Innovative Trend of Statistics in Higher Education

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Abstract: The coming of big data cloud computing era provides opportunities and challenges for higher education of statistics. To cultivate high-quality and compound statistical talents, statistical education must be based on the needs of the state and society on the basis of foresight and emancipation of ideas. In this paper, we discuss the innovative trend of statistics in Higher Education from three aspects: statistical education, statistical practice and statistical modeling.

1. Introduction

Statistics is a methodological science which is on the study of the collection, collation, description and analysis of large amounts of data and data in random phenomena. Its purpose is to explore the quantitative regularity of random phenomena in order to serve the fields of social economic management, engineering technology, quality control and so on. Nowadays, with the rapid development of society and economy, the dependence on statistical methods is becoming stronger and stronger either in the field of science and technology or in all aspects related to people's livelihood, whether in the prediction and decision-making of enterprises or in the formulation of national policies and policies. Many countries in the world, especially developed countries, attach great importance to the research and development of statistical theory and application. But in our country, statistics is still a weak subject, and its application and development in politics, economy, culture, engineering technology and other fields are relatively falling behind. Therefore, the greater the scope of development of statistics in these areas, the better the prospects for its future development [1].

Statistics has a history of more than 300 years. The reason why statistics is enduring and lasting is that application is its motive force, in other words, the vitality of statistics lies in application. Savage, a famous economist and statistician, believes that "statistics is basically parasitic: it survives by studying work in other fields". With the rapid development of science and technology, the arrival of the era of big data[2-4], statistics ushered in the opportunity of rapid development, the application of statistical analysis methods and technology is becoming more and more important. It is both an opportunity and a challenge. Faced with the huge amount of data, how to find out the intrinsic relationship behind the complicated data, how to effectively guide the social production and business operation, how to play its due role in the formulation of national policies and policies, all of these need the continuous innovation and development of statistics. This situation also determines that statistics should have greater development space in our country. Thus, the former head of the Department of Social Affairs of the Ministry of Education made a point at an important meeting: "Statistics is one of the three most promising disciplines in China in the 21st century."

With the development of national innovation forms, the innovation of statistical higher education is imperative. Statistical innovation includes statistical education innovation and statistical practice innovation. The innovation of statistical education is the basis of statistical innovation. Without the innovation of statistical education, we can not talk about the innovation of statistical practice.

2. Innovation of Statistical Education

2.1 Innovation of Course Construction.

The course construction of statistics specialty should first set the training objectives, determine what kind of talents to train according to the national and social needs, and then consider how to train such talents. Secondly, according to the set training objectives, the training program is formulated. The formulation of training programs can not be separated from the construction of professional courses. The core issue of the construction of professional courses is how to set up courses and regulate the main contents of courses offered. According to the different training objectives, set up corresponding courses [5]. If we train statistical theory talents, we should set up more mathematics courses, so as to enable students to have a deeper rational understanding of various statistical methods and form a stronger logical reasoning ability. To train applied statistics talents, we should set up more specialized courses in relevant application fields, and form a perfect combination of statistical methods and professional knowledge in related fields.

For example, if we want to train statistical talents serving the social and economic aspects, we should take into account in the course construction: (1) the necessary economic theory courses, so that students can understand the main process and basic laws of economic activities; (2) the main statistical methods for studying social and economic problems, including data collection methods, data processing methods and data analysis methods; (3) to make students master them skillfully. Grasp at least one statistical software, so as to calmly face a large number of data, steady processing and in-depth analysis. If we want to cultivate statistical talents serving enterprise quality management, in order to achieve statistical quality control, we need to use mathematical statistics method to quantify and scientifically control quality control, effectively prevent and control process quality. Its main objective is to ensure that the product quality characteristic values produced by all processes are as long as possible equal to or close to the expected values, and to improve the process capability of the production process. Therefore, it is commonly referred to as statistical process control (SPC). Its main characteristic is that it fully embodies the process prevention principle of modern control theory. In the course construction, we should consider: (1) the basic theory of mathematical statistics; (2)the theory of scientific experimental design; (3) the study of management and control theory. In a word, the curriculum construction and the setting of practice links must be different according to the different training objectives.

2.2 Teaching Innovation.

We should innovate the teaching methods and means of statistics specialty, make full use of modern educational technology and teaching means, renew teaching methods, and promote the organic combination of educational technology, teaching means and teaching methods. Get rid of rigid dogmatic theoretical education mode, increase the content of case teaching, and combine situational teaching methods to give vitality to statistical theory. Through statistical software, a large number of actual data can be processed in the laboratory and discussed in the classroom, so that students not only understand the statistical ideas and methods, but also exercise and cultivate students' ability to research and solve problems.

Realize the teaching mode from passive teaching to interactive teaching, open students' thinking by case analysis and situational teaching, make students more vivid and quick to accept knowledge, give full play to their independent thinking and creative ability, and cultivate students' creative thinking ability. To establish a three-dimensional teaching mode which combines traditional classroom education, laboratory data analysis and processing ability training with social practice. While helping students construct the theoretical system of statistics specialty, we should strengthen the cultivation of practical ability and improve students' practical ability and innovative ability. Only when statistical methods are applied in practice can the vitality of statistics be demonstrated.

Realize the mode of integration of theoretical teaching and practical application of statistical software in statistics specialty[6]. Most of the current statistical textbooks are separated by theory and software, which has diminished students' interest in learning. Taking Henan University of

Science and Technology as an example, it is not until the second semester of the sophomore year that the study of statistical software begins. The professional courses of probability theory and mathematical statistics, application of regression analysis, multivariate statistical analysis, time series analysis, econometrics and national economic statistics have all been completed. At this time, many content students have forgotten, and the statistical software only for two weeks of learning. Such a short centralized software learning, it is difficult to learn the theory, data analysis methods and means involved in the above professional courses, not to mention the cultivation of data mining ability. It is suggested that all professional courses in statistics should combine theory with software practice. In this way, students can effectively combine statistical theory with practical application, increase students' interest in learning, interest is the best teacher, once students fall in love with statistics, why not study well?

2.3 Innovation in Statistical Practice.

To improve the practical ability of teachers. Teachers, therefore, preach and teach to solve doubts. But if the tutor does not have the ability of practice and innovation, how can we hope to cultivate students with excellent ability in this respect? Therefore, on the one hand, schools should make greater efforts to introduce talents with practical and pioneering abilities, or can employ part-time teachers from enterprises or institutions; on the other hand, they should actively train the existing teaching staff of the subject, and help some young aspiring teachers to study in enterprises without hesitation, so as to improve their practical abilities. This may better strengthen the power of school-enterprise cooperation.

Achieving school-enterprise cooperation enables students to apply what they have learned. The practice activities of students majoring in statistics should not be limited to listening to several reports and making several visits. It should be integrated into the enterprise and work experience. Whether it is data collation or data analysis and interpretation. These may be easier said than done. From the perspective of companies and institutions, it is not convenient for interns to contact sensitive data concerning companies and institutions. Therefore, we must emancipate our minds and make students and enterprises realize two-way choices in advance by means of directional training. This kind of practice is to work for the company, serve the company in the future, and maybe have the opportunity to contact the data. Only in this way can we realize the purpose of using statistical theory and statistical methods to process and analyze the data. Only in this way can students really feel that statistics is very useful. Used, can really serve the enterprise; Only then can let the production student study interest.

Realize the mode of combining senior internship arrangement with statistical practice. Taking the statistics major of Henan University of Science and Technology as an example, four practical links are set up for undergraduates of this major: cognitive practice, statistical software practice, statistical modeling practice and graduation practice. If these four internships can be effectively implemented, the quality of graduates will surely rise to a higher level. This requires that the instructors who guide the four internships have not only solid theoretical foundation, but also practical business background. In order to overcome these problems, the College is also actively operating.

3. Statistical Modeling

Statistical modeling is a process of establishing statistical models and exploring and processing batch data by means of statistical analysis software. It can be used to reveal the factors behind the data, interpret social and economic phenomena, or predict or judge economic and social development. Through the course of statistical modeling, it can help to cultivate the ability of statistical professionals to use statistical methods to solve practical problems, especially to improve the ability to extract statistical models from complex problems. Statistical Modeling Course pays attention to cultivating practical and applied abilities, and can better meet the challenges of data and information in future work.

The National University Statistical Modeling Competition is a statistical application activity for

undergraduate and postgraduate students in Colleges and universities sponsored jointly by the Chinese Institute of Statistical Education, the Chinese Society of Field Statistical Research, the Chinese Society of Mathematics and the Chinese Society of Health Information. Its purpose is to stimulate the enthusiasm of students in studying and applying statistics and to improve the use of statistics. Methods: Establish statistical models, use computer technology to solve practical problems, improve the ability of market survey design, data collection, data collation and data analysis, and encourage students to use various statistical analysis methods to establish statistical models and explore the process of processing batch data, so as to reveal the information behind the batch data. The topics of contest papers are generally divided into three categories: statistical modeling, market investigation and analysis, and big data engineering.

The development of statistics, especially applied statistics, is the need of social and economic construction in service areas, especially in the Central Plains Economic Zone. Henan Province is located in the Central Plains, and the construction of the Central Plains Economic Zone has risen to the national strategy. In the grand process of realizing the revitalization of the Central Plains and the overall national strategic goal, statistics has great potential in the fields of social economy, engineering technology, quality management, medicine and health, resources and environment. In order to better serve the social and economic development of Henan Province, we should actively apply statistical methods directly to the fields of social economy, engineering technology and quality management, which will produce remarkable effects of saving input, increasing output and improving efficiency.

References

[1] Q. He, "On the nature and development of statistics," China Statistics, No. 9, pp. 5-7, 2001. (In Chinese)

[2] H. Wang, "Analysis of the development of big data and new statistical thinking," Youth, No.7, pp. 280, 2016. (In Chinese)

[3] X. Li, "On big data and new statistical thinking," China Business , vol.5, pp. 5-6, 2018. (In Chinese)

[4] H. Xiao, Y. Zhao, "Discuss the way of statistical innovation to meet the challenge of big data Era," Statistics & Information Forum. Vol. 31, No. 11, pp. 3-10, 2016. (In Chinese)

[5] Q. Xi. "Reflections on innovation of statistical education," Journal of East China Jiaotong University, No. 1, pp. 74-77, 2002. (In Chinese)

[6] S. Zhang, "Reforming the teaching mode of statistics to cultivate students' practical and innovative ability," Quality Education in West China, No. 4, pp. 63, 2016. (In Chinese)