

Analysis of the Current Situation of Experimental Technical Teams in Colleges and Universities Under the Background of "Double-First Class"

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Abstract: Under the background of "Double-First Class" construction, the experimental technical team plays a vital role in the development and construction of laboratories in colleges and universities, whether it is the management of large-scale laboratory instruments or as teaching assistants. This paper deeply studies the current situation and existing problems of the experimental technical team in colleges and universities, and discusses the current situation of the experimental technical team in Xinjiang University. At the end of the article, from the aspects of optimizing the team structure of the experimental technical team, promoting professional titles, establishing and improving the institutional system, etc., a series of relevant measures are put forward, so that the experimental technical team can play a greater role in teaching and scientific research experiments and achieve long-term healthy development.

Keywords: Experimental technical team; Construction; Current Situation

1. Introduction

Institutions of higher learning shoulder the historical responsibility of cultivating high-quality innovative talents and conveying high-level professional talents for the country. The ^[1] "double first-class" construction is a major strategic deployment made by the CPC Central Committee and the State Council. With the continuous promotion of "double first-class" construction, higher education is facing unprecedented opportunities for development. Due to the development needs of scientific research and talent training, the laboratory, as an important base for teaching and scientific research of universities, is the main place for cultivating high-quality talents, making high-level achievements and serving the economic construction.^[2] Many universities realize that the construction of high-level and first-class laboratories, not only must have a "high, fine, sharp" large equipment and innovative researchers, but also must have a professional experimental technical team as the support. In the development of colleges and universities, the experimental technical team is an indispensable part of the basic laboratory and technical force, and an important part of the teaching team, so most colleges and universities began to strengthen the construction and management of the experimental technical team.^[3] However, due to various reasons, the construction and management of the experimental technical team face multiple tasks. How to build a high-level, high-quality, high-level professional experimental technical team to meet the needs of laboratory work and help the high-quality development of universities is still a problem that needs to be seriously considered in the long-term development of universities.

2.Current situation of experimental technical team construction in colleges and universities

2.1 The construction concept does not match with the actual development

Most colleges and universities have a vague definition of the experimental technical team. With the construction of high-level and first-class laboratories, the experimental technical team, whether as the main manager of large equipment, or teaching auxiliary personnel, is the backbone of the laboratory development, and is an irreplaceable important role. Under the background of "double first-class" construction, the state's resource investment in large instrument and equipment in colleges and universities increases, but the quantity and quality of the corresponding experimental technical team are obviously lagging behind, resulting in a great discount in the benefit output of large instruments. At present, universities focus on doctor's degrees or give priority to overseas experience. Because the experimental technical team is a teaching auxiliary personnel in colleges and universities, and the salary is relatively low compared with the full-time teachers or scientific research positions, so that the introduced talents are not willing to hold the ^[4] of experimental technical positions. At present the development trend of most universities is heavy scientific research, so in China, the experimental technicians training methods and architecture, basic belongs to the passive service mode, although the experimental technicians is the main body of the laboratory work, but most cases only participate in the school of auxiliary teaching, rarely really participate in the actual scientific research work.

2.2 The overall team structure is unreasonable

In the construction work of "double first-class", the personnel composition of the experimental technical team is complex, leading to the heavy problems of building a high-level experimental technical team. There are many unreasonable phenomena such as age structure, educational background structure and professional title structure in colleges and universities. Although ^[5], in recent years, colleges and universities have strictly checked the source, and most of them require a master's degree or above, which has expanded the team of experimental technicians to a certain extent, the college and technical technicians in the early years are still on duty. From the age structure analysis, some age groups appear fault, the proportion of young and middle-aged people is relatively low, the overall team is aging; from the education, with master, doctor degree is rare, from the title, experimental technicians generally in the primary and intermediate, senior titles, restricting the development of the laboratory. The difference in education and age group creates the difference in educational level and professional ability. The long working life also indirectly leads to the slow speed of accepting new things, which is in obvious contrast with the newly introduced personnel.^[6] and the construction of experimental technical team is not high education, assigning personnel to appropriate positions can make high, medium and low education match each other and cooperate together.

2.3 The Training mechanism is not sound

In the rapid development of science and technology, knowledge in the continuous update of knowledge, the experimental technical team should master the latest instruments and equipment knowledge, and most colleges and universities lack a perfect training mechanism, lack of investment and training of experimental technicians, more lack of financial support. Some colleges and universities have not even organized any training, so that the experimental technicians are in a state of stagnation, resulting in a poor experimental teaching effect but also frequent accidents. As can be seen from Figure 1, from 2005 to 2021, the laboratory dangerous accidents occurred frequently in many universities in China, and the safety situation cannot be ignored. Our experimental technicians are closely related to laboratory safety, and their level of laboratory management and the degree of expertise will be the most important factors affecting laboratory safety.

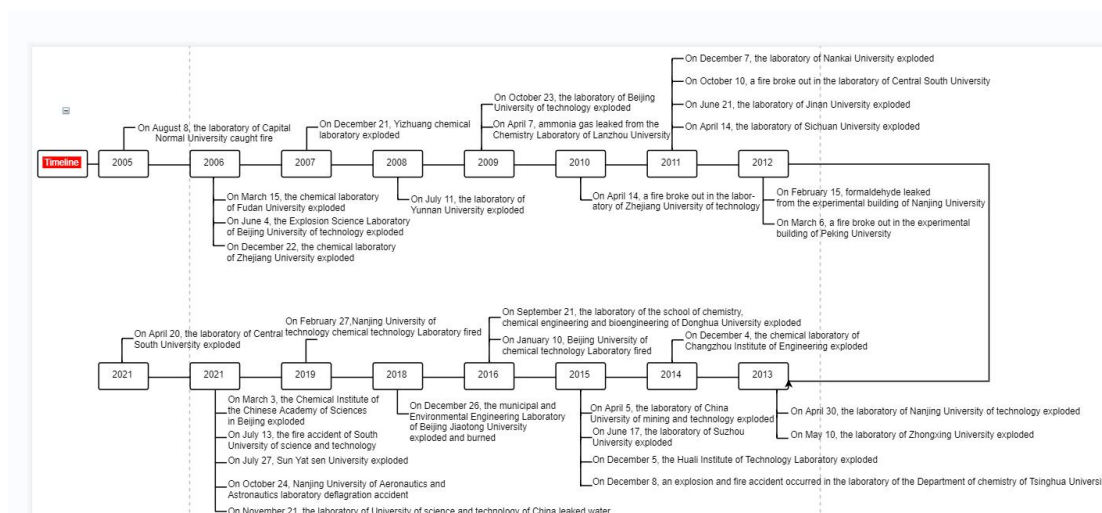


Figure 1: Map of laboratory accidents in many universities in China from 2005 to 2021

Although in recent years, the state has increased the investment in the construction of colleges and universities, but also increased the investment in the experimental technical team, but most universities will pay attention to the purchase of large equipment, lack of training for the experimental technical team. Occasionally a little training is also for the laboratory safety management knowledge training, very few professional skills training, let alone to further study, communication or discussion activities. Although the learning of laboratory safety management knowledge is normal, the number of training is still lacking, and some experimental technicians still do not pay attention to it, and they did not achieve the corresponding effect. There is little training for professional skills. Most of the ways for experimental technicians to improve their professional level is by self-study, but after a long time, the enthusiasm of learning will be reduced, leading to the slow improvement of the construction level of experimental technical team. In recent years, in the development and construction of China, the experimental technical team has been paid continuous attention, but there has been no perfect solution for the long-term planning and training mechanism of this team. There is still no satisfactory answer to its career planning, where the development prospect is, and what the work goal is.^[7]

2.4 Imperfect management system

Experimental technical team has played the auxiliary role of teaching and scientific research for a long time, and few universities have a perfect management system, evaluation or reward mechanism of experimental technical team. In general, the experimental technical team evaluation standard with reference to full-time teachers' evaluation system, mainly in papers, project data test personnel, the system is not fully suitable for the assessment and development of experimental technical team, deviation from laboratory work actual content, lack of assessment standards for the characteristics of experimental technical team work, the lack of incentive mechanism to promote the construction of experimental technical team, eventually lead to in the process of assessment, title promotion by a lot of restrictions.^[8]

The professional title of experimental technical team has always been the bottleneck in career development, and the most fundamental reason is the post attribute of experimental technical personnel. Both in teaching and scientific research, the experimental technical team is auxiliary in nature. In the title promotion channels, both teaching or scientific research teachers or administrative positions are not suitable for experimental technical personnel, so that the title of the experimental technical team is chaotic and not systematic.^[7] For a long time, the work vitality and initiative of experimental technicians are greatly reduced, accelerating the loss of high-quality talents, and increasing a resistance to the construction of experimental technical team.

3. Analysis of the current situation of the experimental technical team of Xinjiang University

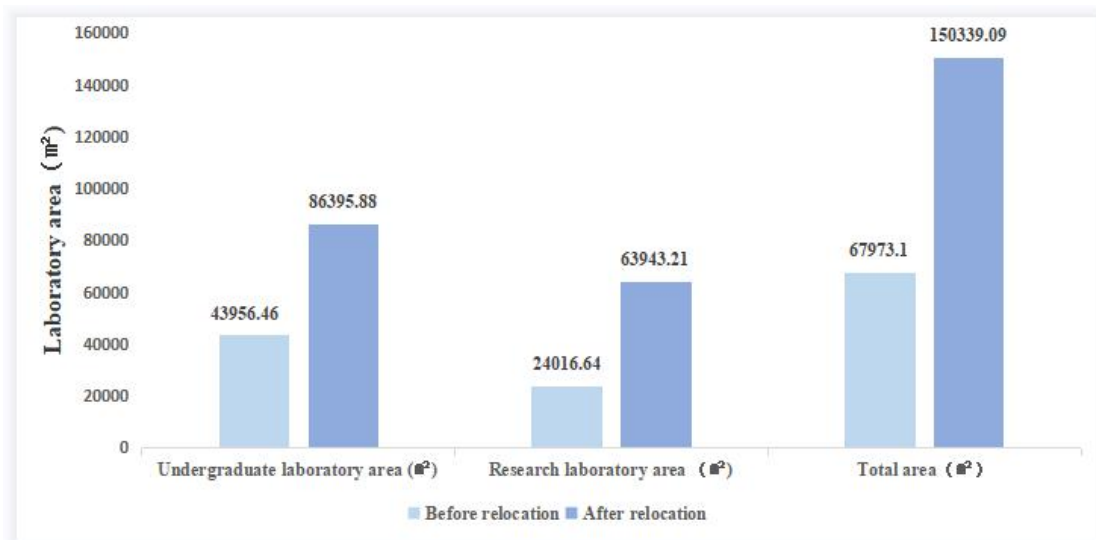


Figure 2: Changes of laboratory area before and after the relocation of Xinjiang University

As the only university in Xinjiang selected for "double First-class" construction, Xinjiang University of Boda Campus project has been completed and used, and the platform space and hardware condition bottleneck of the development of the school of science and engineering have been greatly improved. As can be seen from Figure 2, the total area of the former laboratory is 67,973.1 square meters in 2021, including 478 undergraduate experimental rooms, 43,956.46 square meters, 443 scientific research experimental rooms and an area of 24,016.64 square meters, providing a basic guarantee for talent training and scientific research in our university.

Since the relocation to Boda Campus, there are 187 undergraduate laboratories, 504 undergraduate laboratory rooms, covering 86,395.88 square meters, 635 research laboratories covering 63,639.43.211 m meters, covering 150339.09 m meters, which is more than doubled, which meets the needs of teaching, attracting talents and producing first-class research achievements.

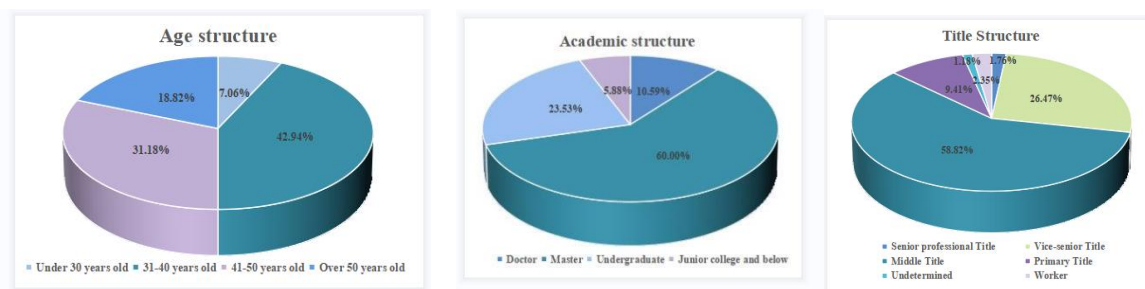


Figure 3: Current Situation of experimental technical Team of Xinjiang University

The school has been greatly improved in the bad situation of education, and the laboratory is more than enough, but there are only 170 experimental technicians responsible for experimental teaching and laboratory management. Figure 3 shows the current situation of the experimental technical team of Xinjiang University. As can be seen from Figure 3, people over 50 years old account for 18.82%, people between 41 and 49 years old account for 31.18%, people between 31 and 40 years old account for 42.94%, and people under 30 years old account for 7.06%. The age structure of the experimental technical team is relatively reasonable. Can be seen from the degree structure, PhD accounted for a minority, 10.59%, master proportion heavier, accounted for 60%, bachelor degree accounted for 23.53%, college and below accounted for 5.88%, compared with other universities, education structure is relatively reasonable, although the master degree number is larger, but professional structure is not enough, some jobs still lack of professional personnel. Among the 170 experimental

technicians, 1.76% have senior titles and 26.47% have deputy senior titles. It can be clearly seen from the structure of professional titles of experimental technical teams. The proportion of professional titles is unreasonable, and the number of people with high titles is small, which indirectly indicates that it is difficult for professional titles to be promoted.

Table 1 "Double first-class" Universities

number	school	Statistics time	experimental technique The number of personnel	Number of full-time teachers	scaling (%)
1	Shanghai Jiao Tong University	2018	530	3061	17.31
2	Jilin University	2018	1085	6503	16.68
3	Huazhong University of Science and Technology	2021	471	3588	13.13
4	(Sichuan University	2019	466	4527	10.29
5	Zhongshan University	2018	600	3823	15.69
6	Central South University	2020	428	3124	13.70
6	Xinjiang University	2021	170	1953	8.70

Note: The data comes from the undergraduate teaching quality report or reference ^[9] of various universities

As can be seen from the data of the "double first-class" universities in Table 1, the number of experimental technical teams in such schools is about 15% compared with the number of full-time teachers ($\pm 5\%$).^[9] Compared with other universities, the number of experimental technical team personnel in Xinjiang University is relatively low, and the proportion of the number of full-time teachers is also relatively low, only reaching 8.70%. From the analysis of the number of experimental technical team personnel, there is a lack of experimental technical personnel, and most of the experimental personnel are not fully employed and unskilled. In the long run, Xinjiang University will gradually get away from the goal of building a high-level, high-quality and first-class laboratory.

3.1 Measures and suggestions to strengthen the laboratory team construction

3.2 Improve the ideological understanding, and clarify the post importance of the experimental technical team

The long-term development of colleges and universities cannot be separated from the experimental teaching and scientific research, while the experimental teaching and scientific research tasks just cannot be separated from the laboratory. The experimental technical team is the core part of the laboratory operation, but also the most direct technical force, but also the experimental teaching auxiliary personnel. Experimental technicians are the direct promoters of experimental teaching. Without the experimental technicians, it will be very difficult to carry out the experimental teaching class, and the teaching task of the school cannot be promoted smoothly. The experimental technical team is an irreplaceable and important role both in the discipline construction, experimental teaching and talent training, and plays a pivotal role in the whole development planning of colleges and universities.

The experimental teaching demonstration center plays an important role in promoting the experimental teaching reform, improving the level of experimental teachers, constructing an innovative experimental environment, and strengthening the

students' experimental practice ability. Xinjiang university has 2 national experimental teaching demonstration centers and 9 autonomous region-level experimental teaching demonstration centers. The experimental technicians are inseparable from the management of the whole experimental teaching demonstration center and the overall future planning of the experimental teaching demonstration center. Therefore, to strengthen the premise of the construction of experimental technical team is that colleges and universities to fully realize the importance of experimental technicians, schools should change the traditional concept, attach great importance to the construction of experimental technical team, and formulate relevant policies and development planning to improve the experimental technicians work enthusiasm, and help to enhance self identity, promote the school experiment related work safety and stability, healthy development.^[10]

3.3 Set up posts scientifically, formulate incentive policies, and improve the performance appraisal mechanism

In order to make the experimental technical team better realize the value of life, we should reasonably set up the laboratory team positions according to the actual position situation, clarify the job responsibilities, optimize the professional title structure, age structure and educational background structure of the team, so as to give full play to the advantages of the experimental technicians. According to the survey, most colleges and universities have different positions, with different assessment mechanisms, such as full-time teachers series, can be divided into teaching, scientific research, teaching and research and scientific research categories, in the year-end assessment, professional title evaluation and other aspects to broaden the development channels and career planning of teachers. However, the work of the experimental technical team is more complicated. If the assessment is conducted according to the unified standard, it is difficult to reflect the actual workload of the experimental technical personnel, which can not provide the corresponding basis for the future professional title evaluation and year-end assessment. Colleges and universities should establish a scientific long-term effect incentive mechanism in line with the experimental technical team according to the actual position situation. The core of stabilizing the team of experimenters, enhancing the responsibility of experimenter and stimulating the enthusiasm of experimenter is to establish and improve various incentive systems. Scientific incentive mechanism is the key to attracting and retaining talents. In terms of the salary system and professional title promotion, the experimental technical team should be given preferential policies, so as to effectively improve the status of the experimental technical team, change the impression of the experimental technical team as "auxiliary" in colleges and universities, and improve the "discourse power" of the experimental technical positions from the source.^[11]

Establish and improve the performance appraisal mechanism of experimental technical team, focusing on the experimental platform construction, large instrument open sharing and undergraduate experiment teaching, etc., belong to the experimental technical team actual work situation and job characteristics for the relevant system, the comprehensive assessment of experimental technical personnel, to arouse the enthusiasm of experimental technical personnel work.

3.4 Ensure the size of the team and improve the professional title system of the experimental technical team

The number of experimental technical personnel in some colleges and universities and the number of full-time teachers has a certain proportion, and the proportion of "double first-class" construction universities can be appropriately increased.^[12] In order to ensure the size of the team, the first step is to improve the treatment, strengthen the introduction of talents, introduce targeted talents according to the characteristics of the discipline, ensure the annual recruitment index, and make the structure of the experimental technical team more reasonable.

The construction of "double first-class" in a university cannot be separated from a stable experimental technical team. The promotion of the experimental technical team's professional title has always been in a very difficult state. Before, experimental technical personnel have not belong to their own title promotion channels, experimental technical personnel go title series in a confused state, don't know which series suitable for yourself, with the public economist series, has nothing to do with itself title, part of teachers series title, but difficult, has been in a state of up. As the reform and development of

colleges and universities, the experimental technical team finally has its own title series, through a clear evaluation system perfect title system, optimize the title level setting, can clearly for the experimental technical personnel career planning drew a different track, at the same time through experimental technical personnel career development channel, can attract more talent gathered.

Xinjiang university on the basis of the Xinjiang uygur autonomous region experimental technology series professional technical position qualification review conditions (trial) " file, improve the experimental technology series of title evaluation, from the assistant laboratory, laboratory, senior laboratory to senior laboratory, through the experimental technicians title promotion channel, pay attention to examine the experimental technology ability, experimental teaching effect and experimental innovation ability. Although the proportion of experimental technicians with senior titles is relatively small, the experimental technicians with outstanding achievements, rich experience and high technical ability still have room for improvement, which makes the experimental technical team have the goal of struggle and makes the road to promotion visible and accessible.

3.5 Strengthen the training to improve the overall quality and professional ability of the experimental technical team

For a long time, the experimental technical team can not get the attention of colleges and universities, rarely organized professional training, most of the experimental technicians are living on their laurels. With the continuous introduction of high-tech large instruments, the continuous development of new technologies and the improvement of scientific research level, the experimental technical team is urgently needed to improve their professional knowledge and professional skills to adapt to the construction of "double first-class" universities and high-quality laboratories in the new era. Each university experimental technical team should go out more, exchange learning, planned, organized diversified training, establish and improve the training system, system training plan, orderly technical backbone study, exchange exercise, understand the experimental teaching development level at home and abroad, learn new experimental teaching ideas, methods and experience, understand the latest equipment maintenance, learning latest achievements, broaden the knowledge, improve the theoretical level of experimental technicians and practical skills, efforts to narrow the overall quality of experimental technical team regional differences.

The construction of "double first-class" universities and high-level laboratories should be in line with excellent universities at home and abroad, regularly organize excellent backbone of experimental technology to study in first-class laboratories at home and abroad, broaden their horizons and change their thinking mode, and build an experimental technical team with connotation and level.^[13]

4. Conclusion

The construction of the experimental technical team in colleges and universities is an integral part of the construction of the "double first-class" universities. The important guarantee of the first-class scientific research and the first-class talent training is the first-class experimental technical team. Colleges and universities should attach great importance to the construction and management of experimental technical team, combining the actual situation and existing problems of scientific analysis, strengthen the top-level design, carry out diversified training, promote the transformation of laboratory construction concept, the construction of reasonable experimental technical team echelon, improve the laboratory team structure, improve and implement the laboratory team management system. Xinjiang University has been making continuous efforts to build a "double first-class" university, and has to exchange lessons with other brother universities, learn from each other, and communicate with each other. In the reform and renewal of "double first-class" high-level laboratory, constantly improve the construction of experimental technical team, and help the "first-class" double construction of high-quality development.

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