Management Pattern Discussion and Practice of Graduate Students Vertical Research Group Based on Matrix Organization Structure

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Abstract. The development of engineering universities in China has entered a “new normal” of great number of graduate students and large quantity of research activities. Doctoral students and graduate students trained by research university account for over 80% among all the ordinary universities in China, research laboratory and research group are the main places for their study and living. The traditional and single horizontal class management which divided according to students’ school year is still play a role, but its limitation is also obvious in moral education, teaching management and other aspects. This paper takes School of Material Science and Engineering of Harbin Institute of Technology as an example, presenting a “horizontal cultivation, vertical extension” research group management pattern based on matrix organization structure. In practical student work, we used and concluded a corresponding mechanism of system construction and management, which is a useful innovation of postgraduate education management.

As a top-notch talent group, graduate students are full of energy, concerning about current affairs and have active thinking. The soundness of their thoughts exert a vital influence on today's social stability. Currently, the number of graduate students enrollment has increased year by year, which reached over 570,000 people, and most of them are from engineering universities include 36 research universities such as Tsinghua University, Harbin Institute of Technology. Doctoral students from these engineering universities account for 59.62% of all the ordinary universities and colleges in China, and graduate students and undergraduates account for 30.45% and 8.31%, respectively. The number of graduate students keeps growing, which brings a challenge to students’ moral education and affairs management. In the background of large quantity of research activities, graduate students scatter in multiple labs and difficult to have the common time and space, which becomes the restriction to carry out graduate student work. Therefore, through setting up departments, research institutes, research centers and other research institutes and basic teaching units, these vertical management organizations cover the shortage of original horizontal class and grade management. These two intertwined management modes comply with the teaching and research work, which provide powerful support and guarantee for universities’ teaching and research work, and gradually formed a new way which adapt to the development of graduate education [1].

Current Situation Analysis of the Existing Student Education Management Mode

At present, the traditional structure of postgraduate management of higher education in China is a linear functional structure that is based on major division and in accordance with the school year to form a pyramid type structure of the class management system. This kind of postgraduate management structure is relatively isolated. The advantage of this structure is that it is convenient to complete “task” required by university and school, and student affairs are almost identical. This “horizontal” work structure is convenient to manage student affairs, issue notices and report statistical data, especially during enrollment and graduation. The disadvantage is that graduate students belonging to the different institutes and laboratories, except class time, most of their time is spent on doing researches in labs. Due to students don’t have enough time spend together, the class cohesiveness is low and lead to the waste of educational resources and low management efficiency.
Therefore, it is still quite difficult to implement moral education rely on “horizontal” work structure.

In recent years, in order to avoid shortcomings of the traditional postgraduate management pattern, many universities have dropped the original class division way, but set up vertical class according to their research and subjects, so every class consist of graduate students and doctoral students from different grades. The advantage of this vertical class management system based on “research group” is obvious. Laboratory as the main place for the graduate students’ activities, is convenient to hold academic exchanges frequently which could improve students’ science research capability and help junior graduate students to adapt to new role as soon as possible. And the tutors could strengthen the supervision of their students, which is conducive to implement each system and issue notice. However, this kind of vertical management pattern is not so good for student exchanges among different disciplines. Students from the same school year have common problems in interpersonal relationship, affective problems and employment pressure, so this management pattern is not conducive to improve exchange and solve their common problems [2].

Therefore, there are pros and cons to both the traditional horizontal class and this new vertical class. Only through learning from each other, diluting the organizational system and intensifying the substance of education and management, can it be more effectively to elaborate the function of education and management carrier.

Feasibility Analysis of “Horizontal Cultivation and Vertical Extension” Matrix Organization Structure

The Theoretical Basis of Vertical Management Pattern Based on Matrix Organization Structure

“Matrix” is a mathematics word referring to a rectangular array of numbers, symbols, or expressions, arranged in rows and columns. In the 1950s, with the development of organization, a new organizational structure appeared—Matrix organization structure. This management pattern combines the bidirectional connection, has both horizontal and vertical functional departments which have dual reporting relationship, and forms an organization structure like a matrix network. The most important feature of this organization structure is being flexible and adaptable. Being an evolution of traditional organization structure, Matrix management is increasingly used by enterprises and World Class Universities [3].

Adapting the Need Training Characteristics of Graduate Students from Research Universities

Harbin Institute of Technology is a research university mainly based on science and engineering, also combines humanities, social sciences, and management, which has “national defense” and “engineering” two scientific research characteristics. HIT advocates students use one year to prepare and complete graduation thesis, and encourages senior students enter into specialty laboratories as early as possible to participate in tutor’s project and become junior researchers, which could intensify the training of outstanding students. Take project implementation agency School of Material Science and Engineering for example, in 2015, existing students 22,525, of whom 968 graduate students and 266 students in senior year have entered into research group labs. These students spend almost of their time with their tutors and classmates from the same research group in labs, which result that the traditional class has less class cohesiveness and students are not active to take part in class activities. This phenomenon brings a number of challenges to the moral education of research universities.

Path Construction and Management Practice of Vertical Research Group Management Mode

Path Construction of the Management Mode of Vertical Research Group

Construction plan of management structure is as follows. Horizontal structure refers to the student organizations set up according to school year (grade), such as student party branch, league
branch and class; the vertical research group management mode refers to build group according to similar discipline or relevant laboratory which implement the vertical management based on “group” organizational system. The relation between “horizontal” and “vertical” management mode: the horizontal class management mode remains unchanged, while build research group (include research institute) which adopts the across-grade vertical student management system, and sets up a matrix organization structure vertically and horizontally interlaced.

The management of student affairs is divided as follows. The horizontal class is responsible for dealing with student public affairs, such as: students status management, approving and allocating of scholarship and grants, health status monitoring and medical insurance management, security and stability work, employment management and so on. These affairs need graduate students gather in the same place, and the same grade students usually have something in common which is more convenient to use “horizontal” work pattern to notice issues, and it is more efficient for management and organization. The vertical research group is mainly responsible for scientific research activities, including Party construction activities, academic activities and recreational and sports activities. This new organization form focuses on the scientific research and academic exchange, and intersects with the original class management system. The vertical organization form takes advantages of similar research direction, collaboration of students and high research group cohesiveness, which is convenient for cultural communication and academic exchange [4].

Mechanism of educational management and student education working system build a “school-student management office-research group” three-level management system. The three levels respectively are leading group, organization and management office and research groups. Leading groups are led by deputy Party secretary and vice president of the teaching. Organization and management offices are led by student management office of school. Research groups are assisted by some young teachers called “students work secretary” and appoint some excellent graduate students as “senior brother”. These teachers and students are jointly responsible for this group’s student education and daily management.

The Construction and Practice of Vertical Research Group Management Mode

Take School of Material Science and Engineering of HIT as an example, according to school’s requirement of decade planning and team building, we chose 9 A level research groups and 12 B level research groups among 51 research groups in our School which cover almost 70% graduate students and senior undergraduate students. School develops the vertical research group management pattern based on these 21 projects. Every research team sets up the corresponding student organization, and implements the vertical “group” organizational management system. The research groups and teams are not involved can, according to the real situation, form a united “group” voluntarily or form an independent “group” by their own. These students Party and League branches were built based on “group”, managed by student themselves, and supervised by School, department, institutes, teams and research groups.

In order to make project implementation more normalized and scientific, and can be passed down from generation to generation, School of Material Science and Engineering of HIT combined with work experience promulgated the corresponding management documents.

After two year's experiment, we have already had certain foundations for extension. The special ceramics research institute led by Professor Zhou Yu and hydroforming engineering research center led by Professor Yuan Shijian had remarkable effect. Hydroforming engineering research center took the advantages of teamwork, implemented the “4+2” management mode which is consisted of a monitor, a vice-monitor and two senior advisers. The team management implements “1+1” mode, which could urge every member to form technical thought and behavioral habit and ensure the stability of team and effectiveness of development. For instance, Professor Zhou’s special ceramics research institute established their League branch and Party branch. Many experts and scholars were invited to give academic lectures 12 times totally. And branch has held mid-autumn festival celebration, badminton game and other colorful activities to promote the emotional communication between teachers and students. Journal of Harbin Institute of Technology reported the events
organization and construction situation of “special ceramics” institute. This research group awarded the “Three Aspects of Education” advanced team.

Table 1. Management pattern operation structure of School of Material Science and Engineering vertical research groups.

**Conclusion**

The vertical research group is bold to do reform and exploration in student management system, and build a good, long-term and comprehensive communication platform for undergraduate, graduate and doctoral students. This communication platform not only makes full use of resource, but also provides an opportunity for the mutual communication, mutual cooperation and mutual education between students and teachers. During the communication, students can realize the self-education and self-management. This vertical management system could effectively promote academic exchange, play the role of tutors and improve the comprehensive qualities of students. On the other hand, this vertical management system could overcome the shortcoming of horizontal class, realizing the overlapping management. Building the Party and League branch on the labs, research groups can make the inspection work of Party activists more effectively, and is beneficial to play the advanced nature of party members and realize the masses supervision to party members. It is a beneficial exploration of student management system for a research university under the new situation. This platform provides a new organization form for the reinforcement and improvement of college students’ ideological-political education.
References


