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THE TRAINING OF RESEARCHERS IN THE USE OF STATISTICS IN CHINA

The responsibility of training researchers in the use of statistics in China belongs to colleges, universities and research institutes. There is a National Statistical Education Association. Under the Association, the Higher Education Branch is an organisation of colleges, universities and research institutes who have a major in statistics or a statistics faculty. Since China has a population of 1.25 billion and more than 100 thousand official statisticians in the whole country, statistics training is a huge task.

There are degree and non-degree training programs. In the degree program, there are undergraduate programs (colleges and universities) and graduate programs (colleges, universities and research institutes). In the non-degree training, different training programs have been used.

Statistical methods are widely used in almost all the fields. The most important application areas are: official statistical work including sampling survey and data processing, micro-economic analysis, management and quality improvement, medical application, agriculture and industry experiment, etc. Most researchers in the above fields need to be trained. Many patterns have been used in training. Class teaching, group discussion, field training, TV, broadcasting programs and Internet are the main patterns.

1.BACKGROUND

China is in the stage of transferring from planning economy to market economy. During the planning economy period 20 years back, China had a huge employee system of making plans from township, county, prefecture, city, province to central government. The government bodies in each level had their own planning commissions to arrange development plans. Since the governments in each level have to make their plan on the basis of the local statistical data, they established statistical bureaus to carry out official statistical works.

Right now, the whole figure of employees is over 2 million, among them about 80 thousands are full time employees. Therefore, the training of official statisticians is the biggest task not only in the past planning economy period but also in the current transformation period for the Chinese government, the Chinese Statistical Society as well as for the Chinese statistical educators.

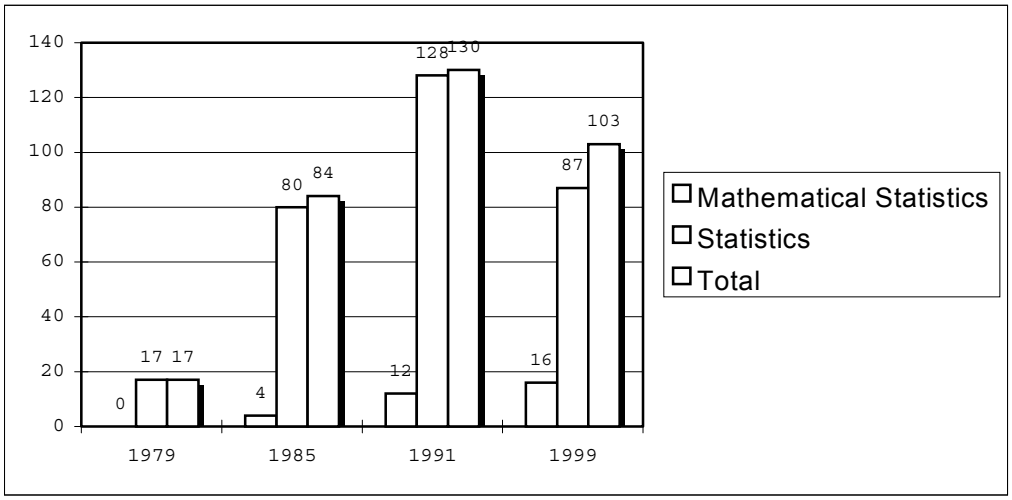
In the future, many other kinds of professional statisticians, such as bio-statisticians, medical statisticians, actuaries, statistical consultants, etc., will be needed. Therefore, the training programs will be more and more diversified. Because of this unique characteristic, I will discuss mainly the training of official statisticians in my report.

2.THE ORGANIZATIONS AND THEIR RESPONSIBILITY

Chinese universities, colleges, research institutes and many statistical training centres are responsible for training the researchers. Among 1000 higher education institutions, there are about 100 universities and colleges which have the statistical programs. That means they either established the statistics department or the statistics major. Since the official statistical system had a big demand in the past, most universities and colleges offered an economic statistics major.

With the transformation from planning economy to market economy, the statistical bureaus have had some reforms to meet this change and adopted more and more sampling surveys to substitute the overall reporting system. Therefore the statistical bureaus not only need fewer new employees than before but also need fewer graduates from economic statistics major (see figure 1). Now the higher education institutions are facing the challenge of this big change and adjusting their curricula. The number of universities and colleges with economic statistics major will decrease and the number with mathematical statistics (that is statistics) will increase. The official statistics bureaus in different levels have a big task to train their employees.

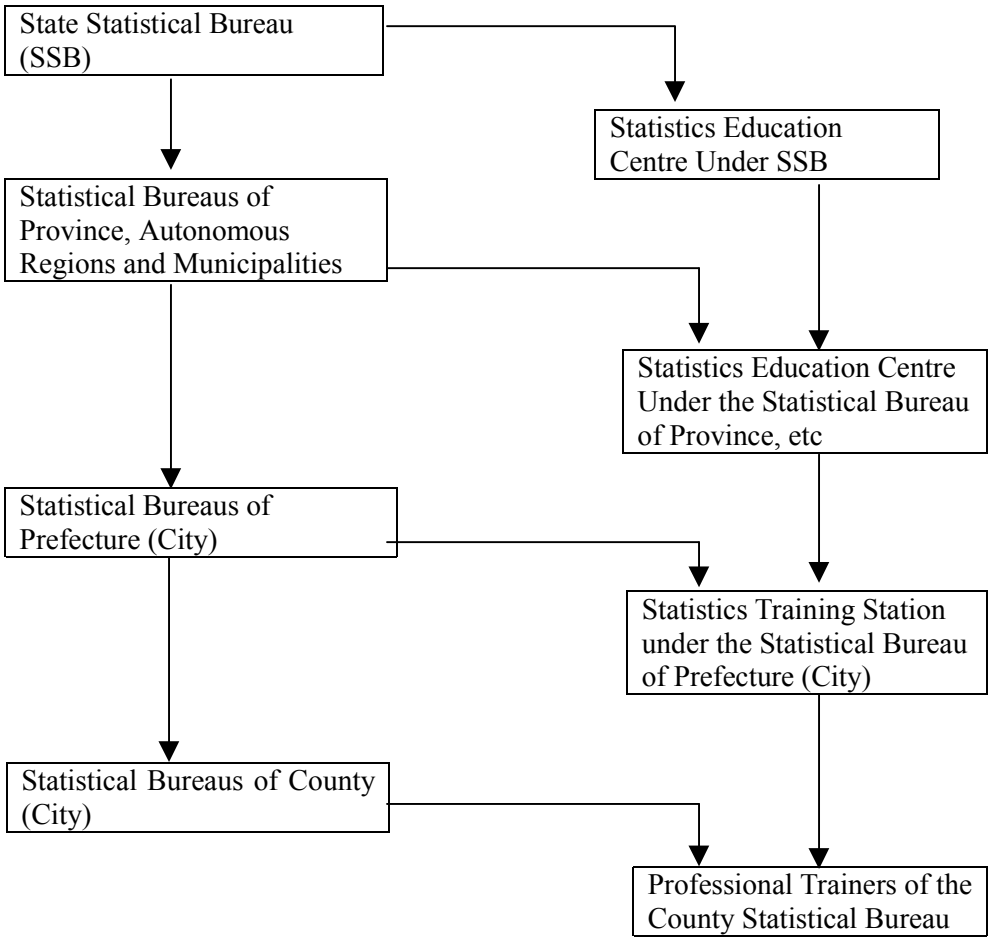
Figure 1. Frequency of Universities and Colleges with Statistics Major



In order to improve the education quality and to raise the training level, the universities, colleges with statistics programs and State Statistical Bureau (SSB) unified to establish the National Statistical Education Association (NSEA). Under the association, there are three branches: University and College Branch, Technical Secondary School Branch and Training Centre Branch. The university and college branch has 60 members which are departments with statistics majors or programs.

Each year the university and college branch organises at least one national meeting to discuss the statistics education reform and to enhance the education and training level. The technical secondary school branch has 15 members which are schools with the statistics major. With the high school more and more universal, the recruitment number from the statistics major in the technical secondary schools will be reduced in the future. The training Centre branch has 31 members which are provincial statistics training centres in each province, autonomous regions and municipalities directly under the central government. Figure 2 shows us the official statistics training system.

Figure 2. The National Official Statistics Training System



3.THE TYPE OF TRAINING PROGRAM

3.1 DEGREE PROGRAM

There are degree programs and non-degree (diploma) training programs. For the degree program, there are 12 academic degrees and 12 research fields stipulated by the Degree Committee of State Council, which are Philosophy, Economics, Law, Education, Literature, History, Management, Science, Engineering, Agriculture, Medical Science and Military Science. A statistics major for undergraduate study is under the degrees of Economics and Science. A statistics major for graduate study is under the degrees of Economics, Science and Medical Science. Most degrees have offered the statistics courses and have their own statistics faculties.

3.2 NON-DEGREE PROGRAM

Distance education

For the non-degree training programs, the most popular program is the Certificate of Economics and Management Statistics offered by Central Broadcasting & TV University and Statistics Education Centre of SSB. For the past 15 years, about 470

thousand students have been enrolled in this field and 250 thousand students graduated. On average, this kind of program needs 2.5 years. The universities have begun to offer statistics training programs and certificate programs through the Internet.

Job training

There are two kinds of job training: job knowledge training and job certificate training. Since 1990, in accordance with the reality that the level of statistical knowledge was not satisfied with the need of statistical work, a standard had been prepared for the requirement of knowledge and skill for statistical clerks, assistant statisticians, statisticians, and senior statisticians.

These standards and requirements have been subsequently implemented. By the year 1995, 800 thousand statistical personnel nation wide had participated in the training. In the job certificate training, according to the relevant laws and regulations of the government, official statistical personnel must obtain a certificate .

To accomplish this goal, two kinds of situations must be separated: Firstly, the majority of those who are already working had a previous certificate and they should be issued a certificate immediately after registration. Those who are not qualified to do this work should be re-trained before allocation to position. Secondly, there are a considerable number of new employees each year, and some of them do not possess the necessary qualification. They should be trained first and over 120 thousand employees have been trained and issued certificates since 1995.

Lectures, seminars and workshops

Except for the degree and non-degree programs, the university and college branch, statistics education centres as well as universities and colleges have organised many different short lectures, seminars and workshops for the statistical researchers, statisticians and employees.

There are two kinds of lectures and workshops. One kind of training is for special position staff. For instance, each year the Statistics Education Centre of SSB and universities organise the training workshops for the directors or deputy directors of provincial statistical bureaus. The provincial statistics education centres also organise the training workshops for county statistics bureau directors or staffs. Another training is for special topics. For example, the sampling survey technique and the system of national accounts are the most welcomed topics.

4.THE MAIN APPLICATION AREAS AND THE MAIN METHODS TO BE TAUGHT

Statistical methods are widely used in almost all fields. But right now in China the important application fields are as follows: official statistics, agriculture and industry experiment and management, economic situation analysis, medical hypothesis testing, etc. The researchers in the above fields especially need to be trained. We understand that the more developed the economy and society, the more widely used are statistics methods. Although at the current stage many fields like education, environment, risk management are less using statistics, and some other fields are short of statistics application, we, as educator and trainer, should do the training for the future in advance.

The topics to be taught should meet the needs of trainees. For the official statistician training, data collecting, tabulation, basic statistic analysis, regression analysis, time series analysis, sampling survey methods, econometric analysis are frequently involved.

For enterprise and company managers, tabulation, simple statistical analysis, cost analysis, forecasting and decision making are usually included.

5. THE MAIN ABILITIES TO BE EMPHASIZED

The aim of statistical training is not only to teach some new methods, but also to increase the trainee's abilities in their practice. The main abilities contain survey designing, data collecting, describing, computing, analysing and explaining. In order to achieve this purpose, we try to make the trainees understand the inside ideas, such as: Why statistical methods can explore the inside quantitative laws through the mass data; How statistical methods can solve the practical problem; What kind of method can be used under What kind of condition; How the statistical method can be correctly used, etc.

To understand, to emphasise, to answer these questions is the most important thing in our training. We should put the above ideas into our training materials as well as our textbooks, and train the trainers first.

6. TO TRAIN THE TRAINERS AND TRAINING MATERIALS

In order to achieve the high quality training, and to enable the trainees to master the capacities of applying the statistical methods correctly, we have to train the trainers first. One way to do this is to organise some seminars for faculties and for professional researchers. The University and College Branch of NSEA have organised this kind of seminar once a year. The participants from universities, colleges, research institutes, training centres and statistical bureaus get together to discuss how to organise effectively the training courses. Another way is to organise experienced experts to edit a series of training textbooks as well as the training materials. These experts are from the National Statistics Textbook Editing Committee, which includes three groups of experts:

- The first group is responsible for the textbooks and training materials of basic statistics methods, mathematical statistics and its applications in many fields;
- The second group is responsible for the textbooks and training materials of official statistics, economic statistics and some application fields;
- The third group is responsible for the textbooks and training materials used at technical secondary school.

Some famous statisticians like George Tiao, Jeff Wu, Lai K Chan and Ben-Chang Shia are the supervisors of this committee. Apart from editing textbooks, this committee also translated the good foreign textbooks into Chinese. Now we have already translated 15 books into Chinese and they are:

1. *Statistics* by David Freedman, Robert Pisani, Roger Purves and Ani Adhikari, 2nd Edition, 1991;
2. *Survey sampling* by L. Kish, 1965;
3. *Nonsampling error in surveys* by Judith T. Lessier and William D. Kalsbeek, 1992;
4. *Stochastic processes* by Sheldon M. Ross, 1983;
5. *Design and analysis of experiments* by Douglas C. Montgomery, 3rd Edition, 1991;

6. *Understanding robust and exploratory data* by David C. Hoaglin, Frederick Mosteller and John W. Tukey, 1983;
7. *Nonlinear regression analysis and its applications* by Douglas M. Bates and Donald G. Watts, 1988;
8. *Applied linear regression* by S. Weisberg, 1985;
9. *Statistical models and methods for lifetime data* by J. F. Lawless, 1982;
10. *Statistical methods for survival data analysis* by Elisa T. Lee, 2nd Edition, 1992;
11. *Forecasting financial and economic cycles* by Michael P. Niemira and Philip A. Klein, 1994;
12. *Statistical decision theory and Bayesian ana*lysis by James O. Berger, 2nd Edition, 1985;
13. *Discrete multivariate analysis theory and practice* by Yvonne M. M. Bishop, Stephen E. Fienberg and Paul W. Holland, 1975;
14. *Time series analysis forecasting and control* by George E. P. Box, Gwilym M. Jenkins and Gregory C. Reinsel, 1994;
15. *Introduction to variance estimation* by Kirk M. Wolter, 1985.

7. CASE STUDY AND TEAMWORK

Case study and teamwork are good measures in training. Like the course of business administration, it is important to find out good examples in statistics teaching. In 1996 and 1997, The City University in Hong Kong, Renmin University of China, Northeastern Finance and Economic University and Shanghai Finance and Economic University jointly organised 4 symposiums on Statistics Teaching and Training. On the symposiums, each university introduced their teaching experience as well as their cases. After the symposiums, a textbook of case study was edited and published. Now more and more universities, colleges and training centres choose these cases as their teaching material. There are 15 cases in the textbook and all of them are the real and practical problems in the current situation of China. Each of them has its training aim and some of them need teamwork. Now we introduce these cases:

- Case 1: The Questionnaire Design and Data Analysis for the Stock Buyers in China;
- Case 2: The Short-term Forecasting and Analysis of Chinese Industry;
- Case 3: The Correlation and Forecasting Analysis of the Two Stocks, Shenzhen Development Bank and Changhong Corporation;
- Case 4: The Analysis of Consumption Structure and the Estimation of Demand Function for the City Residents in China;
- Case 5: The Gini Coefficient Calculation using Survey Data;
- Case 6: The Effect Analysis of Age, Education Level, Marriage Status and Profession towards Mortality;
- Case 7: Can We Earn Profit from Pig Raising;
- Case 8: The Multi-Linear-Regression Analysis for Fiscal Income;
- Case 9: The Effect Factor Analysis of Women Birth Rate in China;
- Case 10: The Evaluation and Analysis for the Companies on the Stock Market;
- Case 11: The Quantitative Analysis of the City Differences and Urbanization;
- Case 12: The Comprehensive Evaluation on the Development Level of Economy and Society for the Cities in Liaoning Province;
- Case 13: The Time Series Model of the Stock Market in Hong Kong;

- Case 14: The Editing and Analyzing of the Index Number of the State Security;
- Case 15: The Probability Distribution of Individual Investor's Share Holdings.

8. STATISTICAL SOFTWARE AND INTERNET TRAINING

In recent years, computer aided teaching has been popularised in most universities, colleges and training centres. Some authors start to use Excel, SPSS, SAS in their textbooks. Many key universities, colleges and training centres delivered the training course for SAS. However, Excel is the most popular software.

Since China is a developing country and government education investment is not enough to meet the needs of the higher education development, computer systems and teaching facilities in most universities and training centres lag relatively behind. Therefore the students and trainees have not had enough time and chance to practice what they learned in the class.

The main problem for computer skill training is the combination of statistical method and software. In most statistical majors and training programs, the statistical courses and computer courses are offered separately. The textbooks are separately edited and published. The students and trainees can not solve the problems and questions using computer skilfully.

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