

Construction of Teacher Performance Appraisal System in Vocational Schools Under the BSC Visual Valve

-- Based on The Application of The PDCA Cycle

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Abstract

Based on PDCA cycle and Balanced Scorecard (BSC) theory, this paper constructs a set of scientific and reasonable performance appraisal system for secondary vocational teachers. As an important cornerstone of China's vocational education system, secondary vocational education is of great significance to the training of high-quality technical and technical personnel. However, there are many problems in the current performance appraisal system of secondary vocational teachers, such as imperfect indicators, non-standard process, poor feedback, etc., which restrict the improvement of education quality and the stimulation of teachers' enthusiasm. This paper analyzes the characteristics of secondary vocational education, combines with the four dimensions of finance, customer, internal process, learning and growth, and scientifically sets the assessment objectives and weights, to ensure that the fit with the school strategy. With the help of PDCA's Plan, Do, Check, and Act four stages, the dynamic management and continuous optimization are realized. By clarifying the division of responsibilities, diversified data collection, scientific weight allocation and timely feedback mechanism, the system solves the problems of the traditional assessment system, accurately identifies the advantages and disadvantages of teachers, provides support for teacher development and school planning, and promotes the transformation of secondary vocational education from scale expansion to high-quality connotative development. The results show that the system can effectively improve the scientific and fair nature of the performance appraisal of secondary vocational teachers, and provide new ideas and methods for the high-quality development of secondary vocational education.

Keywords

Secondary vocational education; teacher performance appraisal; PDCA cycle; Balanced Scorecard (BSC) and performance audit.

1. Introduction

Secondary vocational education is an important cornerstone of China's vocational education system, and it plays an irreplaceable role in the modern social economy. It provides students with a different growth path from ordinary high schools, provides a large number of primary and intermediate technical talents for various industries, promotes the optimization and upgrading of industrial structure, and becomes an important driving force for economic growth. At the same time, the secondary vocational education takes the vocational orientation and the practical operability as the core, which enhances the students' employment competitiveness, alleviates the social employment pressure, and stimulates the entrepreneurial vitality.

In the context of global economic integration, the competition for talents is becoming increasingly fierce. The quality and efficiency of secondary vocational education are not only related to the individual development of students, but also closely related to the national

economic prosperity and social stability. China has issued the National Implementation Plan for Vocational Education Reform and other policy documents, which provide a policy guarantee for the reform of secondary vocational education. In recent years, the scale of secondary vocational education has been steadily expanded, but it also faces challenges such as vague orientation of running schools, insufficient resource docking, and poor connection between middle and higher vocational education. In this context, the performance audit theory and PDCA (Plan, Do, Check, Act) theory are introduced to provide a systematic theoretical support and practical path for the management and evaluation of secondary vocational education.

Through the comprehensive evaluation of educational resource input, process management and output effect, the performance audit theory can accurately identify the problems in resource allocation and optimize the efficiency of education management. PDCA theory, as a circular improvement model, provides methodological support for the continuous optimization of secondary vocational education, and promotes the continuous improvement of education quality through the closed-loop management of planning, implementation, inspection and treatment. In addition, combined with the flat Balanced Scorecard (BSC) threshold, the performance evaluation system is constructed from the four dimensions of finance, customer, internal process, learning and growth, which can further integrate educational resources and promote the realization of educational goals.

The combination of educational performance audit and PDCA theory provides a powerful tool for the scientific management of secondary vocational education. Through data-driven performance analysis and circular improvement mechanism, it helps secondary vocational education to transform from scale expansion to high-quality connotative development, laying a solid foundation for cultivating high-quality technical talents in the new era and building a strong educational country.

2. There Are Main Problems in The Performance Audit Evaluation System of Vocational Education

In the in-depth investigation of the performance appraisal system of secondary vocational schools, we found a series of problems, which restrict the improvement of education quality and the effective stimulation of teachers' work enthusiasm.

2.1. Imperfect performance appraisal indicators

In the investigation of the development of performance appraisal indicators in secondary vocational schools, it is found that there are many places to improve in the construction of performance appraisal indicators in some secondary vocational schools. On the one hand, some schools still use the traditional evaluation index system, such as only students test scores, teachers class quantity as the main assessment content, and the students' practice, ability of core element evaluation, which makes the assessment index cannot comprehensive, accurately reflect the school education teaching quality and teachers' actual teaching level. On the other hand, although some schools try to introduce new assessment indicators, there are obvious defects in the index design, lack of scientificity and rationality, and lack of operability and measurement, leading to the deviation of the assessment results, and unable to truly and objectively present the actual results of education and teaching.

2.2. The performance appraisal process is not standardized

In the current assessment practice, the following problems generally exist: vague assessment standards, lack of clear definition and specification; lack of quantitative indicators, it is difficult to make accurate and objective measurement; the scoring criteria are highly subjective, easily influenced by personal factors, and it is difficult to ensure the objective and fair evaluation results. These problems seriously affect the scientific and effective of assessment.

At the same time, the transparency of the assessment process is insufficient, and the relevant information is not fully disclosed, leading to the lack of necessary supervision and transparency in the assessment process, which further affects the fairness and credibility of the whole assessment process. In addition, the arrangement of the appraisal cycle also exist unreasonable, too long assessment cycle is difficult to timely reflect the teachers' performance and school effect, and too short assessment period may lead to the interference of short-term factors, not comprehensive and objective evaluation of teachers' long-term contribution and the overall development of the school. These problems need to be improved and perfected through scientific and reasonable system design.

2.3. The overall satisfaction rate of the performance appraisal system is relatively low

On the one hand, the current assessment results fail to be effectively connected with the reward and punishment mechanism, leading to the assessment work is a mere formality, it is difficult to give full play to its incentive role, can not effectively stimulate the enthusiasm and innovative spirit of teachers, and then affect the overall development of teachers and the improvement of teaching quality. Assessment results, on the other hand, failed to school with the long-term development planning and organic combination of resource allocation strategy, difficult from the macro level for the school strategic decision to provide accurate and powerful data support and reference basis, restricts the scientific allocation and efficient utilization of school resources, is not conducive to the overall level of school. More importantly, the assessment results are not timely and accurately feedback to the relevant personnel, which limits the opportunities for teachers and managers to identify their own deficiencies and make clear the direction of improvement, and is not conducive to the formation of a virtuous cycle of continuous improvement, thus affecting the steady improvement of school education and teaching quality and the process of teachers' professional development.

2.4. Imperfect audit standards for performance evaluation

The formulation of scientific and reasonable educational performance audit standards requires the support of a large number of industry data. However, China is still in its initial stage in this aspect, and relevant data are relatively scarce, so it is difficult to establish an effective evaluation standard system. Quantitative indicators are mostly based on national standards, while qualitative indicators are highly dependent on the professional judgment and personal experience of auditors, which undoubtedly increases the subjectivity of the evaluation results.

2.5. The feedback channel of performance appraisal results is not smooth

Neither the audit results nor the student evaluation results have been effectively fed back to the corresponding teachers, resulting in many valuable improvement suggestions being ignored. The school management does not pay much attention to the audit results, usually by turning a blind eye to the problems found or failing to take substantive measures to rectify them, which directly weakens the incentive and restraint function of the performance appraisal system.

In addition, in terms of student feedback channels, some teachers report that the existing student feedback mechanism (such as student evaluation) has great problems. Because students worry about grading will adverse effect on their course performance, tend to give higher scores, which makes the authenticity of the feedback results, difficult to obtain students' teaching results and constructive feedback, and affect the school teaching quality of accurate evaluation and continuous improvement.

3. Feasibility Analysis of PDCA + BSC

3.1. Theoretical overview

3.1.1. PDCA recurrence

PDCA cycle (Plan-Do-Check-Act) is a systematic continuous improvement method, proposed by quality management expert Deming (W. Edwards Deming) and widely used in quality management, project management, process optimization and other fields. The core idea is to promote the organization to achieve continuous optimization in the process of finding problems, analyzing causes, implementing improvements and consolidating results through the four steps —— Plan, Do, Check, and Act. In the planning stage, the organization needs to clarify the objectives, analyze the current situation and formulate the improvement plan; in the implementation stage, implement the improvement measures according to the plan and collect relevant data; in the inspection stage, the implementation effect is evaluated and compared with the expected objectives; in the processing stage, the unsolved problems are analyzed and enter the next cycle. The PDCA cycle emphasizes systematization, cycling, and flexibility, and is able to help organizations remain competitive in changing environments, while providing scientific methodological support for continuous improvement in quality management and other areas.

3.1.2. Balanced Scorecard(BSC)

Balanced Scorecard (BSC) is a strategic management tool proposed by Harvard professors Robert S. Kaplan and David P. Norton in 1992 to address the limitations of traditional financial metrics in measuring organizational performance. Through finance, customer, internal process, learning and growth, BSC has built a comprehensive performance management system to help organizations transform strategic goals into operational action plans. In the financial dimension, BSC focuses on the economic performance of the organization, such as revenue growth, profit margin and return on investment; in the customer dimension, BSC emphasizes customer satisfaction and market share increase; in the internal process dimension, BSC focuses on optimizing the operation process and improving efficiency and quality; and in the learning and growth dimension, BSC focuses on employee ability, organizational innovation ability and knowledge management. Through the balance of these four dimensions, BSC not only helps the organization to achieve its short-term financial goals, but also provides strategic support for its long-term development. The core strength of BSC is its systematization and comprehensiveness, and its ability to closely integrate the organization's strategic objectives with its day-to-day operations to ensure the effective implementation and continuous improvement of the strategy.

3.2. Mechanism analysis

BSC theory and PDCA theory are widely used in the field of enterprise management because of their strong scientific nature, which has played the role of effective supervision and assessment and leading the sustainable development of enterprises and employees. However, as performance management tools, they have different emphasis in application. BSC theory includes four dimensions: finance, customer, internal process and learning and growth. The four dimensions, as a unified function and whole, jointly support the long-term development of the organization and play its due synergistic function. However, the specific content of BSC theoretical assessment system is complicated, and the number and coverage of indicators are large, which cannot focus on the core role of key factors. PDCA theory emphasizes the circular management process of planning, execution, inspection and treatment, and emphasizes the continuous improvement and optimization of the process.

The specific application of Balanced Scorecard (BSC) in the PDCA teacher audit cycle is mainly reflected in the combination of the four dimensions of BSC (finance, customer, internal process, learning and growth) with all stages of teacher audit, so as to ensure the comprehensiveness

and pertinence of the audit work. The PDCA (Plan, Do, Check, Act) based on BSC (Balanced Scorecard) is applied to teacher performance audit. It is a systematic and scientific management method, which provides a systematic management framework for teacher performance audit. It realizes the optimization and long-term development of teacher performance through a clear goal, controllable process and continuous improvement mechanism.

The effective combination of BSC theory and PDCA theory is applied to the teacher performance appraisal system in the field of secondary vocational education, for the original performance appraisal system with "morality, ability, diligence, performance and integrity" as the main assessment direction and focus. The comprehensive application of BSC theory and PDCA theory can not only effectively increase the "coverage" of the performance appraisal of secondary vocational teachers, but also improve the "pertinence" of the key factors of the performance appraisal of secondary vocational teachers, and achieve full coverage of the assessment. On the premise of increasing the coverage, through the continuous improvement of PDCA cycle, the core elements are selected to achieve key breakthroughs, the key assessment is conducted on key indicators, and complete the performance assessment of secondary vocational teachers with less human and material resources.

4. The System Construction Based on the BSC Visual Valve of the PDCA Process

4.1. P (planning stage): setting of BSC threshold audit objectives and index weights

The "P stage" of PDCA cycle is the starting point of the construction of performance audit system. Its core is to set the four dimensions of Balanced Scorecard (BSC) (finance, customer, internal process, learning and growth), and index weights scientifically to ensure that the goals are highly compatible with the strategic positioning of secondary vocational colleges. The overall goal of the performance audit of secondary vocational education includes improving the quality of education, meeting the needs of the industry, and promoting the all-round development of students. In addition, audit objectives should be consistent with the educational philosophy and training objectives of vocational schools and focus on assessing the quality of vocational schools. Ningbo Vocational and Technical College adheres to the educational concept of "building the school with technology, educating people with ingenuity", and is committed to cultivating highly skilled talents with exquisite skills and good professional quality. This educational concept should be fully reflected when setting the audit objectives, focusing on the following aspects: first, whether the investment of educational resources effectively supports the improvement of students' technical skills; second, whether the craftsmanship culture is integrated to cultivate students' professional ethics and craftsman spirit; third, whether the school training base and school-enterprise cooperation project provide students with enough practical opportunities to develop their ability to solve practical problems.

The P stage ensures that the performance audit objectives are scientific, reasonable and feasible, lay a solid foundation for the subsequent "D implementation", "C inspection" and "A improvement" stages, realize the effective connection between education and market demand, and promote the common development of teachers and students. It is the key to clarify the weight of each index in the "Performance audit-PDCA" teacher performance appraisal system to ensure the effective operation of the "Performance audit-PDCA" double cycle. The setting of the weight reveals the relative importance of each index, and has a direct impact on the scientificity and rationality of the assessment system. By the application of Analytic Hierarchy Process (AHP), the index weight can be quantified, so as to reasonably determine the weight allocation of each index. Hierarchical analysis constructs an orderly hierarchical structure by breaking down the complex decision problems into multiple sub-problems and grouping them

into hierarchical groups according to the control relationship. This method evaluates the relative importance of each factor by pairwise comparison, and combines experience, insight and intuition to adjust the importance of each factor. This approach not only helps to ensure the systematic and comprehensive decision-making, but also improves the transparency and operability of the decision-making process. The specific steps are described as follows:

4.1.1. Establish a hierarchical hierarchical structure model

The performance appraisal of teachers in secondary vocational education schools is of great significance for improving the quality of education and promoting teacher development. When using the hierarchical analysis method for index quantitative analysis, the first task is to build a reasonable hierarchical structure model. The first layer is the target layer, and the core goal of this 6 model is to clarify the index weight of the teacher performance appraisal system of secondary vocational education schools. The establishment of this goal provides the direction guidance for the quantification of the indicators of the whole performance appraisal system, and all the index setting and analysis of the subsequent levels are carried out around this goal. The second layer is the criterion layer, using the five dimensions of Balanced Scorecard (BSC) to construct the criterion layer. These five dimensions cover many key elements of teacher work. The third time is the program layer, and the program layer focuses on the specific implementation rules under the dimension of each criterion layer, that is, the specific rules of the secondary indicators.

4.1.2. The "1-5 scale method" gives expert scoring to construct the judgment matrix

When using the hierarchical analysis method for index comparison, it is difficult to directly determine the weight of each index and to guarantee the accuracy in the multi-index evaluation system. Using the pairwise comparison method, the complex multi-index weight determination problem can be decomposed into relatively simple pairwise index comparison problems. By measuring the importance of different indicators by relative scale, experts can more accurately express their judgment of the importance of indicators in the comparison process, so as to improve the accuracy of the whole weight determination process. After designing the questionnaire with the weight of the index, consult the expert opinions through email, and score according to Table 3, you can get the scoring table on the comparison of the degree of the importance of the index, and then the judgment matrix can be obtained.

Table 1. Compares the specific meanings of the "1-5 scale method"

scale	Specific meaning
1	The i th index has the same effect as the j th index
2	The effect of the i index is slightly stronger than the j index
3	The effect of the i index and the j index is strong
4	The effect of the i index and j indicators is obviously strong
5	The effect of the i index and the j index is absolutely strong
1/2,...,1/5	The effect of the i index and the j index is weakened accordingly

4.1.3. Agreement test of the judgment matrix

When conducting a multi-criterion decision analysis, the construction and verification of the judgment matrix consistency is a key step to ensure the reliability of the analysis results. In this study, MATLAB software was used to normalize the expert scoring data and calculate the maximum eigenvalue of the judgment matrix, and then conduct the consistency test to determine the weight of each index.

In this study, the scoring data of all the experts were processed, calculated the respective weights and conducted the consistency test. If the test result does not meet the condition of $CR < 0.1$, the judgment matrix needs to be adjusted until the requirements are met. Finally, by averaging the independent evaluation weights of each expert, the weight distribution of all levels of indicators was obtained, as shown in Table 4.

Table 2. Weight distribution of indicators at all levels after integrating expert opinions

The standard layer		Scheme layer		Total weight
metric	weight	metric	weight	
Internal process dimension	0.313	A1 Course completion rate	0.187	0.0585
		A2 Assessment of teaching quality	0.189	0.0592
		A3 teaching efficiency improvement	0.142	0.0444
		A4 Teaching process optimization	0.166	0.0520
		A5 Teacher Support Services	0.109	0.0341
		A6 course content updates	0.098	0.0307
		A7 continuous improvement mechanism	0.109	0.0341
Learning and growth dimensions	0.262	B1 Participation rate in teacher training	0.140	0.0367
		B2 Teacher education background and professional title promotion	0.102	0.0267
		B3 Teachers' scientific research achievements	0.139	0.0364
		B4 Communication and cooperation between teachers	0.098	0.0257
		B5 The improvement rate of students' academic performance	0.123	0.0322
		B6 Students' skills improvement	0.156	0.0409
		B7 Cultivation of students' innovation ability	0.100	0.0262
		B8 Teaching reform and innovation	0.142	0.0372
Functional benefit dimension	0.194	C1 Basic salary	0.116	0.0225
		C2 Performance Bonus	0.226	0.0438
		C3 title allowance	0.094	0.0182
		C4 funding for teacher training	0.217	0.0421
		C5 External training and refresher costs	0.189	0.0367
		C6 Teacher career development project planning and investment	0.158	0.0307
Customer dimension	0.231	D1 Enrollment and employment rate of students	0.239	0.0552
		D2 Excellent rate of students' final grades	0.108	0.0249
		D3 Award rate of students	0.155	0.0358
		D4 Students' satisfaction with the teachers	0.120	0.0277
		D5 Parents' satisfaction with their teachers	0.099	0.0229
		D6 Frequency of parents' meetings	0.113	0.0261
		D7 Number of communication between parents and teachers	0.166	0.0383

4.2. D (execution stage): Performance audit implementation and division of responsibilities in the BSC dimension

Phase D is the execution phase of the plan. In the process of D, in order to ensure the accuracy and comprehensiveness of the audit results, collect index data related to the BSC dimensions in performance audit execution, according to the audit objectives and performance audit plan, the questionnaire survey, interviews, data analysis, data and information related to collect the finance, customers and internal processes, learning and growth dimensions.

Decompose tasks according to the BSC dimension, clarify the division of responsibilities, encourage multiple subjects to participate in the audit process, and ensure the implementation of the audit plan. Set up an audit team composed of the Academic Affairs Office, the Finance Office, Student Affairs Office and other departments to ensure the cross-departmental cooperation of the audit work. For example, the Student Affairs Office, as a department in direct contact with students, is responsible for collecting and analyzing student feedback on teaching quality, including satisfaction with curriculum, teaching quality, employment prospects and more. At the same time, teachers, students, parents and other stakeholders are invited to participate in the audit process, provide multi-angle feedback and suggestions, and enhance the objectivity and credibility of the audit results.

4.3. C (inspection stage): Multidimensional performance evaluation and problem diagnosis

Stage C in the performance audit cycle, namely the result analysis stage, can be combined with the internal self-assessment at the end of the school. This stage is the key link of secondary vocational education performance audit, involving the detailed summary and evaluation of the effectiveness of the implementation plan. The audit team will summarize and check the assessment results of teaching implementation according to the established indicators to ensure that the achievement of educational goals is accurately reflected. For example, check

4.4. A (Improvement stage): Feedback of audit results and BSC-PDCA double-cycle dynamic optimization

Stage A is the core link in the PDCA cycle system. Its role is not only to solidify the optimization results of the current cycle, but also to provide the driving force for the start of the next round of cycle through problem rectification and strategy iteration, so as to achieve the spiral improvement of audit efficiency. After completing the performance audit of the year, the audit team needs to timely publish the results through diversified channels and open the channels of inquiry and supervision. The contents of the publicity should cover the evaluated indicators, specific scores, rankings, existing problems and suggestions for improvement, so as to ensure the comprehensiveness and specificity of the information.

In the process of continuous education quality improvement, the timely adjustment of BSC index weight is an important part to reflect the dynamic adaptation of PDCA cycle. For example, for the key target of "student skill improvement", if the expected target is not met in the continuous evaluation cycle, the weight can be increased from 0.0409 to 0.05 in the next cycle to increase the attention and investment in this field. Through the closed-loop logic of PDCA and the double-cycle process of continuous improvement of performance audit, combined with the multi-dimensional framework of BSC, promote the audit system from "static assessment" to "dynamic optimization", so as to promote the continuous quality and expansion of vocational education.

5. Conclusion

Under the background of global economic integration and industrial upgrading, secondary vocational education is crucial to the training of high-quality technical and skilled personnel. However, there are many problems in the current performance appraisal system of secondary vocational teachers, such as imperfect indicators, non-standard process, poor feedback, etc., which restrict the improvement of education quality and the stimulation of teachers' enthusiasm. Based on PDCA cycle and Balanced Scorecard (BSC) threshold, this paper constructs a set of scientific and reasonable performance appraisal system for secondary vocational teachers. By analyzing the characteristics of secondary vocational education, combining with the four dimensions of finance, customer, internal process, learning and growth, the assessment objectives and weights are scientifically set to ensure the fit with the school strategy. With the four stages of PDCA planning, execution, inspection and improvement, dynamic management and continuous optimization are realized.

The system defines the division of responsibilities, through diversified data collection, scientific weight allocation and timely feedback mechanism, solves the problems of the traditional assessment system, accurately identifies the advantages and disadvantages of teachers, provides support for teacher development and school planning, and promotes the transformation of secondary vocational education from scale expansion to high-quality connotative development. However, in the practical application, it is necessary to flexibly adjust and optimize the indicators and weights according to the actual situation of the school, strengthen the data collection and analysis, improve the audit standards, and improve the scientific nature of the evaluation. At the same time, teacher training should be strengthened to help them adapt to the new system. The system provides a new idea for the scientific management and high-quality development of secondary vocational education, and is expected to promote the sustainable development of secondary vocational education and help the prosperity of vocational education.

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