refers to the organizational form, tools, standards and other means and methods of teaching quality activities, that is, the problem of "how to develop teaching quality". According to the organizational form of teaching quality, the education quality assurance of higher vocational colleges can be divided into internal teaching quality and external teaching quality. Internal teaching quality is the self-evaluation of educational institutions in higher vocational colleges, which has the advantages of promoting teachers' reflection and deepening institutional reform. The external teaching quality can be divided into two categories. One is the rating, education statistics, qualification examination led by government departments and obtain education data at the macro level.[9]Second, the evaluation of third-party institutions, carried out by professional institutions and families, to make educational information more comprehensive and diversified. According to the evaluation method of teaching quality, the education quality assurance in higher vocational colleges can be divided into quantitative and qualitative evaluation methods. The former generally adopts standardized tools such as tests and scales, while the latter uses non-standardized tools such as observation and interview.

1.3.1.5 Purpose of teaching quality

It refers to the expected purpose of teaching quality activities, that is, the problem of "for what teaching quality". The purpose of teaching quality has a dominant and overall influence on quality teaching quality activities, which determines the pattern of each element of teaching quality system. The purpose of education quality assurance in higher vocational colleges has two categories: supervisory purpose and developmental purpose. Supervisory purpose, as the name implies, focuses on the supervision function of quality teaching quality, that is, urge the government to perform its duties, supervise the educational institutions of higher vocational colleges to follow the relevant laws and regulations, and standardize the school;[10]The developmental purpose is to promote the improvement of quality through teaching quality, which is a further requirement, that is, to find and analyze the problems and deficiencies of educational activities, and to put forward and help institutions to take feasible improvement measures, so as to improve the educational quality of educational institutions in higher vocational colleges.

2. Current status of higher vocational college education

2.1 Erect five guarantees and build a quality shield

To improve the quality of education and teaching and promote the connotative development, Shenzhen Vocational and Technical College passed the acceptance of the national model school construction in 2009 and entered the demonstration period. The school trains applied talents based on the OBE education concept, and evaluates the teaching effect of the course. Establish a regular internal quality assurance system and a sustainable self-diagnosis and improvement working mechanism, so as to improve the quality of personnel training in colleges and universities, and provide high-quality technical personnel guarantee and intellectual support for the local economic development.[11]

Integrality is the most essential characteristic of the system, that i s, the whole is greater than the sum of the parts. The system is based on each component, but on this basis it the functions that each part does not have. This characteristic of the system is determined by the relationship between its components and the interrelated elements, that is, collaboration produces new quality. To use the principle of system integrity to guide the construction of the university education quality system, it is necessary to clarify the components and the connection of the education quality system.

The education quality system in colleges and universities is mainly composed of five parts: education quality assurance subject, education quality assurance object, education quality assurance content, education quality assurance method and education quality assurance purpose. At present, China has not yet established a unified quality system of college education, so all the components are still in the process of continuous formation and change.[12]The subject of education quality assurance is mainly the single leader of government agencies; the object of educational quality assurance is mainly for public student schools, mostly qualification examination; education quality assurance is mostly based on the rating standards set by provinces and cities, including structural quality elements such as school management conditions, grade assessment and educational supervision, the quantitative evaluation method; the purpose of education quality assurance is basically at the supervision level, but in recent years emphasize the orientation of quality improvement. The components mentioned above are in the right state, and what is expounded here is the current actual situation of China. By contrast, it can be seen that the quality system of college education in China is incomplete, and it needs to bridge the vacancy of the system in the five elements. The constituent elements are not complete, and the connection between the elements is naturally a disorder.[13] In recent years, under the background of the comprehensive construction of

high-quality education system, the purpose of the college education quality system has gradually shifted from emphasizing the rating to emphasizing the function of guidance and development. However, the lack of evaluation standards, the lack of local education quality assurance tools, the content of education quality assurance is still based on input elements.

2.2 Structural principles

The structure of the system refers to the way of interaction and action between the elements, parts and levels of the system, that is, the combination mode between the components. Usually, each component can be realized in combination according to different proportions, orders and methods. The structural principle of the system shows that the more reasonable the structure of the system, the more efficient the system operation and the more perfect the function. Therefore, the reasonable combination of the university education quality system in the above five components should be realized.

The structure of university education quality system is reflected in the five elements of education quality assurance subject, education quality assurance object, education quality assurance content, education quality assurance method and the purpose of education quality assurance. First, the subject of education quality assurance should take into account the government leadership and multi-party participation. At present, the main body of education quality in China is only limited to the government category, and the division of labor of education quality assurance institutions at all levels is not clear. First of all, a unified government education quality assurance agency from the central to the local governments should be established to lead the overall situation. Secondly, actively promote external subjects to join as independent third parties, especially professional institutions. Again, give institutions the opportunity to self-assess and supervise to enhance the intrinsic motivation to improve quality.

2.2.1 Principles of hierarchy

The hierarchy of the system is determined by the integrity and structure of the system, mainly reflected in the following two aspects: first, the whole system can be composed of subsystems of different levels, and each subsystem has its own internal hierarchy; second, the operation rules of different subsystems are different, so its properties, characteristics and functions are different. It is necessary to distinguish the different levels of the education quality assurance system, and to grasp the commonness and particularity of the subsystems at different levels.

3. Focus on the major and establish the principle of "three combination" for education quality assessment

The internal quality assurance system of education and teaching should establish a diagnosis and improvement mechanism, continuous improvement, continuous improvement and continuous improvement. The relevant units should, according to the actual situation of the development of the school, refine the construction tasks, strengthen the process supervision, promote the improvement of the construction quality, and ensure that the construction tasks take root and the construction objectives are fully realized.

In terms of professional quality assurance, the diagnosis and reform of teaching quality focuses on the professional construction, takes the brand professional construction and the Sydney agreement certification major as the starting point, and aims at the normal diagnosis and improvement of professional positioning, training program, curriculum system, teachers, teaching conditions, talent training effect and other aspects.

Informatization is the basis of diagnosis and reform work. The establishment and improvement of the information platform can make the diagnosis and improvement work information, normalized and objective. On this basis, the principle of "three combinations" should be based on.

The combination of teaching quality evaluation and diagnosis improvement: teaching is the main means of school talent training, teaching is the largest daily work of the school, and the quality of teaching directly affects the quality of talent training.[14]Can be set according to the diagnostic target index system and the teaching quality evaluation method, through experts, students, teachers and other data survey for the evaluation results, through the analysis of the evaluation results data can get courses, teaching, student satisfaction harvest analysis, to determine what work done well, should continue to keep, what work is not done enough, need to improve. We believe that evaluation is the process of diagnosis, and that diagnosis and improvement are the result of evaluation.

So from a teaching point of view, you can.

Combine data investigation with expert investigation: for a large amount of work, data investigation can be adopted; investigate with experts for special work or overall and conclusive work; combine the two organically to form the basic working methods of diagnosis and improvement.

Combine accessibility and measurement: according to SMART principle (S=Specific, M=Measurable, A =, Attainable, R=Relevant, T=Time bound), design schools, majors, courses, teachers and students. Based on the process method, various activities and resources are identified and managed as processes, determine the input and output process of each process and the interface of the associated process, set up quality monitoring points, and establish a quality system integrating target responsibility, quality standard, work system and performance assessment.[15]

4. "Three levels" of continuous improvement: from ability cultivation to value generation

With the student-centered concept, the whole process data is collected from the three levels of major, curriculum and classroom, and the key nodes of diagnosis are used. Big data analysis and real-time feedback are applied to form a periodic diagnosis and reform operation system.

4.1 Learn from the international professional certification standards, and carry out the whole process of professional construction quality evaluation

On the basis of the docking of industry needs, the process of strengthening professional construction by relevant departments involves a number of key links such as the analysis of professional talent needs, the determination of professional post ability objectives, and the formulation of professional diagnosis and evaluation standards. The process also includes professional training objectives, typical tasks, curriculum system, teaching effect, practical training and other relevant data. To ensure an overall improvement in quality, we use a systematic approach that includes professional self-assessment, diagnosis, improvement plans and school diagnosis and review to further improve the overall quality of professional education through regular comprehensive professional diagnosis.

4.2 Integrate cognitive goal classification and career action ability, and carry out quality evaluation of the whole course construction

Teachers can determine the course diagnosis scheme and diagnosis points according to the course content, professional standards and students' goals. The diagnosis points of the curriculum are divided into three aspects and 11 key points: basic diagnosis, including six key points: course

positioning, course objectives, teachers, students, training room, and course construction; In the implementation of diagnosis in curriculum, the two key points are teachers' teaching quality and students' satisfaction; In terms of curriculum effect evaluation, it includes several aspects: curriculum evaluation standards, three-point analysis of test papers, grade analysis, data collection of students and teachers, docking information between curriculum objectives and professional training objectives, curriculum organization data, information related to curriculum and ability cultivation, teaching effect and evaluation data, curriculum experimental teaching equipment and spatial information, etc. In this way, the teaching process can be fully standardized from the course target orientation to the course implementation to the teaching effect analysis. Standardize the curriculum ability objective and its expression.[16]At the same time, according to the four steps of self-examination of the course group-self-diagnosis-making improvement plan-school diagnosis and review.

4.3 Adhere to the concept of "student-centered learning", and carry out the whole process of classroom teaching quality evaluation

"Student-centered learning" (Student Centered Learning) is the core concept of the teaching reform of higher education in the European Bologna process. It emphasizes the dominant position of students in the teaching process, stimulates students 'learning motivation and promotes the cultivation of students' ability, which objectively requires students to participate more in teaching activities.

Based on the demand of connecting vocational education teaching and production process, the weight of students' teaching evaluation on teachers has been increased to 50%, three school teaching quality evaluation documents have been revised, and three sets of supervised classroom evaluation indicators and two sets of student evaluation indicators have been classified, among which the mid-term index of students focuses on the leading follow-up of course content. Use case or project (task, etc.) teaching methods; The final index of students focuses on harvest and satisfaction evaluation, and the student evaluation rate is above 97% every semester.[17]

Through the teaching progress information collection, class teaching quality supervision, student evaluation, supervision-teacher-student quality information feedback communication, after-class students teaching effect evaluation, department evaluation teachers self-diagnosed data analysis, from before class, class, after class, the whole process of teaching quality, evaluation and feedback, effectively improve the teaching effect of talent training.

4.4 Data collection, analysis and feedback, tracking and review to form a closed-loop management of whole process quality diagnosis improvement

We can improve the data collected by internal quality management and diagnosis system, data visualization system and other information systems, and establish data warehouses composed of structured data and unstructured data through data analysis; teachers can use data extraction, intelligent evaluation analysis, visual analysis, portrait and other technologies to analyze big data, as the basis for diagnosis improvement and performance assessment, to achieve the teaching quality diagnosis of schools, majors, courses, classes, teachers.

In the process of information feedback, it is issued in the form of mobile information instant feedback and analysis report, or the diagnosis and Improvement Proposal is issued to the relevant teaching units for improvement, and the quality department tracks and reviews, so as to realize the closed-loop system of teaching quality diagnosis-feedback-improvement.[18]

4.5 Independent research and development of information system to realize the diagnosis and improvement of the whole-process teaching quality at three levels

Internal quality management and diagnostic analysis system is independently developed by the management team, with the school teaching quality management constantly increasing information modules, including 7 subsystems: teaching quality comprehensive evaluation and diagnostic analysis system; internal quality diagnosis and improvement management system; "student-teacher-supervisor" PDCA feedback communication system; teacher self-diagnosis and self-test system; internal quality feedback and improvement tracking system; document data management system; status data diagnostic analysis visualization system, etc.

In the operation process of quality diagnosis and improvement system of major, curriculum and classroom, the information system realizes the personalized definition of multidimensional evaluation model, mobile and desktop rapid and heterogeneous data collection, arbitrary data extraction, intelligent evaluation analysis, instant feedback, improved tracking management, big data visual analysis of portrait, supporting the whole process of diagnosis and improvement of teaching quality; the daily work of quality management system, diagnosis and improved big data analysis system, PDCA feedback communication of teachers, students and supervisors, and promotes the construction of quality culture.

We found that in the operation process of professional, curriculum and classroom quality diagnosis and improvement system, the information system realized the personalized definition of multidimensional evaluation model, mobile and desktop fast heterogeneous data acquisition, arbitrary data extraction, intelligent evaluation analysis, instant feedback, improved tracking management, and big data visualization portrait analysis, supporting the whole process of teaching quality diagnosis and improvement.It can also promote the construction of quality culture through daily work quality management system, diagnosis and improvement of big data analysis system, PDCA feedback communication with teachers, students and supervisors.[19]

5. The utility of the diagnosis and improvement of education and teaching quality

Diagnosis and improvement of education and teaching, take students as the center, track the quality of the whole process from the three levels of major, curriculum and classroom, diagnose the key links, position the weak nodes, and improve the improvement effect of major and curriculum.

5.1 Diagnosis and Improvement of Teaching Quality has obvious effect on improving teaching quality

In terms of promoting specialty construction, the teaching quality diagnosis and improvement promote the professional development methods and means, refine the post tasks and optimize the curriculum system; The course construction is classified according to the cognitive objectives, standardizing the curriculum ability objectives, following the quality management, ensuring that the course objectives and teaching content meet the post ability requirements of the industry.

We can diagnose and analyze the key links in the process of major and course construction and implementation, accurately locate the weak links in the whole process, improve the efficiency of major and course improvement, so that the teaching quality can get continuous attention from the point (classroom), line (course), surface (major) and body (quality of talent training). Quality data is not only used as the basis for performance appraisal, but also as the reference data for defect discovery, diagnostic analysis, improvement task assignment and improvement tracking, so as to promote the effective use of diagnostic results for teaching improvement.[20]

5.2 Diagnosis and improvement of teaching quality Promote the change of teaching evaluation means

The whole process quality diagnosis focuses on the use of process quality assessment data, and the self-developed mobile terminal "student-teacher-supervisor PDCA feedback communication system" realizes instant feedback and interactive communication. Constitute student-teacher-supervisor peer-to-peer online interaction. Students give feedback on classroom discipline, learning situation, questions and discussions. Teachers check students and supervise the evaluation results, supervise and understand the learning status, and feedback the classroom observation and evaluation results. Feedback and communication information will accumulate in the system over time, forming massive data sources to support the overall evaluation of the teaching quality of departments or teachers.

Based on the concept of management service, big data is carried through the teaching process, so as to give full play to the important role of educational big data in improving the quality of education, promoting educational equity, realizing personalized learning, optimizing the allocation of teaching resources, and assisting scientific decision-making in teaching.

6. Conclusion

With the concept of "student development as the center" and the purpose of cultivating high-tech talents, this paper discusses the establishment of a relatively independent quality assurance mechanism at five horizontal levels: school, major, curriculum, teachers and students. Combined with the application of artificial intelligence technology, the "student-teacher-supervisor PDCA feedback communication system" based on the real-time feedback and interaction between teachers and students was developed. It has achieved obvious results in improving the school teaching quality and promoting the individual development of students.

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