

# Research on the Management of Natural Science Foundation in Colleges and Universities

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## Abstract

Natural Science Foundation is an important source of funds for scientific research in colleges and universities. This paper explores the whole process management mode of natural science fund from application to conclusion, which improves the scientificity and standardization of fund management. By using advanced data analysis tools, it provides deeper and more intuitive decision support for fund management. By means of performance appraisal, we encourage original exploration, focusing on the science forefront, and output of high-level scientific research achievements. This paper will lay a good foundation for improving the quality and efficiency of natural science foundation management.

## Keywords

Natural Science Foundation, Management, Data Analysis, Performance Appraisal

## 1. Introduction

The natural science foundation is an important way for the state to organize scientific research. Universities and colleges are the main entities applying for the natural science foundation, accounting for the vast majority of the main funding. In the face of world's new developing situation, scientific research management departments should play a guiding role and guide scientists to solve key scientific problems in national, economic, social, people's livelihood, and industrial development (Hao et al., 2022). For the natural science foundation of universities and colleges, the management methods of the natural science foundation should be studied from the whole process of application, project approval, research development, and project conclusion. Use the means of big data analy-

sis to guide and encourage scientists to focus on the frontiers of science and promote the development of scientific undertakings (Yao et al., 2019; Zhuo, 2019). The management of natural science funds in colleges and universities should carry out system and mechanism reforms (Qiu & Wang, 2019), actively plan the future development of basic research, and provide lasting power for innovation-driven development. The article is organized as follows: Process management, Data Analysis, and Performance appraisal.

## **2. Process Management**

### **2.1. Fund Application**

The organization and management of project fund application should be done carefully, and the quality and quantity of project application should be improved. Coordinate with all departments to publicize and implement project guidelines. The applicants should be organized to submit qualified applications in accordance with the relevant provisions of the natural science foundation. The quality of the application should be carefully checked, and the number of applications should be increased under the premise of quality assurance.

After the release of the fund guidelines, the scientific research management department should make overall arrangements, organize publicity and mobilization. The leaders of each college, scientific research secretaries, and academic leaders should carefully study the guidelines and recommendations. And understand the new policies, new requirements, and new changes declared of the current year.

The scientific research management department and the leaders of each unit need to comprehensively set the content and quantity of each unit's fund application according to the research directions and constraints such as the funded project, professional title, age, etc. At the same time, through policy guidance, researchers will be attracted to apply proactively to ensure stable growth in the quality and quantity of project applications. This target management model puts forward clear requirements for natural science fund application work of each unit, and promotes the enthusiasm and initiative of application with administrative force.

At the same time, in response to the application form review and budget preparation, the scientific research management department needs to work with the financial department to conduct special training for scientific research secretaries and new teachers. After extensive mobilization, the university should invite experts to give special lectures on the writing of the application and give special guidance, which guides applicants to refine and raise scientific questions, and improves the quality of scientific research topics and fund applications.

### **2.2. Progress Management**

The natural science fund departments in universities should strictly manage project implementation in accordance with the clauses of the natural science

funding project managing procedures.

The scientific research management departments of universities and colleges should further implement the whole process management of natural science funded projects. Promote the reform of scientific research management, ensure the development of research work, and improve the scientific research innovation ability.

Avoid the phenomenon of attaching importance to application but despising management. Keep abreast of the research progress and completion of various funded projects. Urge the person in charge of the project to complete the research tasks on time, on schedule and as required, and remind them to submit various reports on time. Establish and improve the file management system for funded projects, strengthen the management and supervision of project implementation. And assist the natural science foundation committee to carry out supervision and inspection.

After the natural science foundation fund projects applied by the scientists are approved, the scientific research management department needs to organize the major persons to fill in the task book according to the regulations of natural science foundation. During the implementation of the project, the scientific research management department will supervise according to the time node specified in the task book, and investigate the progress of the project research and the progress of the implementation of funds. Of course, performance evaluation and final inspection work are essential. The research results need to be sorted out in a timely manner, with result files being established, and an annual achievement report of the funded project being written.

Scientific research management department should not only regulate the form of natural science funds, but also pay attention to the whole process of scientific research. Scientific research management departments should help scientists solve the difficulties encountered in the implementation of the project. The solution is to actively coordinate the relevant departments. All departments need to communicate with each other to realize the smooth flow of information from university to college to individual, and jointly manage the whole process of science fund.

At the end of each year, the scientific research management department needs to write a summarizing report of the previous year's project management, fund utilization and important achievements. In addition, the department needs to master the overall situation of school fund work, analyze the existing problems, and put forward improvement measures.

### **2.3. Concluding Management**

Project conclusion management needs to be further strengthened. The natural science fund management department of the university should organize and assist the person in charge to complete the project conclusion and acceptance check. Urge the project leader to write project conclusion reports, research re-

sults report and the final account report. In the end, carefully check acceptance materials, ensure that the information is true and accurate.

1) The person in charge of the funded project should complete the scientific research task in accordance with the requirements of the natural science fund assignment book, budget book and agreement. After the project is completed, the project should be concluded in a timely manner, and the settlement procedures of the scientific research project should be handled as soon as possible. The person in charge of the scientific research project can use the surplus funds in accordance with the regulations, and shall be responsible for the legality, authenticity and effectiveness of the fund settlement materials.

2) The second-level units perform the review and supervision responsibilities for the conclusion, settlement, and balance fund management of scientific research projects. The second-level units urge the person in charge of the project to go through the closing procedures in a timely manner as required, and are responsible for reviewing the relevant materials for the settlement of the scientific research projects.

3) The scientific research management department must continuously strengthen the management of the completion of scientific research projects. Regularly sort out the progress of scientific research projects and provide the financial management department with question list. Review the research project conclusion and closing materials. Assist the project leader to handle the closing and settlement and other follow-up matters.

4) The financial management department is responsible for reviewing the final financial accounts report of the project, and calculating the receivables and payables of the finalized project. Then complete the surplus fund allocation in a timely manner. For scientific research projects that have not gone through the billing procedures without justifiable reasons, the surplus funds will be transferred in accordance with relevant regulations, or the university will take back the funds for overall planning and use in arranging relevant scientific research activities.

5) The supervision and auditing department shall be responsible for irregular supervision and auditing of the use and management of surplus funds of scientific research projects in accordance with relevant regulations of the state and the university. Where the competent departments of scientific research projects require the opinions of the audit departments on the financial and final accounts, the audit departments shall be responsible for signing the checking opinions.

6) Scientific research management departments organize timely statistics, analysis and publicity of the project achievements. Then direct and promote the outcome management, use and transformation.

First, the project leader is required to do a good job in the collection and preservation of the original records of the achievements to ensure the systematicness, integrity and accuracy of the scientific data in the project results report. Second, scientific research management departments and other competent units

review the authenticity of the project achievement report submitted by the project leader, and establish a project achievement file. Third, the university writes a report on the achievements of the funded projects, and submits it to the natural science foundation committee as part of the annual management report.

### 3. Data Analysis

The era of big data has arrived, but there are still many deficiencies in the management of natural science funds. Among them, the outstanding problem is that there are few horizontal connections between various types of data stored, and only statistical analysis can be performed (Jun et al., 2022). It is impossible to intuitively analyze the objective laws and phenomena hidden behind the data through in-depth data mining. It is difficult to provide more effective support for research management and policy formulation. It is necessary to automatically aggregate data from different business systems on a unified platform, establish a unified data standard system, and integrate various data interfaces, which breaks the business and information islands.

In recent years, technologies such as graph databases, multi-dimensional analysis of big data, and knowledge graphs have developed rapidly, providing new solutions for big data processing and analysis of natural science foundation. First of all, it is necessary to establish a natural science fund knowledge map including projects, personnel, units, and achievements, and a multi-dimensional data warehouse based on big data. Secondly, it is necessary to build a deep knowledge analysis mining and visual display system based on relational network. The hotspot analysis, review recommendation, association analysis and other technologies of scientific research projects based on knowledge graphs fully demonstrate the data expressivity, visualization and friendliness (Wang et al., 2022). The development of big data and scientific research innovation are organically combined to form a big data-driven scientific research innovation model, and fully release the dividends generated by the big data of the natural science foundation. It is of great significance to provide accurate and high-level knowledge services for scientific and technological innovation, which provides a strong boost for the enhancement of national scientific and technological innovation capabilities.

### 4. Performance Appraisal

The scientific research performance evaluation system is the baton of the organization of scientific research management, as well as an important basis for innovation management and optimization of resource allocation. The goals of scientific research performance evaluation are: improving basic research and cutting-edge technology research capabilities, improving the transformation rate of achievements (Wang et al., 2021), generating economic and social benefits (Duan et al., 2019), and guiding scientific researchers to focus on national strategic needs.

1) For different types of scientific research projects, formulate differentiated performance evaluation indicators. Increase the evaluation weight of key technologies and technological breakthroughs in core fields, and reduce the evaluation weight of indicators that are easy to “watering” such as publishing papers and applying for patents.

2) Establish the authority of the performance evaluation results, and use the performance evaluation results as an important basis for the university’s subsequent cultivate and support. Guide scientific research resources to favor outstanding talents and teams, and improve the efficiency of scientific research funds.

3) Adhere to the combination of quantitative evaluation and qualitative evaluation. When formulating evaluation criteria, it is necessary to set quantifiable specific indicators, as well as qualitative indicators such as peer review, market response, and social impact.

## 5. Conclusion

The management of natural science funds in colleges and universities should serve scientists well during the whole process. The scientific management department should refine and improve the project management process and regulations. Improve professional management, supervision and service capabilities. Pay attention to the role of artificial intelligence, big data, and cloud computing in the management of natural science funds. Make full use of scientific and technological progress and analyze data in multiple dimensions to provide scientific support for project application. Use information technology, intelligent technology and big data technology to free scientists from tedious transactional work, and encourage them devoting more energy to scientific research work.

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## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

## References

- Duan, Y. Z., Zhang, Y. L., & Lin, Z. L. (2019). Current Situation, Problems and Countermeasures for Management of the Results of Projects Funded by Guangdong Natural Science Foundation. *Science Research Management*, 40, 278-281.
- Hao, H. Q., Zhao, Y. H., Zheng, Z. M. et al. (2022). Proposal Application, Peer Review and Funding of National Natural Science Foundation of China in 2021: An Overview. *Bulletin of National Natural Science Foundation of China*, 36, 3-6.
- Jun, O., Wang, L. C., & Li, Y. B. (2022). Analysis on the Status Quo and Management

- Thinking of Founding of National Natural Science Foundation of China of Hunan Province from 2010 to 2020. *Science Foundation*, 309, 60-65.
- Qiu, Y., Li, X. G., & Wang, Y. (2019). Management Overview and Analysis of Guangdong Natural Science Foundation from 2011 to 2017. *Modern Information Technology*, 3, 180-182.
- Wang, S. Y., Tao, R., & Wang, J. (2021). Optimization of Funding Policies of Science Foundation of China for High-quality Development of Basic Research. *Bulletin of Chinese Academy of Sciences*, 36, 1-7.
- Wang, T., Jin, Z., Huang, Z. P. et al. (2022). Data Visualization Design for NSFC Regional Innovation Development Fund Management. *Bulletin of National Natural Science Foundation of China*, 36, 153-159.
- Yao, C., Wang, X. F., Du, Y. et al. (2019). Overall Scheme and Key Technologies: Knowledge Management and Service Platform Based on NSFC Big Data. *Bulletin of National Natural Science Foundation of China*, 1, 55-61.
- Zhuo, X. Z. (2019). How Does Big Data Assist University Scientific Research Management Decision-Making in Universities—Taking the Projects in Anhui Provincial Universities Funded by the Natural Science Foundation of China from 2007 to 2016 as an Example. *Meitan Higher Education*, 37, 34-38.