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Design of survey questionnaire and practice of social research based on the mode of cultibating application-oriented talents

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Abstract. Based on the principle of being realistic, the research is to do the further statistical analysis and study on social development, in which questionnaire is an important form. Firstly, the basic principles of questionnaire design is studied. Secondly, under the mode of cultivating application-oriented talents, design methods and techniques of survey questionnaire are discussed, as well as analyses the teaching practice, which is a form of social research practice. Finally, the reflection on the questionnaire design and the process of social research practice is presented. The research results of this paper will provide valuable suggestions for the reform of the mode of cultivating application-oriented talents for many colleges and universities to adapt to the social development.

Key words. Research Questionnaire, Cultivating Application-oriented Talent,Mode, Social Research Practice.

1. Introduction

1.1. Motivation and related works

The cultivation of application-oriented talents is an important objective of education development in China and application-oriented talents are the urgently needed talents in our country. It is inseparable with China's national conditions; it also meets the needs of the development of our country[1]. Our country is in the era of rapid development of industry and economy, so the primary goal of China's educational development is to cultivate a large number of application-oriented talents. This is an important prerequisite for the national economic development.

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Application-oriented talents, as the name suggests, are the talents who can apply knowledge learned to the real life. China has become a leader in developing countries and an important branch of the world economy. The development of the world is inseparable from China, and China's development is inseparable from the talents.

In recent years, many universities and colleges in China began to pay attention to the cultivation of talents, especially application-oriented talents. They also began to learn from the successful training pattern of foreign universities of applied science and technology. While both theoretical understanding and education practice are not perfect generally. The resources of all aspects of the society should be made use of to promote the improvement and development of the application-oriented talents training system in colleges and universities so as to cultivate talents who can adapt to the changing of the society and cope with all challenges. But currently most colleges and universities graduates engaged in development, application and management of production technology. They are content with the status quo. Only a few graduates engaged in the work of some high-end technology and function.

The development of China is inseparable from the comprehensive talents cultivated by the colleges and universities who are prominent in knowledge, ability and quality. However, there are still some shortages in cultivating such comprehensive talents in China's higher education which focus on the cultivation of the book knowledge while ignore practice teaching and quality training. A lot of colleges and universities graduates have difficulty in employment. Some are unfit for a higher post but unwilling to take a lower one. But at the same time, many companies are suffering from the shortage of the proper talents.

2. Introduction to the research questionnaire design and its importance in the research

2.1. Research questionnaire design

As a means of data collection, questionnaire survey refers to a survey method that the researchers compile the social phenomena they want to study into the form of questionnaires and deliver the questionnaires to the people being researched through a variety of ways or directly give the questionnaires to their hands, then the respondents give their answers and return the questionnaire to the researchers. This kind of research method is simple and the investment is small. The recovery rate was higher, and the survey results were more accurate than other research methods. So in a lot of social survey research, more and more researchers use this method. A survey questionnaire design is divided into six steps. First of all, determine the research program and objectives. secondly, design the questionnaire. thirdly, send the questionnaires. fourthly, arrange the data in the questionnaires.fifthly, analyze the data. Finally, draw the conclusion.

Each step is summed up in only a few words, so it seems that it is a very easy thing to do the statistical research. But in practice, it's a very difficult thing for us to do each step well. Of course everything lies in perseverance, statistical research as well. When preparing a questionnaire research, we often do not take the contents

of the questionnaire and the process of research seriously because we ignore that the questionnaire is an art.

2.2. The importance

Questionnaire research is one of the important forms in the research. The questionnaire can provide more comprehensive information to help solving problems and making the right decisions. Questionnaire research is a very important and widely-used method in the current social survey. The design of the questionnaire is not only a science, but also an art. The quality of the design of a questionnaire to a large extent determines the accuracy of the results. The design of a questionnaire should be rigorous, the format should be reasonable, and the content should be reliable.

How to design a reasonable questionnaire and determine the scope of the survey, which form of the questionnaire should be used are the problems should be considered and solved. Of course, the purpose of designing the questionnaire is to get the results, so statistics must be used. In the process of questionnaire survey, we can not expect what happens[2-5]. People's logical thinking, the ever-changing society and a lot of external factors will affect the survey results, the choice of the respondents, tools and methods.Modern statistical methods are attached to the computer, SPSS and SAS etc. are the commonly-used statistical methods. Generally, the accurate results can be obtained by using the computer statistical software for data processing. Statistics are the summary in the questionnaire and we may not get the facts we want without Statistics.

3. Basic principles of questionnaire design

3.1. Rationality

Rationality means that the questionnaire must be closely related to the content of the survey and the subject matter. The design of the questionnaire must correspond with the purpose of the study. For example, there are no ready-made choice elements of the selected topic in the questionnaire of "investigation of consumers' feelings on a particular kind of food". The researchers should start from the survey itself, combine with the professional rules and knowledge of the food industry and try to avoid privacy issues (such as: spices, secret recipe, etc).

Key elements can be found in the process of design documents. The first element is the consumer, including her/his basic information(such as gender, age, physical condition, and the size of the appetite, etc.), normal situation of eating food of such kind(whether or not to have the experience of eating food of this type, whether or not to eat other foods of the same brand, etc.). The second element is the purchasing power, including her (his) income level. The characteristics of food consumption mainly include packaging, price, taste, etc. The third element is the food itself. Such factors as price of the food, brand value, advertising and other promotions, comparison with similar products will change its sales and users' feeling. Overall, these elements provide a direct help to the food survey. With the three elements,

buyers are easy to understand the purpose of the researches, so they can cooperate with the research and the survey can be carried out smoothly.

3.2. Logic

Being a relatively perfect system, questionnaire must have associative perception. The researchers must avoid logic and consistency mistakes in questionnaires. Irrelevant, unrealistic, and unpractical questions also must be avoided. The questions in the questionnaires must be classified and differentiated clearly. In a questionnaire, the researchers set the problems with great differences into different blocks so as to ensure that each question is related and each key point can be all inclusive. A questionnaire is inseparable from the logical and procedural characteristics.

For example, in a questionnaire of investigating weekly quantities of novel reading, the research chose a part of the people being researched to answer the questions. Respondents in this questionnaire are all students in various schools in Suzhou city, so there is a logic problem in the questionnaire. Weekly quantities of novel reading of college students are the main topics in the questionnaire, not of all students in all schools. There are mistakes in choosing the scope because all schools include primary and secondary schools. There are only a few colleges in Suzhou city, so the results of the survey may not show obvious mistakes. But taking a part for the whole is the mistake must be avoided. If college students in Shanghai city are chosen as the respondents, we cannot choose all the college students in Shanghai city because there are so many colleges and universities of different kinds which have students from all over the country. The heavy workload will waste a lot of time, energy and human resources, so we only need to choose part of the students in different colleges and universities in Shanghai as participants in the survey[6–8].

3.3. Rigor

Even if it is a very successful questionnaire, it cannot be so successful at the beginning of designing. A variety of problems will appear which need to be tested by practice. After many revisions and experiments it can be a successful questionnaire at last. In the preliminary step of designing a questionnaire, a small scale test should be carried out. Correcting the mistakes and problems existing in it timely, the questionnaire can be completed in accordance with market survey.

In the preface of the questionnaire, the intention of the research must be introduced to remove the concerns of the respondents. The wording should be euphemistic, polite, and decent. Personal privacy, issues contrary to social moral, too much calculation and complex issues must be avoided. The researches should be neutral to avoid partiality. The designer of the questionnaire must be fair and impartial in the process of designing it, in which personal subjective views, opinions, and one-sided answers must be avoided. The respondents' personal information must be protected. A rigorous spirit must be held by the researches and the successful questionnaire is the one after testing and auditing many times.

3.4. Convenience of Sorting and Analyzing

Except for close relationship between the research subject and content, simple and easy survey method, convenient collection of survey data, the researcher also need to consider whether the results are easily obtained, whether survey results are consistent with the laws of nature and the real situation, whether the survey results are accurate, practical when designing a questionnaire. This is the work that needs to be done after the research, so whether the data are easy to arrange and analyze is not only the key to the success of a questionnaire survey but also the necessary steps of it.

Firstly, this requires that the survey index is easy to be distinguished, be classified and added by using simple method. Secondly, results of the index after classifying and adding are useful to calculate. Lastly, the statistical analysis of relative numbers of the index can produce effective data, which can illustrate the issues to be investigated clearly. Meeting the former three points, the research can achieve the desired results in the survey and gain the relatively accurate and realistic results.

3.5. Clarity

The problem setting must be normative, namely clarity. This principle refers to the specific questions: whether the proposition is correct; whether the question is clear and easy to answer; whether the respondents can answer the correct answer and so on. For example, the answers of "yes" or "no" to the question can be easily made a clear judgment.

After statistics, the research can easily see what percentage of the number of respondents two extreme probability respectively accounts for, which extreme probability accounts for more than the other, or whether the numbers of both are almost the same. On the contrary, if the problem answers are "general" or "both" and other vague answers, it is difficult to explain the problem. The respondents also feel difficult to answer. For example, the answers to the question "Are you healthy?" are "healthy" and "ill", but there is a third possibility (sub-healthy, weak, general). If the research only provides two options of "healthy" and "ill", the correct information will inevitably lose. The accuracy of the survey results will be affected. It is also contrary to the principle of clarity.

4. Design and technique of research questionnaire based on the mode of cultivating application-oriented talents

4.1. Design of task-oriented questionnaire

Task-oriented questionnaire focused on task-oriented purpose and the task-oriented purpose of this questionnaire is the cultivation of application-oriented talents.

The respondents in the task-oriented questionnaire based on the mode of cultivating application-oriented talents are application-oriented college students themselves who are cultivated under such mode. They are the main subject of the questionnaire.

This kind of questionnaire should include such questions as "How do you understand the mode of cultivating application-oriented talents?", "Do you know the status quo of college students?", "Do you know why the mode of cultivating application-oriented talents should be advocated?", "What is the educational programs in your college?", "What's your opinion on the school's current education system?", "What do you learn in college except for the book knowledge?"

Many colleges and universities begin to adopt the new training mode of cultivating application-oriented talents, so curriculum in some inexperienced ones can not be so perfect, which can not provide better practical opportunities and platforms. Enclosed questionnaire should be used in the research in which the questions should be simple enough to understand and the answers should be clear and not be ambiguous. Too much professional words should be avoided to make it lose to the college students' common knowledge. Then the researches can obtain more accurate results.

4.2. Design of research questionnaire

The purpose of designing a research questionnaire is to do research. The main research direction of research questionnaire based on the mode of cultivating application-oriented talents is the training goal, education targets and results. The questionnaire of this kind should mainly focus on how to implement the cultivation of application-oriented talents and how to cultivate more excellent application-oriented talents in colleges and universities.

Enclosed questionnaire and open-ended questions should be used so that each student can express their true thoughts and the colleges can carry on the reform of the education system through the research results to find proper ways to solve such problems as "how to establish a good relationship between the enterprise and the college", "how to help students to get platforms of practice learning", "how to establish teaching team with dual energy", "how to avoid boring teaching methods". So that learning-weariness of students can be avoided effectively[9-10].

4.3. Design of modular questionnaire

Modular design method can be used in order to make structure of the questionnaire clear, easy to organize, analyze and maintain. In modular questionnaires the researches divide the questionnaire into several function modules, each of which consists of several problems. There is a logical relationship between one question and the other, and they are interrelated and mutually restricted. Each function module is relatively independent. Through integrating multiple functional modules, conclusions can be drawn by statistical analysis.

There are two modules in survey questionnaire based on the mode of cultivating application-oriented talents and questionnaire of social practice research: the mode of cultivating application-oriented talents and social practice research. And then the two modules are subdivided to design a modular questionnaire for research.

4.4. Network questionnaire

As we all know, with the development of network and the progress of the survey, the network has become the hub of the world and network research has become an important part of the survey. Combing with the features of contemporary social development, network survey puts the research and network closely together and breaks the limitations of the traditional research methods to make it more convenient and has much more respondents. The researches will receive more questionnaires and get twice the result with half the effort. Because of the diversity of network, the design of network questionnaire can not be ignored and it is not easy to design a scientific and effective network questionnaire.

The following steps are general included in the design of such questionnaire: firstly, determine the research purpose and divide the purpose into multiple target points. Secondly, divide the target point into several key points which cover all the research requirements and then covert the key points into the questions. Thirdly, select the type of questionnaire (closed, open) and set questions to form the initial questionnaire; fourthly, do the test research on the initial questionnaire to conclude and modify the improper part and then form the final questionnaire. Finally, issue the questionnaire on the Internet and set the quantity limit, wait for the answers to the questionnaire from respondents, collect the questionnaires and then analyze the data to obtain the results of the network questionnaires.

5. Teaching practice, a form of social research practice, based on the mode of cultivating application-oriented talents

5.1. Theory with practice

The contemporary education idea is generally influenced by traditional education thoughts. Theories still occupy a dominant position when judging a student's achievement, which limit students' practical abilities and hinder the development of their potentials and creative thinking, so that the improvement of their comprehensive qualities are influenced. The phenomenon of "being a bookworm and reading mechanically" is still prevalent in students. Many students are still only trying to memorize the book knowledge and their social practice ability is poor, so they have no flexibility in the use of the learned knowledge. Such "talent" will be eliminated finally with the rapid development of society.

In order to meet the social demand for application-oriented talents, colleges must build excellent faculty teams with strong learning and practical ability, carry out some curriculum like manual, design, exercises, experiments and other aspects, establish multiple students' organizations to explore the students' abilities to work and cultivate their management abilities, strengthen the cooperation between schools and enterprises to provide more practice platform for students, who can apply their knowledge to social practice and correct their own inadequacies in practice. The enterprises' development also can be promoted by the talents with high IQ who are highly educated.

5.2. A variety of plans prepared in advance

In order to adapt to the development of modern society, the traditional teaching system in our college has begun to be transformed into the teaching system of application-oriented talents cultivation. Of course, this decision is not the blind decision of the school leadership. It is a deliberate decision on the premise that the college can provide a large number of application-oriented talents.

College of Mathematics and statistics also carries out teaching reform in response to the transformation. Firstly, set up the concept of open practice teaching, integrate practical teaching resources provided by the college and the society and then set up a number of the modeling groups of scientific research. Secondly, establish a faculty team with rich teaching and research experiences, assign the teachers to the various research teams, and encourage the college students to participate in the modeling group of scientific research chosen freely by themselves according to their own preferences. Thirdly, determine the members in each group, carry out practical research, provide guidance and preparation for students who will do the experiments by themselves and present the timely feedback on the progress of the experiments, such as: preparations for the experimental modeling, design of the experimental scheme, the operation process of the modeling, the analysis and summary of modeling results. Finally, participate in some local or national mathematical modeling competitions through modeling experiments of the scientific research project.

In order to encourage students to participate in all kinds of teaching practice actively, the colleges should include all these in the elective courses, award scholarships to students with outstanding performance and recommend them to be outstanding graduates, etc. Practice shows that the reform of practical teaching system under the mode of cultivating application-oriented talents is necessary and useful.

5.3. The combination and application of professional knowledge and social research

The combination of social practice and the students' majors is to apply their professional knowledge to social practice, and then consolidate their learned knowledge and grasp the skills and knowledge they have never learned before.

Some examples that we can see in everyday's life are often cited in math class. For example, there is an aluminum alloy iron with the area of S. How to design the largest polygon V by using this aluminum alloy iron without wasting? Actually we often meet with this kind of polygon in daily life, such as the beverage bottles and rectangular boxes.

Specifically, first of all, we can find a beverage bottle of Jiaduobao, a rectangular box with the same area of the former one and an iron cone. Volume of the beverage bottle of Jiaduobao is largest according to the calculation. It is not difficult to find that the beverage bottles bought on the market are all cylinders, because a cylinder uses a minimum amount of materials in different polygons with the same volume and goods of cylinder are more convenient for carrying. Through the details of everyday's life, students can not only consolidate the knowledge they have learned, but also have the potential to solve problems encountered in life which have not yet

been found and solved. It increases their fun of learning as well.

5.4. Entry processing of the survey data and choice of the analysis methods

Check the returned questionnaires before input the data to see whether the questionnaires are completed and exclude the incomplete ones. Put the complete ones together, and then make a serial number for each questionnaire. Establish a standard working process to avoid duplicate records, control the working process and provide the basis for later verification and research. Sort the input data and do statistical analysis.

The statistical methods of the data are: univariate descriptive statistics, multivariate analysis and inference statistics. The analysis methods of the data are: linear regression analysis, variance analysis and principal component analysis, etc[11-12]. Such software as SPSS, SAS can be used to do data analysis. Use different analytical methods in different formats of questionnaire. Whichever method is used, errors can not be avoided, which can only be reduced.

6. Reflection of the process of questionnaire design and social research practice

6.1. Selecting the appropriate questionnaire for different research content

Forms of questionnaires are varied. According to the forms of answers to the questions, questionnaires can be divided into two kinds, "open questionnaire" and "closed questionnaire", which are commonly used. For example, the questionnaire designers chose the closed questionnaire in the questionnaire of the residents' physical activity, from which we draw out some of the questions. For example, answers to the question about the nature of the work are "businessman", "staff", "farmer", "students" and "unemployed", which basically summarize and accurately describe all the nature of the work without repetition. The second example is that answers to the question about working hours per week are "going to work every day", "a day off", "two days off" and "deciding to work or not according to my own intention". The first three are definite answers. The last answer is indefinite, so accurate data can not be obtained. But from the inference, the rough conclusions can be got. The third example is that answers to the question about amount of time people spend exercising in the gym are "every day", "often", "occasional", "almost not" and "never". There are many uncertain factors in this kind of questions. Going to the gym is completely in accordance with the wishes of the individuals and there is no fixed requirement, so there is no definite answers to this question. After doing statistical analysis of the questionnaire results, rough conclusions can be obtained from the inference[13, 14].

Closed questionnaire is conducive to the collation and analysis of the questionnaire data. There are also defects in closed questionnaire. For example, it is difficult to design comprehensive and complete answer choices for some complex research

topics. Each person has her/his own idea and respondents can only choose from the fixed answers, so it is difficult for respondents to fully express their ideas. They may select an answer casually to lead to large errors in the results of the research. So sometimes there are some limitations in the closed questionnaire.

An open questionnaire refers to the questionnaire in which questions are raised, and the respondents are free to express their own views. It has relatively large flexibility. The researchers can receive a wide range of information and many valuable advice from the open questionnaires. But it is difficult to obtain the results from calculation. So statistical analysis can not be carried on to get the accurate analysis results, and the expected research purpose can not be achieved. Therefore, this type of questionnaire can only be used for some complex issues that need to be explored for research projects[15-16]. A combination of closed and open questionnaire is usually used in a questionnaire, the first half of which is closed and the latter part are open questions generally.

6.2. Summarizing the problems found and failure lessons learned in the process of statistical research on time

During the process of the research, it is easy to find that previous statistical investigation method is no longer applicable to the development of contemporary society. Complicated research process and the single form lead to the unsatisfactory effect of questionnaire survey. Some of the survey data are often missed and repeated to be recorded, so a lot of manpower, material resources and money are wasted. Many people lack legal consciousness of statistics and they do not take statistics seriously. They sometimes fill in the false information. Some of them fill in the questionnaire casually just for the completion of the task. The false information lead to inaccurate questionnaire data.

Since we are aware that the survey will be an important component of future research, we need to establish a relatively perfect system of survey methods to strengthen the construction of statistical laws and education of statistical theory. So that everyone has a statistical law consciousness to make the results of statistical survey more fruitful. We need to clarify the responsibilities of each statistics department to make the labor division of each part clear, so as to keep pace with the times[17-18]. In the survey, we should treat every step carefully and correct errors in a timely manner. In this way can we achieve the purpose of the survey.

6.3. Other issues worth thinking about

College students should not "pay no attention to what is going on beyond one's study and bury oneself in the books". They should improve themselves in social practice and promote production and make the maximization of efficiency by using their learned knowledge and helping farmers, workers who have not received higher education. Colleges and universities are the place to train professional talents for the society. College students should transform their knowledge into ability, learn knowledge in colleges and learn experience in society. The wrong concept of "I am the person of knowledge and I am different from the ordinary people" should be

abandoned.

The purpose for colleges to cultivate high-quality talents with high qualifications is for the development of the society. Knowledge can change the world, students should not only learn the knowledge but also make flexible use of the knowledge they bear in their minds. Otherwise knowledge is just a piece of waste paper. Therefore, college students should take an active response to the reform of the mode of cultivating application-oriented talents and strengthen their practical ability. They should try their efforts to become an excellent application-oriented talents.

7. Conclusion and discussion

Taking students as the main body and taking the development of students' innovative spirit and practical ability as the main purpose, the mode of cultivating application-oriented talents focus on cultivating application-oriented talents with high comprehensive quality, strong adaptation ability, solid professional knowledge and rich practical ability. Cultivation of application-oriented talents is the mode which should be carried out in all colleges and universities currently for the purpose of cultivating talents who have the abilities to keep pace with the development of society.

Taking a panoramic view of the situation and going deep into the realities of life, the researchers of statistical research should be good at using various analysis methods, highlighting the key topics, choosing the proper topics and seeking truth from facts. The researchers can not give up halfway only because the work of statistical research is often hard and complicated, so as to get the facts we want. During the research process, the researchers can not ignore social practice because practice is the criterion for testing truth. Only a profound understanding and master of the statistical survey, familiar with the statistical investigation of the need to pay attention to the matter, hope that the future opportunities for the application of personnel training mode has further research.

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