

Analysis on Modeling of Balanced Innovation Mechanism of Teacher Team Management

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The traditional capacity-based model of teacher team management innovation overemphasizes the teacher's ability to innovate, but neglects the balance of ability, which leads to the team management being in the unbalanced state of innovation. Therefore, the balanced innovation mechanism of teacher team management is established to build the model of teacher competency and to evaluate the teacher team. Based on the theory of organizational duality, the internal mechanism of management innovation imbalance and balance is obtained. Combined with the competency model, the model of the balanced innovation mechanism of teacher team management is established. The experimental results show that after the use of the model, the innovation ability of the teaching team is in line with the standard, the number of innovative topics has increased by five, and the number of published innovative papers has reached seven.

Keywords: teacher team, management, competence, balanced innovation mechanism, organizational duality

INTRODUCTION

As an important carrier of knowledge dissemination and innovation, universities shoulder the important historical responsibility of cultivating talents and promoting comprehensive, coordinated and sustainable development of society (Omur & Argon, 2016). The cultivation of high-quality and innovative talents is inseparable from the stable and innovative faculty (Sun & Bai, 2017). To this end, we must further emancipate our minds, change our mindset, and create scientific and innovative faculty construction mechanism to achieve the positive interaction between people and universities (Dubina et al., 2016; Gurd & Helliari, 2017). At present, there are still some problems in the management and employment mechanism, such as the concept of employing people, the tenure of teachers and the tenure of professional and technical positions (Tyunnikov, 2015; Wang et al., 2016). These problems hinder the development of teachers and inhibit the enthusiasm of teachers (Lillis et al., 2015).

Balanced innovation means that in the process of management innovation, teachers must adapt to the environment and obtain effective and balanced innovations to pursue sustainable development (Zhao & Wu, 2017). The organizational duality theory in management is cited in the innovation mechanism to build teacher competency model and assess the competency. The internal mechanism of management innovation imbalance and balance is analyzed to build the model of balanced innovation mechanism of teacher team management. Finally, the innovation results of the teaching team are evaluated by the grey correlation analysis method.

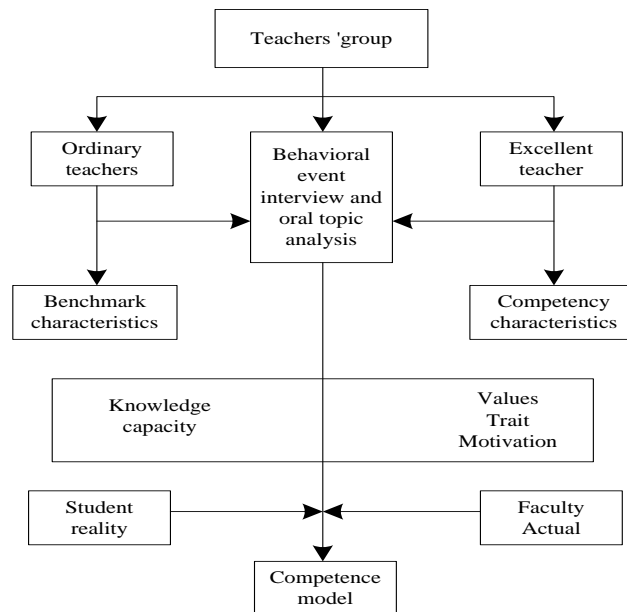
MATERIALS AND METHODS

Teacher Competency Model

Model Construction

The teacher competency model is shown in Figure 1.

FIGURE 1
TEACHER COMPETENCY MODEL UNDER THE BALANCED INNOVATION MECHANISM OF TEACHING TEAM MANAGEMENT



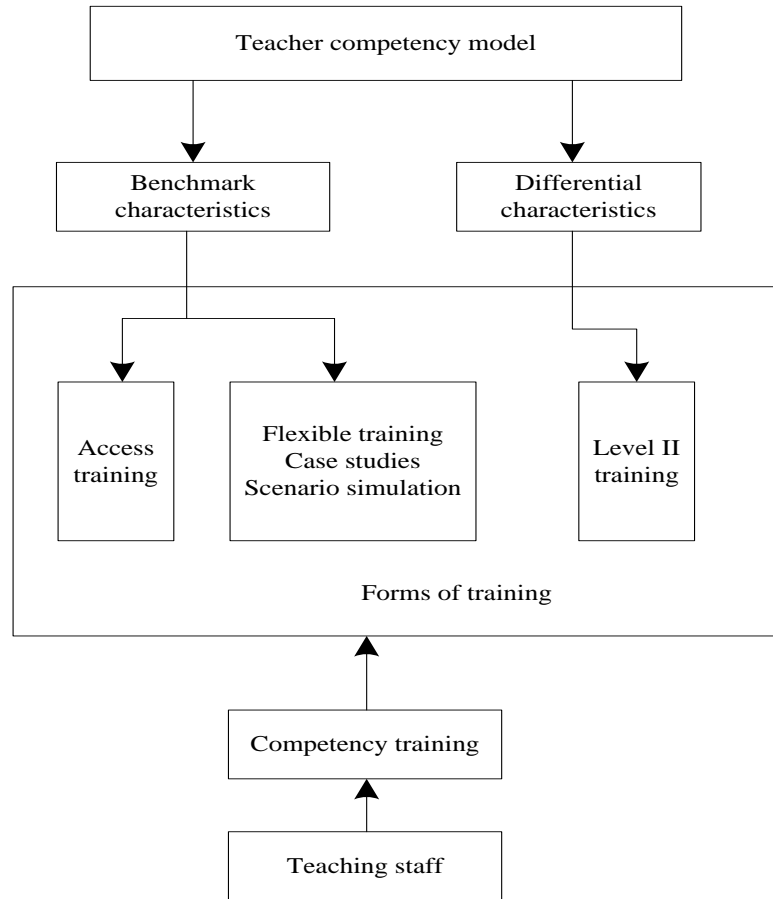
It can be seen from Figure 1 that the construction of the model has the following steps.

1. The establishment of a development team consisting of functional departments such as the school leadership, the personnel affairs department of the Personnel Office and vocational education experts.
2. Divide the categories, classify the teachers into excellent and ordinary categories, and extract the criteria for identifying them.
3. Select a certain number of excellent performance teachers and general performance teachers as analysis samples.
4. Obtain the sample's competency data.
5. Analyze the data, build the model, and validate the model.

Training and Development Based on Teacher Competency Model

Training and development is one of the core functions of the competency model. Through the assessment of the competency of existing incumbents, the shortcomings of the overall strength of the teaching team are found. Then training plan is developed to improve the individual and overall advantages (Petraite & Dlugoborskyte, 2017). The training system based on the competency model can balance the cost input and adjust the training plan based on the quality evaluation results (Domenech & Lusa, 2016). The training and development system based on the teacher competency model is depicted in Figure 2.

FIGURE 2
TEACHER TRAINING AND DEVELOPMENT SYSTEM

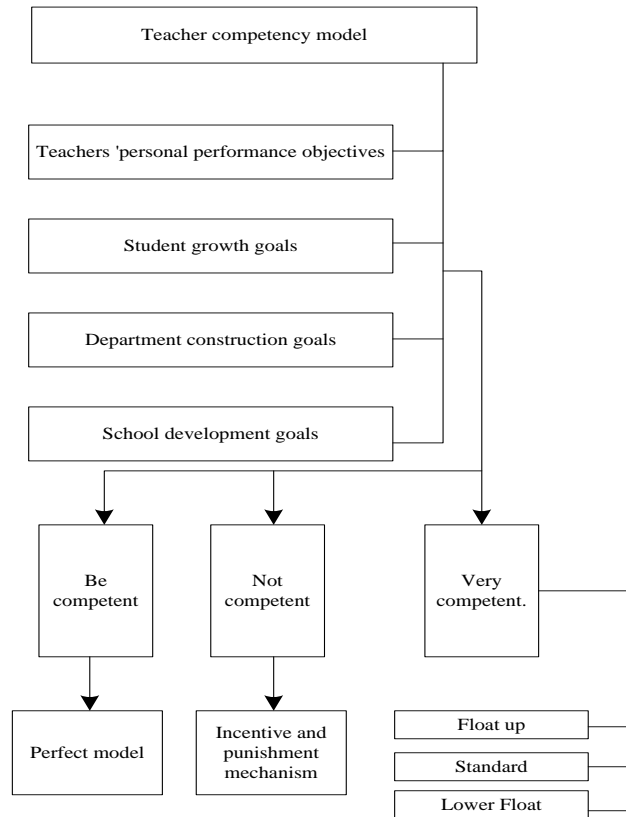


It can be seen from Figure 2 that the teacher’s competency is developed through different forms based on the teacher’s benchmark and discriminative characteristics to ensure that the teacher is competent.

Assessment and Management Based on Teacher Competency Model

Assessment is the important management tool for the construction of the teaching staff, which can play leverage role. The teacher assessment based on the competency model is the process of assessing and evaluating the quality of teachers’ work by setting performance targets and applying a series of management methods and indicator evaluation methods (Thomas et al., 2015). This process not only pays attention to the short-term performance of teachers, but also pays attention to the long-term performance of teachers, and can reduce the influence of human beings and enhance the objectivity and impartiality of evaluation. The assessment and management system based on the teacher competency model is shown in Figure 3.

FIGURE 3
TEACHER ASSESSMENT AND MANAGEMENT SYSTEM



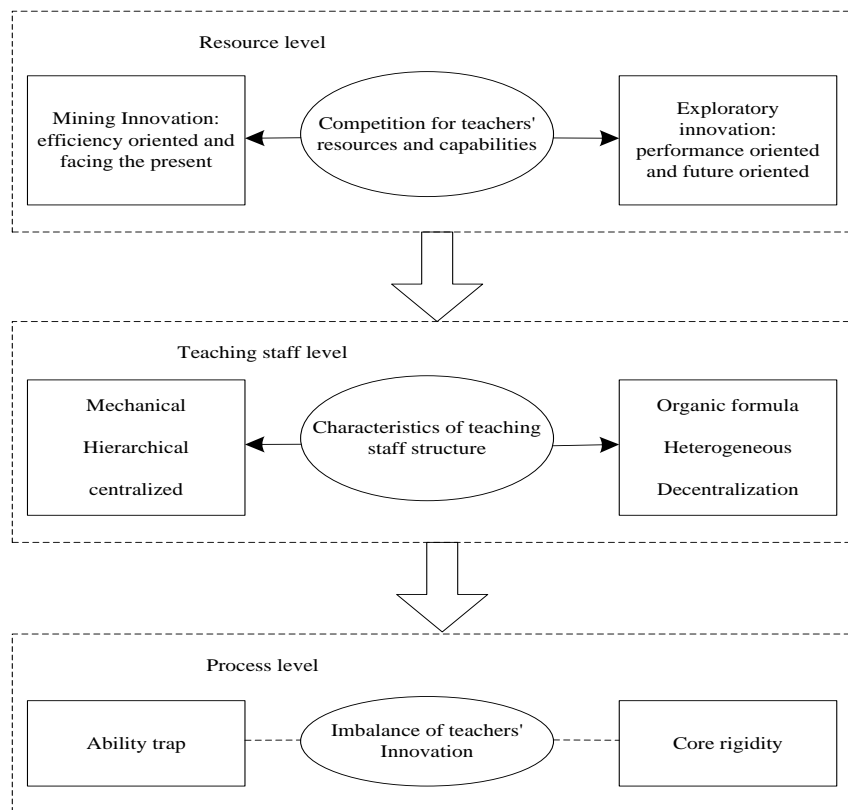
From the analysis in Figure 3, the assessment of teacher competency is based on performance goals, student growth goals, faculty construction goals and school development goals. Through the assessment, the teacher's competency is obtained in order to reward them accordingly.

The Internal Mechanism of Innovation Imbalance Based on Organizational Duality

Organizational duality in the field of management, successful companies are able to adapt to increasingly complex environments while at the same time having the dual ability to operate current careers and adapt to future changes (Zhang et al., 2015; Gammon et al., 2015). The application of organizational duality in the innovation of teacher team management is that teachers should adapt to the environment of continuous innovation, and in the process, they will continue to obtain effective and balanced innovations.

The subsystems of the teacher team elements cannot function independently, otherwise it will cause inefficiency. These negative aspects are unbalanced by the unbalanced logic process and path evolution, which makes the teacher team unable to operate in healthy manner (Owusu-Manu et al., 2015). The difference in the innovation path leads to the conflict between the teacher team structure and the management system, which makes the teacher team management in a dilemma, resulting in the imbalance of the teacher team management innovation mechanism. The intrinsic mechanism is described in Figure 4.

FIGURE 4
THE INTERNAL MECHANISM OF THE IMBALANCE OF FACULTY MANAGEMENT
INNOVATION BASED ON ORGANIZATIONAL DUALITY



From the perspective of management philosophy, the inherent logic of the development of things is a process of transitioning from one equilibrium state to another. The evolutionary system of the teacher team management innovation path is also the process of “equilibrium---balanced destruction---new equilibrium” (Yi, 2017). Exploratory innovation and excavative innovation compete with each other on resources and elements, and demarcate each other in behavioral patterns, so boundary overlap and elemental interactions inevitably exist (Conforto & Amaral, 2016; Nair et al., 2015). If the two cannot be effectively coordinated and balanced, it will hinder the self-reinforcement of the management innovation activities of the teaching staff.

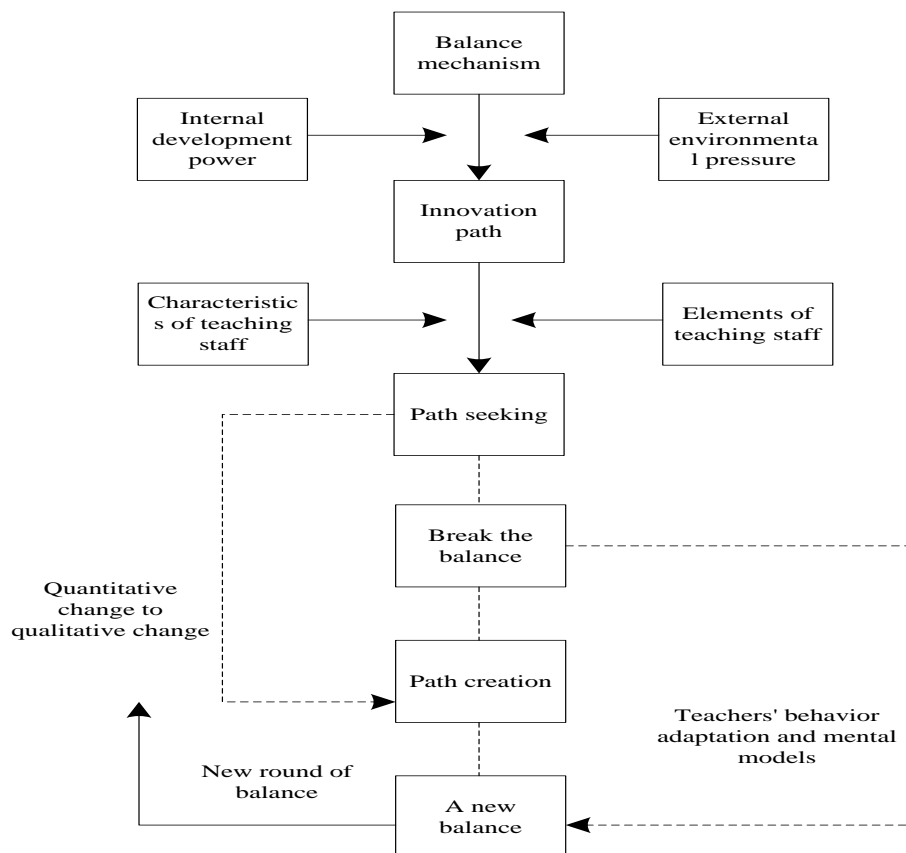
The Internal Mechanism of Innovation Balance Based on Organizational Duality

The multi-dimensionality of the teacher team structure determines the different functions of different teacher team structure characteristics. The teacher team structure is the carrier of the team operation, and the division of labor and cooperation system is set up in order to achieve the goal. In the process of innovation activities, the dynamic framework system consisting of division of labor, cooperation, balance and coordination is formed, and its stability requires a balancing mechanism (Sun & Yang, 2015; Ye et al., 2016). Whether it is the degree of centralization or the degree of formalization, the purpose is to ensure organizational efficiency, so that the teaching staff can respond to changes in a balanced manner and achieve the goals of the team. The organization of the dual-innovation balance mechanism is driven by external environmental pressure and internal development power, seeking the system that matches the innovation path and team structure characteristics.

Organizational duality as one open unit management system, the internal subsystems and elements of the organization will change with time under the influence of internal and external forces (Liu, 2016). In

order to maintain their own stability and development needs, in the state of the teacher team structure is coordinated, various elements are integrated to complete the dynamic leap, and achieve the recombination and balanced transition of the internal contradictions within the team. When the team is in balance, the team balance mechanism can always be in stable state through self-recovery, self-regulation and self-reinforcement. The intrinsic mechanism of innovation balance based on organizational duality is described in Figure 5.

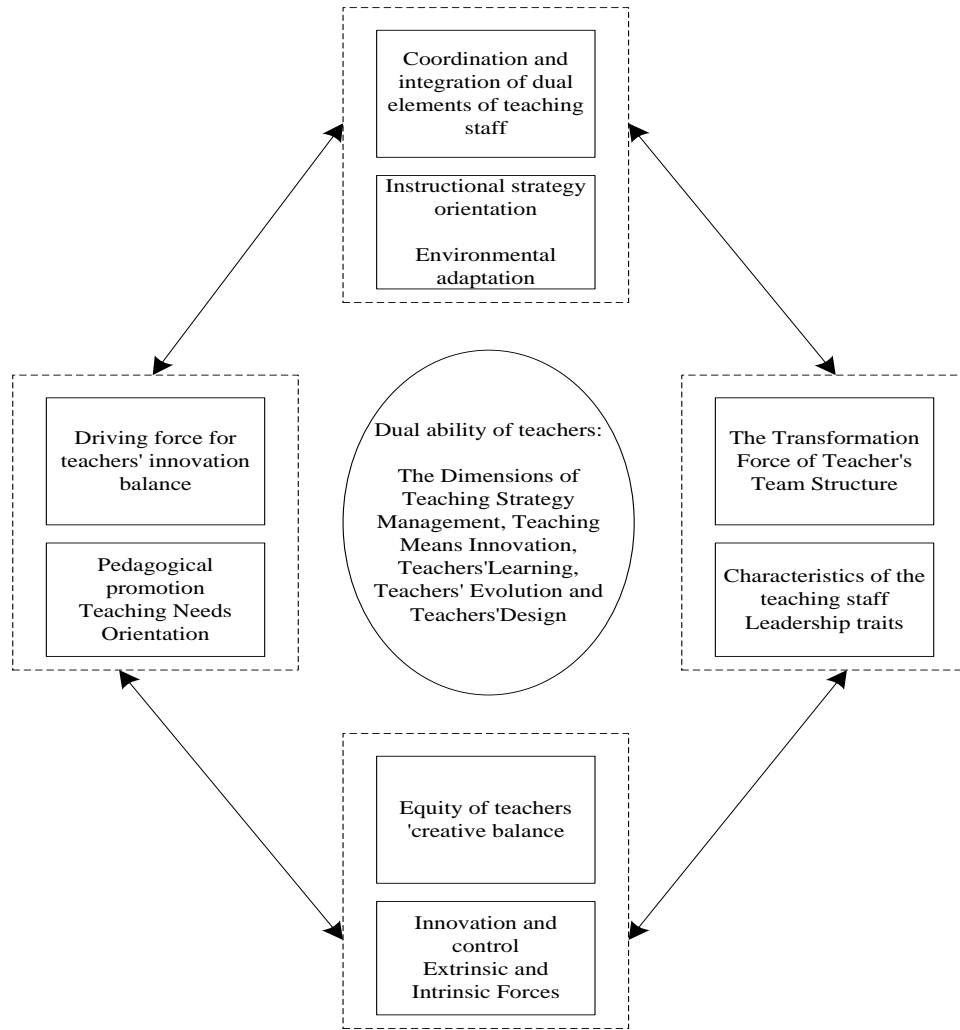
FIGURE 5
THE INTERNAL MECHANISM OF THE INNOVATION BALANCE OF TEACHERS BASED ON ORGANIZATIONAL DUALITY



Model of Balanced Innovation Mechanism of Teacher Team Based on Organizational Duality

Excavating the existing ability of the teaching team and exploring the unknown ability of the team, and coordinating the two are the essential requirements of the organization of the duality ability, which is actually the dynamic ability of the organization. Through organizational management, technological innovation, organizational learning, organizational evolution and organizational design, the organization’s duality capabilities are mapped to integrate the goals, technologies, management, resources and processes of organizational operations into one framework (Omur & Argon, 2016). The model of balanced innovation mechanism of teacher team management based on organizational duality is clearly presented and described in Figure 6.

FIGURE 6
THE MODEL OF TEACHER BALANCE INNOVATION MECHANISM BASED ON ORGANIZATIONAL DUALITY



As can be seen from Figure 6, the model consists of four forces, which are the driving force of balance, the integration of elements, the transformation of structure and the balance of balance (Kasule et al., 2015a). As the degree of environmental uncertainty increases, the teaching team needs to enhance the adaptability of the organizational structure. In the process of adapting to environmental changes, the exploratory innovation and excavation innovation activities, and the relatively stable results obtained for the survival and development of the organization are the process of adaptation and evolution of the teacher team in the evolution process.

Evaluation of Teacher Innovation Ability

Evaluation of the Innovation Effect of Teacher Team Based on Grey Correlation Analysis

The grey relational analysis method is used to evaluate the teacher’s innovative ability to obtain the evaluation result of the teacher’s innovative ability, that is, the evaluation result of the teacher team’s innovation effect (Ji, 2017). It is an important part of the grey system theory. By analyzing the correlation coefficient between the evaluation indicators, the scores of the evaluation indicators are recognized and ranked. Finally, the evaluation results of the innovation effect are obtained. The calculation steps are as

follows:

Step 1: Determine the reference series and comparison series of evaluation indicators (Kasule et al., 2015b)

Assume that the reference data is listed as $x_0 = (x_{01}, x_{02}, \dots, x_{0n})$ and the comparison sequence $x_i = (x_{i1}, x_{i2}, x_{i3}, \dots, x_{in}) (i = 1, 2, 3, \dots, m)$ with m evaluation indicators.

Step 2: Standardization of variable sequences

Before the correlation coefficient is calculated, the sequence with different units or different initial values is normalized by $x'_{0j} = x_{ij}/x_{0j}$. Where, $i = 1, 2, \dots, m; j = 1, 2, \dots, n; x_{ij}$ is the original sequence, and x_{0j} is the reference sequence.

Step 3: Calculation of the correlation coefficient

The difference order of the evaluation indicators is obtained according to the following formula:

$$\Delta_i(k) = |x'_0(k) - x'_1(k)| \Delta_i = |\Delta_i(1), \Delta_i(2), \dots, \Delta_i(n), i = 1, 2, m| \quad (1)$$

Where, $\Delta_i(k)$ is the difference order of the evaluation indicators of teacher's innovation ability in the k layer; Δ_i means to obtain the difference order.

Maximum and minimum difference of indicators' difference order:

$$M = \max_i \max_k \Delta_i(k) \quad (1)$$

$$m = \min_i \min_k \Delta_i(k) \quad (2)$$

Where, k represents the number of layers, and i represents the number of indicators.

Correlation coefficient of evaluation index:

$$y_{0i}(k) = \frac{m + \xi M}{\Delta_i(k) + \xi M} \quad (3)$$

Where, ξ is the constant, and $\xi \in (0, 1)$. $\xi = 0.5$, and $k = 1, 2, \dots, n; i = 1, 2, \dots, m$.

Grey Weighted Relevance of Teacher's Ability to Innovate

It is not appropriate to analyze teachers' teaching innovation evaluation indicators according to this formula (Nagyová, 2015). According to the analytic hierarchy process, the weight of the second-level indicator $W = (W_1, W_2, \dots, W_n)$ is calculated to obtain the gray correlation degree formula of the teacher's innovation ability:

$$R_1 = \sum_{i=1}^n W_i y_{0i}(k), i = 1, 2, \dots, m \quad (4)$$

Where, R_1 is the gray correlation degree of the teacher's ability to innovate. Through the calculation of the correlation degree of the secondary indicators, the correlation degree of the primary indicators is obtained in order to derive the teacher's ability to innovate.

Experimental Analysis

In order to verify the validity of the model, the model is used to conduct the four-month innovation management training for teachers in five universities in a city. After the training, a teacher from each school is randomly selected to form a 5-person test group for model validation testing. The five teachers are named T1, T2, T3, T4, T5, and the evaluation of the teaching innovation ability of the five teachers based on the grey relational analysis method is proposed to verify the validity of the model. The model of this paper is valid when the teaching innovation ability scores of the five teachers exceed the set standards.

RESULTS

Analysis of Teachers' Ability to Innovate

Determining the Evaluation Index System of Teachers' Teaching Quality

According to the original teaching quality evaluation index system of the five universities, combined with the research of other scholars, the characteristics of themselves and the actual situation of the teachers, the evaluation index system shown in Table 1 is constructed.

TABLE 1
EVALUATION INDEX SYSTEM OF TEACHERS' INNOVATIVE ABILITY UNDER THE
BALANCED INNOVATION MECHANISM OF TEACHERS

First level evaluation index B	Two level evaluation index C
	C ₁ Number of innovative papers published
Innovating teaching achievements B ₁	C ₂ Publishing the number of innovative works
	C ₃ Number of innovative courses
	C ₄ Innovating the use of textbooks and preparing lessons
Innovating teaching content B ₂	C ₅ Highlight teaching emphasis
	C ₆ Constantly updating and supplementing innovative content
	C ₇ Flexible teaching methods
Innovative teaching methods B ₃	C ₈ Innovative use of courseware, standardized expression
	C ₉ Innovative lectures and active classroom atmosphere
	C ₁₀ Innovation completes syllabus and teaching tasks
Innovative teaching effect B ₄	C ₁₁ Integrating theory with practice

Table 1 describes the composition of the evaluation indicators of teachers' innovation ability. The contents of the first-level evaluation indicators are the results, content, means and effects, and the first-level indicators are divided into different secondary indicators.

Teacher Innovation Ability Score

The first-level indicator scores and total scores of the five teachers obtained are described in Table 2 and Table 3, respectively.

TABLE 2
THE SCORE OF 5 TEACHERS' TEACHING INNOVATION ABILITY EVALUATION
LEVEL 1 INDEX

Teacher's name	B1	B2	B3	B4
T1	0.6372	0.7778	0.5353	0.7231
T2	0.8576	0.6115	0.7782	0.5984
T3	0.5318	0.4079	0.7786	0.6669
T4	0.8628	0.7215	0.6639	0.7773
T5	0.8006	0.6860	0.6458	0.6389
Eligibility criteria	0.5000	0.3500	0.5200	0.5500

TABLE 3
TOTAL SCORE OF 5 TEACHERS' TEACHING INNOVATION ABILITY

Teacher's name	Total score
T1	0.683
T2	0.6869
T3	0.5959
T4	0.7549
T5	0.6828
Eligibility criteria	0.5000

Analysis Table 2 and Table 3 can show the advantages and disadvantages of each teacher. First, the innovation ability of the five teachers in Table 2 is qualified, which verifies the validity of the model, and the innovation ability of some teachers is far greater than the prescribed standards. In Table 3, the total scores of the innovation ability of the five teachers are greater than the standard scores, which indicate that the balanced innovation mechanism of teacher team management is effective and reliable. Secondly, according to the evaluation total score of teaching effect can be drawn, their order is $T4 > T2 > T1 > T5 > T3$.

Analysis of the Effect of Balance Innovation Based on Organizational Duality

The number of teachers' innovative achievements before and after the adoption of this model is shown in table 4.

TABLE 4
NUMBER OF TEACHERS' INNOVATIVE ACHIEVEMENTS BEFORE AND AFTER THE
ADOPTION OF THIS MODEL

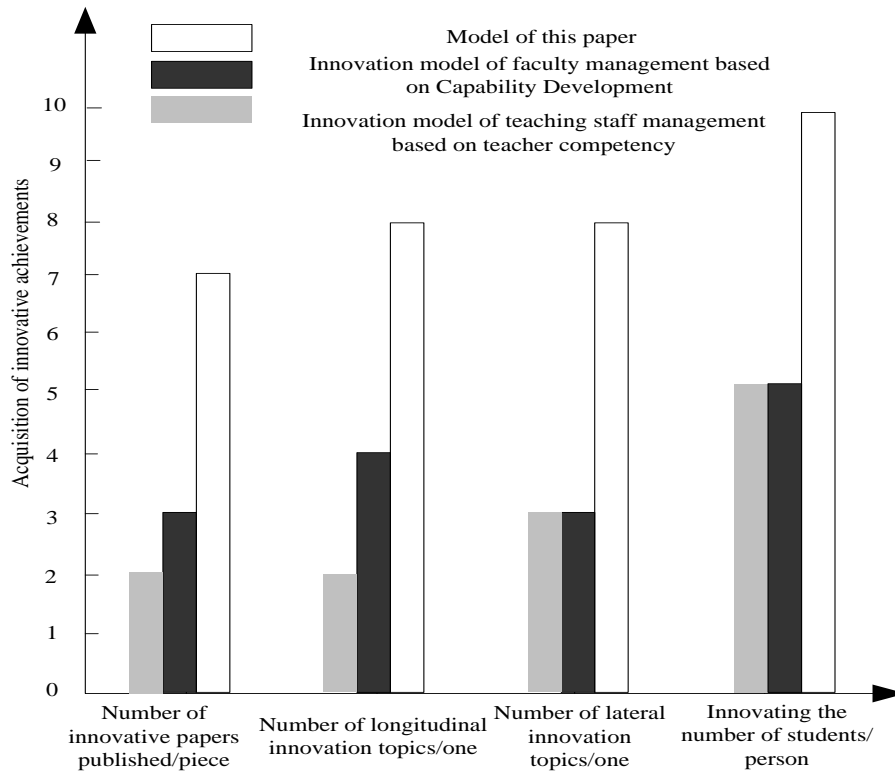
Innovative projects	Before using this model to innovate	After the innovation of this model
Number of innovative papers/articles published	2	4
Number of innovative paper retrieves / articles	1	4
Number of vertical innovation issues/one	3	6
Number of horizontal innovation topics / one	2	7
Innovative outcome outputs	0	2
Number of innovations published / Per copy	0	2
Number of innovation guidance students/persons	5	10
Number of innovation papers / articles included	4	7
Innovation curriculum normal number / item	2	6
Innovative Academic Awards / Articles	0	2
Transformation of innovation results	0	1
Number of innovative patents/ item	0	1
Number of patents transferred / item	0	1

According to the analysis, the number of innovative results in the four months increased significantly after adopting the model. It can be seen from the data comparison that the model proposed in this paper has a significant effect on the improvement of teachers' innovative ability.

The Impact of Different Models on the Innovative Achievements of the Teaching Staff

In order to highlight the effectiveness of the model, while using the model to train five teachers in innovation management, the other two models are selected as reference to train the other two groups of teachers. The number of teachers in these two groups is also five. The original innovation ability, teacher title and innovative research ability of the three groups of teachers are quite comparable. The comparison of the innovative results is depicted in Figure 7.

FIGURE 7
COMPARISON OF THE TOTAL NUMBER OF INNOVATIVE ACHIEVEMENTS OF TEACHERS



It can be seen from the analysis of Figure 7 that the number of results in the model is much larger than the other two models. This shows that it can obtain significant balanced innovation results, and can improve the innovation of teachers while properly managing the teaching staff.

DISCUSSION

Teacher's Ability to Innovate

Through the analysis of Table 2 and Table 3, the validity of the model is verified, and the innovation ability of some teachers is far greater than the prescribed standards; the data in Table 3 also shows that the balanced innovation mechanism of teacher staff management is effective and reliable.

According to the evaluation score of the teaching effect in Table 3, the total score can be ranked as $T4 > T2 > T1 > T5 > T3$. According to the score of the first-level indicators, the advantages of each teacher and the shortcomings they have can be known.

The reason why the model of this paper can achieve the ideal balanced innovation is determined by its analysis process. First, the teacher competency model is built to capture the skills and competencies that teachers need to do their jobs. Second, the teachers are trained according to the model, and the trained teachers are assessed to ensure they are competent. On this basis, the teaching team is being balanced and innovative to achieve the desired ability to innovate.

Therefore, after adopting the model of this paper, the scores of the teaching innovation ability acquired by the teachers are all in line with the standard, and some of the innovation ability far exceeds the prescribed standard score, which is significantly improved.

The Impact of Organizational Duality on the Balanced Innovation of Teacher Team Management

Analysis Table 4 shows that in this model, the effects and advantages of the balanced innovation mechanism based on organizational duality are very obvious. Comparing the two sets of data, it can be seen that after using this model, the number of teachers' innovation output and the number of innovation achievements have increased in the period of 4-months.

At the same time of paying attention to the training and assessment of the competence of the teaching staff, the "organizational duality" of the innovation of the teaching team is paid attention to promote the development of the team's balanced innovation and avoid entering the state of imbalance. Therefore, while ensuring the use of innovative environments, timely and moderate innovation. Effective innovations are constantly being acquired and innovation capabilities are constantly being improved in order to avoid entering a state of unbalanced innovation.

The Impact of Different Models on the Innovative Achievements of the Teaching Staff

Analysis of Figure 7 shows that in terms of "number of published innovations", the number of models in this paper is 7, and the number of the other two models is 3 and 2. In terms of the number of vertical innovation topics, the number of models in this paper is eight, and the number of the other two is 4 and 2. In terms of the number of horizontal innovation projects, the number of models in this paper is eight, and the number of the other two models is three. In terms of "innovation to guide the number of students", the number of models in this paper is 10, and the number of the other two models is 5. This shows that it can obtain significant balanced innovation results, and can improve the innovation of teachers while properly managing the teaching staff.

Under the premise of ensuring that the teaching staff is qualified for their own work, the model of balanced innovation mechanism based on the theory of "organizational duality" can not only keep teachers' innovative ability continuously improved, but also eliminate the imbalance. The organizational duality of management is incorporated into the innovation of teacher management, which ensures the effective construction and implementation of the model.

CONCLUSIONS

The balanced innovation mechanism of teacher team management is established to build the model of teacher competency and to evaluate the teacher team. Based on the theory of organizational duality, the internal mechanism of management innovation imbalance and balance is obtained. Combined with the competency model, the model of the balanced innovation mechanism of teacher team management is established. The construction of the model provides an effective means for the balanced innovation management of the teaching team to prevent innovation from falling into the unbalanced state.

While using the built model, the following suggestions are given to the management of the teaching staff:

- (1) Optimize teacher resource allocation
In combination with the actual situation of the institutions, the mechanism will actively be built to absorb innovative teachers. Its main purpose is to build reserve talents for innovative teams. The positions of teachers in various professions need to be further analyzed in order to coordinate the contradiction between teaching and research and promote the development of integration. At the same time, the competition mechanism needs to be formulated to effectively improve the innovation level of the teaching staff.
- (2) Create the good campus environment
The work of this link can be carried out in two aspects: The first is to create the atmosphere of lifelong learning, to improve their innovative ability through continuous learning, and to promote the professional development of teachers. The second is to build the excellent campus culture. Excellent teaching is based on excellent campus culture, and it is impossible to create excellent teaching results without it. Institutional administrators should strengthen the flexible management of innovative teachers, and inject new talents into the teaching team by

continuously introducing innovative talents, so that the teaching team has the strong creative vitality.

- (3) Cultivate the consciousness of innovative teaching
Institutional teachers are the group of diverse talents. The specific measures are as follows: First, guide students to carry out self-study. Teachers point out the focus and direction of learning for students and guide them to conduct learning in the form of self-study. At the same time, students' ability to discover problems, analyze problems and solve problems needs to be focused on. Second, strengthen practical teaching. Social practice activities are carrier for cultivating students' innovative spirit and practical ability, and improving students' comprehensive quality. They are good form of implementing quality education. Third is the combination of research and education. Through the promotion between teaching and research, teachers can keep up with the times and pass on the latest knowledge to students.
- (4) Strengthen the cultivation of professional ethics
For innovative college teachers, the high level of professional ethics is must. In the teaching process, not only professional knowledge is imparted to students, but also noble professional ethics has subtle influence. It mainly refers to teachers' attitude towards science. It is necessary to conduct research in the rigorous, realistic and dedication manner, and to create the good learning atmosphere for students with the teaching style of truth supremacy and knowledge supremacy, so that correct values and awareness of lifelong learning can be established.

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