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Exploration and Research on the Construction of Efficiency Supervision Platform for Large-scale Instruments and Equipment

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Abstract: Large-scale instruments and equipment play an increasingly prominent role in teaching and scientific research, personnel training and social services, and are also one of the important indicators to measure the level of teaching and scientific research in Colleges and universities. This paper analyzes the current situation, problems and deficiencies in the use of large-scale instruments and equipment in our university, studies how to improve the use efficiency of large-scale instruments and equipment, gives full play to its important role in teaching, scientific research and social services, puts forward the idea of building a large-scale instrument and equipment efficiency supervision platform, and describes in detail the main functions of the platform, such as basic setting, monitoring management, use efficiency analysis, etc, The feasibility and expected benefits are described comprehensively. The focus of this paper is to scientifically purchase large-scale instruments and equipment, improve the use efficiency of large-scale instruments and equipment, and give full play to its due role and value.

1. Introduction

Large instruments and equipment play an increasingly prominent role in teaching and scientific research, talent training and social services. It is also one of the important indicators to measure the level of teaching and scientific research in Colleges and universities. With the deepening implementation of the strategy of "rejuvenating the country through science and education", China's higher education has developed rapidly. On the one hand, the state has increased the capital investment in higher education, and the school running scale of colleges and universities across the country has gradually expanded; On the other hand, the school continues to improve and upgrade the equipment level of teaching and scientific research. Especially in the construction of key disciplines and key laboratories, the number of large instruments and equipment has increased sharply, and the material conditions of teaching and scientific research have been significantly improved. [1] The focus of this paper is to scientifically purchase large-scale instruments and

equipment, improve the use efficiency of large-scale instruments and equipment, and give full play to its due role and value.

According to statistics, the number of scientific instruments and equipment in China is more than the total number of EU 15 countries, but most of them are idle, and the utilization rate of many instruments and equipment is less than 25%; According to a survey by the Ministry of science and technology, only 50% of the more than 7000 sets of instruments in China can be started normally, and the waste of resources is serious. [2]

How to improve the use efficiency of large-scale instruments and equipment has become a top priority. In addition to establishing reasonable assessment procedures and strict reward and punishment system, we should also establish the efficiency supervision platform system of large-scale instruments and equipment, which plays an important role in improving the use efficiency of instruments and equipment, solving the problems of repeated purchase of state-owned assets, long-term idle waste of resources and so on.

2. Current Situation Analysis of Large Instruments and Equipment

Laboratory is an important place for scientific research and personnel training, and large-scale instruments, as the basic guarantee conditions, play a vital role in teaching and scientific research. [3] In recent years, with the deepening of school connotation construction, laboratory construction has also made great development. In order to improve the school running level and enhance its competitiveness, the school has purchased a large number of instruments and equipment, of which the proportion of large instruments is increasing. Taking Shanghai Publishing and Printing College as an example (hereinafter referred to as "our school"), especially in the five years from 2017 to 2021, the total newly added fixed assets of laboratory equipment were 185.4 million yuan, accounting for 53.57% of the total assets of laboratory equipment of the whole school. As shown in the Table 1 and Figure1.

Table 1: List of new laboratory equipment and fixed assets in 2017-2021

Unit: million yuan

Fixed assets of new laboratory equipment in 2017-2021					Total added laboratory equipment assets	Total assets of laboratory equipment of the whole university
2017	2018	2019	2020	2021		
23.3	33.7	34.3	34.9	59.2	185.4	346.1

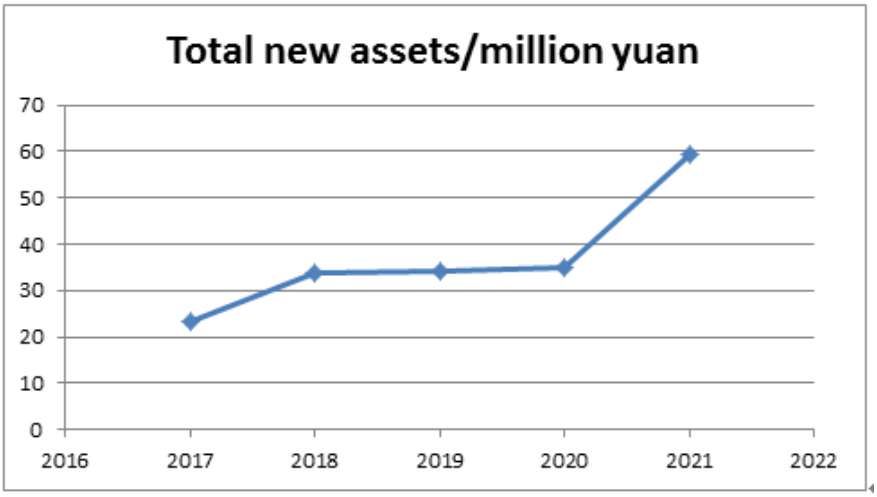

Figure 1: Trend chart of newly added instruments and equipment in the laboratory in recent five years

Among them, in recent five years, the added large-scale laboratory instruments and equipment (instruments and equipment with a unit price of more than 200000) accounted for more than half of the total assets of newly added laboratory equipment, up to 56.53%. As shown in the Table 2 and Figure2.

Table 2: List of new fixed assets of large instruments and equipment in 2017-2021

Unit: million yuan

New fixed assets of large laboratory equipment in 2017-2021					Total assets of new laboratory large instruments and equipment	Total added laboratory equipment assets
2017	2018	2019	2020	2021		
13.1	13.6	19.4	23.3	35.5	104.8	185.4

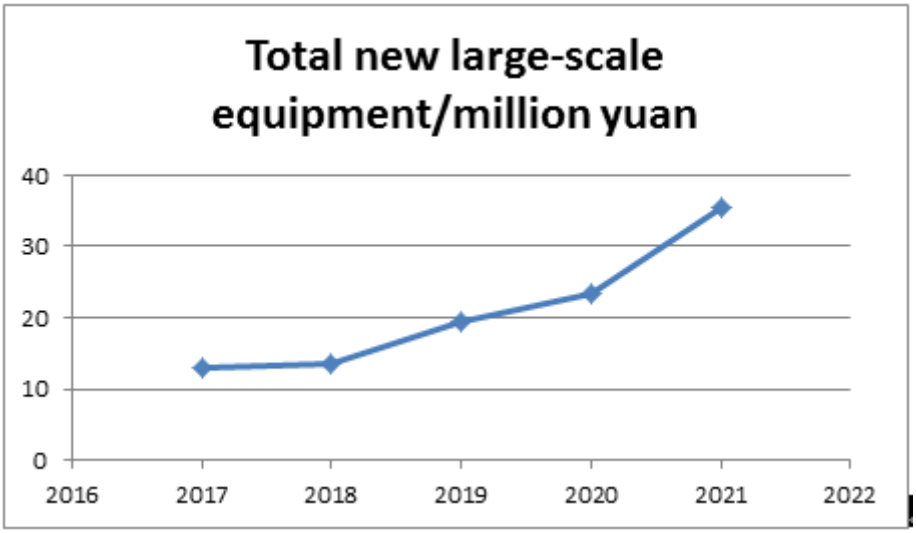

Figure 2: Trend chart of new large instruments and equipment in the laboratory in recent five years

As the structure of large-scale instruments and equipment becomes more complex, systematic and diversified, the overall value of large-scale instruments and equipment is also higher and higher. The existing management means of the school can not effectively monitor the dynamic operation of large-scale instruments and equipment. Using advanced Internet of things technology to monitor the use of large-scale instruments and equipment through current monitoring, IOT supervision and other means can not only improve the dynamic life cycle of large-scale instruments and equipment, but also effectively monitor the use efficiency of large-scale instruments and equipment to avoid wasting school resources, but also effectively improve the use rate of school funds and avoid unnecessary investment of school funds.

3. System Construction

In order to implement the opinions of the State Council on opening national major scientific research infrastructure and large scientific research instruments to the society [4], the guiding opinions of the Ministry of education on strengthening the opening and sharing of scientific research infrastructure and scientific research instruments in Colleges and universities [5], the Ministry of science and technology, the development and Reform Commission Notice of the Ministry of Finance on printing and distributing the administrative measures for the opening and sharing of national major scientific research infrastructure and large scientific research instruments [6] and the notice on carrying out the evaluation and assessment of the opening and sharing of major scientific research infrastructure and large instruments in Central Universities and scientific research institutes [7], and implementing the provisions of Shanghai Municipality on promoting the sharing of large scientific instruments and facilities, Improve the open sharing and use efficiency of large-scale scientific instruments and facilities, and enhance the ability of scientific and technological innovation. At the same time, in response to the measures of Shanghai for the evaluation and reward of large-scale scientific instruments and facilities sharing services [8], it is necessary to supervise the use information of large-scale instruments during the operation of large-scale instruments and equipment.

There are 367 large-scale instruments in our school. At present, the service time of all large-scale instruments is calculated by offline manual statistics. With the increasing diversification of the number, structure and function of large-scale instruments, the way of manual recording can not respond to the construction needs of the school. At present, the school has built an asset management system, which has completed the collection and management of basic information of school equipment. As an important part of school equipment, the collection of basic information of large-scale instruments has been basically completed. After the construction of large-scale instrument and equipment efficiency supervision platform is completed, the basic information can be directly used to complete the initialization of supervision equipment through data sharing.

The construction of the efficiency supervision platform for large-scale instruments and equipment will monitor the large-scale instruments and equipment in the school through the current monitoring equipment. Each equipment will set its own number. The system will monitor the equipment by monitoring the current change of large-scale instruments and equipment, and judge the use of the equipment by recording the change of equipment current, By continuously recording the current changes of large instruments and equipment, complete the service time statistics of large instruments and equipment, and finally realize the recording and analysis of the service efficiency of large instruments and equipment.

3.1. Basic Settings

(1) Personnel management: the personnel used in the management system, including the internal personnel of the laboratory, the faculty and staff in the school, the personnel outside the school, etc., including the addition, deletion, modification and inspection of users and the registration management of personnel outside the school.

(2) Permission management: set the permissions and roles of each person in the system.

(3) Large-scale instruments and equipment information initialization: there are two ways to initialize the information of large instruments: direct input and docking with the asset management system. Direct input, that is, initialize the basic information of large instruments directly through input or import; Connect with the school asset system, obtain the basic information and storage location of all large instruments, and verify and confirm them. After initialization, the supervision setting of Large-scale instruments and equipment can be realized by pairing with Large-scale instruments and equipment monitoring equipment.

(4) Rules and regulations: publish various rules and regulations in the sharing platform.

(5) Download Management: provide the download of various contents and templates in the large-scale instrument and equipment sharing management platform.

3.2. Monitoring Management

(1) Information of large-scale instruments: list the basic information and location information of all large-scale instruments and equipment within the current monitoring scope, which can be queried by building and laboratory name.

(2) Large instrument monitoring: monitor the use of large instruments and equipment by reading the large instrument monitoring equipment, obtain the current voltage, current, power and other data of the large instrument, display the operation status of the equipment, and the current monitoring data can be queried remotely through the system.

3.3. Usage Efficiency Analysis

(1) Supervision on the use efficiency of large instruments: comprehensively count the use time and use efficiency of large instruments.

(2) Statistical analysis of alarm of large instruments: count the fault alarm, threshold alarm times and total alarm times of all instruments.

3.4. Supporting Hardware (Current Supervision Equipment)

Communication mode: 485
Specification: 250V / 380V, 20A
Installation method: 86 shaped bottom box bypass installation
Communication mode: 802.11a/b/g/n/ac, built-in antenna
Standby power consumption: ≤ 0.5W
Working environment temperature: - 5 ℃ ~ + 50 ℃

4. Benefit Analysis

Large instruments and equipment are mainly scattered in various laboratories, and the experimenters in each laboratory are responsible for the equipment. Information technology is an effective means to improve the operation efficiency and use efficiency of large instruments and

equipment in each laboratory. During the construction process, through full communication with relevant experimenters, the smooth implementation of the project is ensured.

The construction content includes the supervision platform of Dayi (basic setting, monitoring management and use efficiency analysis) and 100 supervision equipment for equipment use supervision. The system monitors the equipment by monitoring the current change of large instruments and equipment, judges the use of equipment by recording the change of equipment current, and continuously records the current change of large instruments and equipment, Complete the use time statistics of large instruments and equipment, and finally realize the recording and analysis of the use efficiency of large instruments. After the construction of the platform, according to the data analysis results, the use efficiency of instruments and equipment has been greatly improved, the role of large instruments and equipment in teaching and scientific research has been brought into full play, and the school's school running ability and talent training level have been further improved. [9]

At the same time, the school shall formulate a practical management system according to the actual situation. The management system specifies the relevant responsibilities of each department and personnel, and a supervision team is composed of the leaders of the school in charge, the academic affairs office, the assets office, the office of the Commission for Discipline Inspection, the finance office and other departments to regularly inspect, assess and evaluate the use efficiency of large instruments and equipment. Form an assessment report according to the inspection results and publish the assessment results. The assessment shall be included in the annual assessment of the management department, relevant principals and experimental technology management personnel as the basis for personnel job promotion, professional title evaluation and department reward and Punishment. [10-12]

5. Conclusions

From the perspective of perfecting the national innovation system and improving the innovation capacity of the whole society, we should open the major national scientific research infrastructure and large scientific research instruments formed by public financial investment to the society through deepening reform and institutional innovation, so that they can better serve scientific and technological innovation and society. Through the combination of platform and system, our school has continuously and effectively promoted the management of large-scale instruments and equipment, and the use efficiency of large-scale instruments and equipment by various departments is gradually developing towards standardization, scientization and systematization.

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