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On the Optimization of Cultivation Model of Economic Statistics Students in the Context of Big Data

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Abstract:

In the context of the widespread use of big data, the cultivation of economic statistics talents faces more challenges and higher requirements. Therefore, based on the objective analysis of the current situation of talent demand and the existing problems of cultivation mode of economic statistics majors in the background of big data, this paper summarizes the talent cultivation mode and characteristics of some universities in the new era, and then propose the optimization strategies of cultivation mode of composite talents in economic statistics majors in three aspects of cultivation goal, curriculum and teaching mode, in order to better meet the needs of social development.

Keywords: big data; economic statistics; composite talents; cultivation mode

I. Introduction

Since the 18th Party Congress, the State has attached great importance to the development of big data. 2015, the State Council issued a notice on "Action Plan for Promoting the Development of Big Data", which clearly put forward the need to fully utilize big data, continuously improve the ability to obtain and utilize data resources in various fields, enrich the sources of economic statistics, and establish a new mechanism for smooth, safe and efficient economic operation. According to China's 13th Five-Year Plan, "the implementation of the national big data strategy" has elevated the development of big data to an unprecedented level.

Compared with traditional data, big data is huge, diverse and faster to process. Big data requires users to be able to effectively record and store relevant data information, and skillfully use relevant technologies to quickly mine and extract effective information to make efficient scientific predictions and decisions. Thus, Big Data is an organic unification of hybrid data objects, comprehensive technologies and a wide range of applications.[1] Statistics, on the other hand, is closely related to data science, and economic statistics is the application of mathematical methods, models and tools from the field of statistics to economic analysis with a view to better solving problems in the field of economics and providing a theoretical basis for economic decision-making.[2] With the advent of the big data era, the explosive growth characteristics of data in the economic field will greatly promote the wide application of economic statistics in social practice. Of course, this will also put higher demands on the data processing ability of economic statisticians, especially the ability of big data analysis.

However, there is still a shortage of talents with big data technology at this stage, and how to cultivate economic statistics professionals to meet the new needs of social development has become an important issue to be solved at present. Based on this, it is necessary to discuss the cultivation mode of economic statistics talents from the perspective of interdisciplinary intersection, so as to propose the innovative path of cultivation mode of economic statistics

talents in a targeted way, taking into account the demand and current situation of compound talents of economic statistics in the era of big data.

II. The demand and cultivation status of economic statistics professionals in the context of big data

The essence of economic statistics lies in the use of statistical knowledge to solve economic problems. Economic statistics are based on the principles of economics, combined with statistical modeling methods to quantitatively analyze difficult problems in the economic field, making economic problems modeled and objective, and eliminating the influence of human subjective emotions to the maximum extent. Although the traditional economic statistics is more well developed, the rapid change of all kinds of information in the big data environment requires that the economic statistics talents trained by universities must have complete information collection and data mining ability to cope with the market demand in the digital era.

2.1 The demand for composite talents in economic statistics in the context of big data

2.1.1 Proficiency in professional knowledge

In the era of big data, information and knowledge are updated rapidly, and the relevant concepts in traditional statistics have changed profoundly. On the one hand, the concept of sample is different. The data in the big data environment are mostly network data, and the concept of sample has been further deepened. For static network data, all data is already generated and there is no need to interact with the database, in which case the sample is equivalent to the total and the client does not have to spend on sample extraction. For dynamic network data, the data is the sum of all spatio-temporal data, and the samples are no longer randomly selected data, but selected data related to research objectives. On the other hand, data types are increasingly abundant. This means that the traditional structured data is no longer limited, but also includes unstructured data, semi-structured data and heterogeneous data. The identification tool of big data is usually an information network system, and all

information and symbols that can be recorded and stored can be called data. The database of big data can directly store the detected signals automatically, without the need to set a fixed format and structure specifically. Therefore, in the face of huge and complex data, economic statistics professionals should not only be proficient in traditional mathematical and statistical principles, but also have the ability to update knowledge rapidly, combine the advantages of traditional knowledge with the advantages of newly developed big data, and continuously improve the knowledge system to meet the development needs of the times.

2.1.2 Have a rich knowledge structure

Social development and economic statistical analysis are inseparable. In the context of an increasingly complex global economic situation, scientific and reasonable economic statistical analysis helps to identify and demonstrate relevant economic issues and provide decisions for healthy economic operation. In the era of big data, it is easier to access massive amounts of economic data. However, accurate analysis of big data using economic statistics is not an easy task, which requires the relevant personnel to be able to select the appropriate statistical methods and solve practical problems with agility, so the following three main abilities are required. First, the ability to solidify the foundation of mathematics and the selection of statistical analysis methods. The essence of data analysis lies in dealing with numerical problems, and the models and methods encountered in the process are ultimately mathematical problems. Therefore, it is necessary to strengthen and consolidate mathematical knowledge, and on this basis, firmly grasp various statistical analysis methods, and have the ability to graphically display the results and express complex conclusions in a concise manner. Second, skilled use of various types of computer software. The data types in the big data environment are more abundant, and the traditional structured data analysis technology can hardly meet the development needs of the times. Because of this, students of economic statistics should not only master basic software such as SPSS and Stata, but also be familiar with computer technologies such as Python and Matlab, and master data mining, cloud computing and other data computing methods, with a view to visualizing the results and improving the effect of economic statistics applications. Third, proficiency in economic and management expertise. The emergence of big data is bound to promote the development of

economic statistics, which is inherently interdisciplinary in nature, as almost all fields of social and economic practice are covered by big data. In order to better apply big data technology to socio-economic analysis, students of economic statistics need to deepen their professional knowledge vertically, and at the same time, they need to explore related disciplines horizontally, so as to build a firm foundation for scientific and rational decision-making.

2.1.3 Good cooperation skills

With the specialization and refinement of various industries, the social division of labor is becoming more and more detailed. Compared with the data analysis mode in the era of big data, the traditional economic statistical analysis steps are relatively simple. According to past experience, economic statisticians generally put forward hypotheses based on meeting objectives for a certain economic problem, and then establish relevant models for verification. However, nowadays complex data obviously put forward higher requirements on the professional ability of relevant personnel. People need to find relationships from complex data and then summarize. As the saying goes, "every inch has its own strengths". In this complex process, members of the same project team need to play a high degree of cooperation and complement each other's strengths in order to better accomplish the set tasks.

2.2 Problems of training students of economic statistics in the context of big data

2.2.1 Cultivate content that is light on practice

In the training of economic statistics students in higher education institutions, teachers still teach theoretical lectures, often using standardized and virtualized cases, due to the constraints of class time, space and equipment.[3] This has led to the problem that students are unable to understand real-world problems in depth and produce weak practical skills. However, in the big data environment, students of economic statistics should not only have good professionalism, be proficient in statistical analysis methods and have the ability to handle basic data, but also should be able to skillfully use computer science software to collect, analyze and process big data, so as to solve practical problems for the government, enterprises and institutions.[4] Therefore, although many colleges and universities have set up

practical courses, students' participation is low, and the courses are mostly carried out with teachers showing and students watching, and students lack opportunities for practical exercises, so that the practicality of students in most colleges and universities is insufficient.[5]

2.2.2 The curriculum system needs to be improved

Generally speaking, economic statistics courses cover two parts: statistics and economics. Statistics courses generally include mathematical analysis, advanced algebra, probability theory and mathematical statistics, statistical theory, market investigation and analysis, statistical software, etc. Economics courses generally include macro and micro economics, finance, accounting, econometrics, national economic accounting and so on. However, with the wide application of big data, it is necessary for the major of economic statistics to offer courses related to big data analysis, such as Python, machine learning, data mining and so on. However, at present, many colleges and universities still follow the old teaching plan, and the teaching content of economic statistics major has not undergone fundamental changes due to the arrival of big data, which leads to the disconnection between classroom knowledge and the requirements of The Times, and the low matching degree of talent cultivation and social requirements. On the one hand, statistics courses focus on theoretical derivation, ignoring the process of practical exercise, resulting in low practicality of the course; On the other hand, the scope of curriculum is narrow, and the lack of interdisciplinary curriculum system such as database language and computer science restricts the development of students' thinking and behavior.

2.2.3 The allocation of teachers needs to be optimized

Affected by social development and the new crown pneumonia epidemic, the path of continuing education, such as graduate school and doctoral examinations, has become the first choice of many students. Moreover, with the expansion of higher education institutions, many young teachers are pouring into colleges and universities. However, it goes without saying that young teachers generally lack teaching experience and are prone to follow the old ways and imitate traditional teaching methods. The "duck and filler" teaching leads to poor listening effect and insufficient enthusiasm and initiative of students. In addition, the teachers recruited by the economic statistics majors are mainly from the economic management category.

However, the new era has put forward new requirements for the faculty of economic statistics. The faculty of economic statistics needs not only economics and statistics talents, but also teachers with high education in mathematics and science and computer science, so as to build an innovative talent training team with strong skills and high quality in a stable way.

III. The experience of cultivating economic statistics talents in domestic universities in the new era

3.1 Talent training model of related universities

In order to develop the statistics discipline in the big data environment and improve the practicality of statistical research, domestic universities innovatively put forward different talent cultivation models for statistics-related majors, which are illustrated by Fudan University, Zhejiang University and Renmin University of China in this paper.

In 2015, Fudan University established the School of Big Data, which is supported by computer science, statistics and computational mathematics, and conducts interdisciplinary research with economics, sociology, management, information science and other fields, and is committed to the construction of big data disciplines, training of complex talents and industrial technology innovation, striving to become the highland of data talent training. The college takes data science and big data technology as the main body and introduces a team of high-level professional teachers, which provides a solid guarantee for teaching and research. In addition, the School of Big Data is also directly oriented to industrial applications widely joint industry, and signed agreements with State Grid Shanghai Electric Power Company, Huayuan Data, etc. to promote the development of industry-academia-research cooperation.

In 2017, Zhejiang University established the Data Science Research Center, with statistics, applied mathematics, computer science and management as the core, and cross-fertilization with economics, medicine, sociology and many other fields, to widely carry out research on the theory and application of big data and training of innovative talents. The center takes the market and industrial needs as the guide, and takes both research and technical talents into

account, introduces teaching and research teams in interdisciplinary fields, and focuses on cultivating complex talents who master data science and technology. On this basis, the center is dedicated to theoretical and methodological research in data science, providing analytical tools and algorithms for handling massive and high-dimensional data in many disciplines such as economics and management, and effectively solving many practical problems.

In 2020, Renmin University of China established the Department of Data Science and Big Data Statistics to combine statistics and big data, with the mission of "training future data scientists" and developing a world-class data science center with lasting regional and global social impact. The Department of Data Science and Big Data Statistics offers courses in traditional statistics as well as Big Data-related courses, including but not limited to Big Data mining and statistical machine learning methods, statistical analysis of high-dimensional data, spatio-temporal Big Data analysis, and Big Data networking technologies and applications. The department originated from the five-school joint master's program in big data analytics initiated in 2014 and the undergraduate program in data science and big data technology established in 2017, which has been improved and effective in its development.

3.2 Talent training characteristics

3.2.1 Orientation to the needs of the times

Economic statistics professionals should not only have a comprehensive and systematic grasp of professional theoretical knowledge, but also have the ability to solve practical problems. In the Internet era, various kinds of data are emerging, which requires students to have practical experience. Looking at the talent training mode of the above three universities, they all insist on both theory and practice under the premise of clear training objectives. For example, Fudan University not only sets up theoretical study courses such as statistics and economics for students, but also carries out extensive contact with the community to provide students with a platform for practical operation, which cultivates and enhances students' hands-on ability.

3.2.2 Focus on cross-disciplinary

Statistics, computer science and mathematics are the core courses for cultivating new talents,

which are both fundamental and important. Observing the curriculum system of the above three universities, we can see that students have to learn the knowledge of statistics, but also proficient in computer and mathematical knowledge, and also involved in management, sociology and other disciplines, the interdisciplinary characteristics are very obvious. Based on the objective situation that big data research in the economic field carries out data extraction and application based on an effective economic big data platform, students or talents who carry out economic statistical analysis should master the basic knowledge of economics, statistics and mathematics, and also have computer science skills, in order to truly be a composite talent in economic statistics.

IV. Optimization Path of Cultivating Composite Talents of Economic Statistics in the Background of Big Data

Talent cultivation requires the joint participation of multiple parties, and this paper proposes the optimization path of the compound talent cultivation mode of economic statistics from the following three aspects.

4.1 Establishing training objectives

The wave of big data has further expanded the connotation and extension of economic statistics, and the training of talents requires the joint participation of economics, statistics, computer science and mathematics. Local colleges and universities should understand the current situation of the big data environment in advance and cultivate "multi-disciplinary" talents with the practical needs of society. Economic statistics professionals should be guided by statistical ideas, have good knowledge of economics and statistics, and have the ability to use computer science and technology to deal with structured, semi-structured and unstructured data, and be able to engage in investigation and analysis, data analysis, statistical forecasting and decision-making in government, enterprises, institutions and research institutions. In other words, students of economic statistics should be able to understand the principles of economics and model derivation, and more importantly, they should be able to use computer software to process statistical data. In this way, economic statisticians can meet the needs of the big data era.

4.2 Optimize the curriculum

The impact of the big data era brings opportunities and challenges for the further development of economic statistics, and the traditional statistical inference can no longer meet the requirements of the times. Therefore, in terms of curriculum, higher education institutions should, while keeping the traditional courses (principles of statistics, market research and analysis, multivariate statistical analysis, econometrics, macro and micro economics, etc.), add data science courses such as data mining, practical R language, Python, etc., and increase and popularize computer knowledge in a targeted way; at the level of research and academics, schools should regularly set up relevant lectures and trainings. At the level of academic research, schools should regularly set up lectures and trainings, arrange teachers of different disciplines and majors as speakers, encourage students to participate in disciplinary competitions and form teams with students of different professional backgrounds, promote disciplinary exchanges, and improve the application skills of models and algorithms; at the level of practical training, institutions of higher education should devote themselves to improving the practical teaching environment, strengthen cooperation with third-party platforms such as government departments and software organizations, and arrange students to participate in social practice and scientific research projects, so as to improve students' ability to solve The practical training level is to improve the practical teaching environment, strengthen cooperation with third-party platforms such as governmental agencies and software organizations, and arrange students to participate in social practice and research projects, so as to improve students' ability to solve practical problems.

4.3 Reform the teaching mode

In terms of teaching methods, we can try to adopt the flipped classroom approach, i.e., combining teacher-led lectures with student discussions to guide students to take the initiative to sort out new knowledge. When introducing faculty members, we should follow the goal of cultivating complex talents and recruit them extensively to form a team of teachers with professional backgrounds in statistics, mathematics, computer science and economics as far as possible, so as to enrich the talent cultivation structure from the source. The composite teachers should have a solid foundation of economics theory and statistics application, and be

proficient in big data related knowledge. In view of the strong ability of young teachers to accept new knowledge, the university should also encourage the existing young teachers to pursue further education and support them to visit schools and participate in training, so as to improve the relevant knowledge, teaching skills and innovation ability of the faculty.

V. Remainder

The emergence of big data does not mean that economic statistics is obsolete or over. On the contrary, big data makes up for the error problem in traditional economic statistical analysis because of its diversity, improves the quality of economic statistics while reducing the cost of economic statistics, promotes economic statistics in the change, and provides a good opportunity for the development of economic statistics discipline. Of course, opportunities always coexist with challenges. Facing the rapidly changing and complicated data, how to effectively collect and reasonably analyze them has become a problem to be considered in the field of economic statistics. In this context, it is urgent to cultivate the compound talents of economic statistics in the big data environment. By analyzing the demand for economic statistics professionals in the era of big data and the problems of the current cultivation mode, this paper proposes the optimization strategies of the cultivation mode of economic statistics professionals in three aspects: cultivation objectives, curriculum and teaching mode, with a view to providing reference for cultivating innovative and complex talents in economic statistics that meet the requirements of the times.

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