Preliminary Study on Improving the Effectiveness of Statistics Class

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Abstract: Statistics, with various disciplines, is a methodological subject that studies the rules of overall quantity in objective phenomena. The intersection of statistics, data science, and computers will give birth to powerful statistical tools, which will enrich our horizon and depth of viewing the world, and will enable the theories and methods of statistics to develop in a wider world. Thus, this article mainly analyzes how to improve the effectiveness of statistics lessons.

1 Overview

The current undergraduate education in statistics is to cultivate students' ability to collect and arrange data, and it is more critical to use statistical methods to solve practical problems. In terms of existing teaching methods, it mainly includes classroom lectures, explanations of exercise and computer-based experiments; the employing direction of statistics is concentrated in administrative agencies, finance, economic industries. The advent of the era of big data will bear the brunt of the existing basic framework of traditional statistical models with random sampling as the core. At the same time, due to the existence of massive high-dimensional, semi-structured and unstructured data, students in statistics must also be skilled in computer skills. The original intention of this research is to combine challenges and traditions, starting from classroom teaching methods, to cultivate students' data sensitivity, guide students to accurately and objectively treat matters, and to become talents in comprehensive data analysis. At the same time, they can teach and improve teaching quality and scientific research.

2 Design of Statistics Course

2.1 Select appropriate teaching materials and install convenient statistical software

Most of the statistical textbooks for non-statistics majors in economics and management emphasize the memory of concepts and the derivation of formulas, but they are less involved in the important areas of analysis on economic and social survey. In addition, most of the statistical software used in the existing statistical textbooks is Excel. Due to the changes in Excel, students who use the Excel in the textbooks need to uninstall and re-install the office software on their computers. The case analysis in the textbook does not actually arouse the enthusiasm of the students for the process. Finally, the school replaced the statistical textbooks with a more economic and social survey-oriented version, and uniformly installed a more convenient statistical software R Language.

2.2 Increase training courses and strengthen skills of Mapping

Economics and management statistics courses usually only have theoretical learning, but lack of practical training is not conducive to students' comprehension of the use of some indicators in the book. Finally, the school takes the financial management major as a testing point, and provides extra training courses for the statistics courses of the two classes. It adopts the concept of "teaching, while doing and operating", taking classroom teaching as the basis, classroom exercise as feedback, and practical operation-oriented

to strengthen the students' ability of manual mapping.

2.3 Strengthen the supervision during the process and pay attention to the usual assessment

The quality of the student's statistics course is usually a closed final exam of the term. Many non-statistics students do not pay attention to the accumulation of the usual, and choose to memorize the content of the course. It is easy to discourage the enthusiasm of students who are more serious in normal study, on the other hand, it is not conducive to the sound development of statistical training courses.In addition, after-school assignments such as concepts and formulas are highly reproducible.

The average student can find the answer to the homework by simply searching. However, the arrangement of the training homework is not easy to submit, which leads to the statistical course lacking supervision. An important part of the reform of the statistics curriculum is to set up an online bank of after-school exercises. The usual assignments can be randomly assigned to students. After the students' actual results are uploaded online, teachers can give scores online to not only increase the fun of the usual assessment, but also facilitates the supervision of the course.

Example: 44 independent annual rainfall data collected in a weather station, the data is as follows (ordered):

520 556 561 616 635 669 686 692 704
707 711 713 714 719 727 735 740 744
745 750 776 777 786 786 791 794 821
822 826 834 837 851 862 837 879 889
900 904 922 926 952 963 1056 1074

Assuming that the annual rainfall follows a normal distribution, first use the method of maximum estimation of likelihood to obtain the estimates of the overall mean and variance, respectively as follows:

$$\hat{\mu} = \bar{x} = 785.114$$

$$\hat{\sigma}^2 = \frac{1}{n}\sum_{i=1}^{44}(x_i - \bar{x})^2 = 14338.01$$

The 44 data are divided into six groups with a group distance of 100. The frequency distribution table is shown in Table 1.

Table 1. Frequency distribution table

组序	分组区间	组中值	频数	频率	累计频率	$P\{X_{(k)} < x \leqslant X_{(k+1)}\}$
1	(500,600]	550	3	0.068	0.068	0.228
2	(600,700]	650	5	0.114	0.182	0.102
3	(700,800]	750	18	0.409	0.591	0.104
4	(800,900]	850	11	0.25	0.841	0.159
5	(900,1000]	950	5	0.114	0.955	0.264
6	(1000,1100]	1050	2	0.045	1	0.827

组序：group order
分组区间：group interval
组中值：group median
频数：frequency number
频率：frequency
累计频率：cumulative frequency

The last column of the frequency distribution table in Table 1 is Pdf under the SPSS conversion. Probability of the binomial distribution is calculated by the Binom Model:

$$P(X_{(k)} \leqslant x < X_{(k+1)}) = C_n^k [F(x)]^k [1 - F(x)]^{n-k}$$

$$F(x) = \Phi\left(\frac{x_k - \bar{x}}{\sigma}\right)$$ x^k is the upper limit of the group interval, and k is the number of the largest order statistic in each group. This column of data can be used as a rough estimate of whether the original data obeys the normal distribution when the data is incomplete. The median of the grouped data can be used as an estimate of the mean. Only one or two values are calculated. According to the principle of actual inference, we believe that events with small probability will not occur. In Table 2.1,the probability of the last column of data we see is greater than 10%, so we can consider these data follow a normal distribution.

3 Strategies to improve the effectiveness of statistical class

3.1 Improve teachers' teaching ability

(1) Update teaching content in time

100% of multimedia teaching has been implemented in most vocational colleges, making modern teaching

more flexible and convenient, but also requires teachers to be familiar with the application of office software, especially PPT methods, in addition to being familiar with knowledge in textbook. But making PPT is a time-consuming and labor-intensive task, especially PPT in statistics needs to edit various complicated formulas. In order to save time, many teachers directly borrow PPT from others, or do not update the case and content of a PPT for many years. If they are not familiar with the PPT or the PPT is out of date, it is not conducive to teaching development. As a qualified teacher, you should always pay attention to the latest research results and cutting-edge theories of the course, check the PPT before each class, update the case with the times, and improve the fun of the PPT.

(2) Expand knowledge

We often ask students to broaden our horizons. As teachers, why not? If you are constrained by your own knowledge of this subject, it will be difficult to cite vivid cases in class, and the interaction with students will decline. As teachers, we should be involved in knowledge of various disciplines, understand current affairs, and even understand some hot topics. When students are tired in class and lack of interest, they can relax for a few minutes to talk with them about current affairs. It is better to combine current affairs with statistical knowledge.

(3) Scientifically integrate teaching content to improve students' learning confidence

The training of higher vocational students should be focused on ability, and the teaching content should be professional and advanced. The content of the textbooks we use is often theoretical and insufficient. Teachers must be able to scientifically integrate teaching content on the basis of being familiar with teaching materials, re-integrate and process the knowledge structure and knowledge content in the textbook, select typical cases from the real and complete projects of the enterprise as the teaching carrier, and closely integrate the core teaching activities with the enterprise to achieve "seamless joint". By training students' ability to deal with real problems in the classroom, they can lay a solid foundation for lifelong development, whether on preparation for knowledge or thinking way.

3.2 Teaching form integrated with the Internet

We encourage students to explore practical problems, and inevitably reflect the advantages in teaching methods of the times. On the one hand, students can feel that big data is close, and it is easy to use data to get algorithms; on the other hand, they can use methods such as MOOC, course website and wechat public account to assist teaching, stimulate students' interest, broaden students' horizons, and cultivate students' good habits of learning. The MOOC and curriculum website first need to reflect the characteristics of big data in the acquisition of resources. Python technologies, such as neural networks, classification, clustering, association and other algorithms should be used and display the corresponding code and links. After students have studied the content of the class, they can easily search and obtain it if they are willing to expand their knowledge. WeChat is the most common social tool at the moment. The development of WeChat public account should not only be a simple copy of the course website, but should also reflect the fun and intelligence, and complement the advantages of the course website.

3.3 Guide students to conduct project research based on curriculum knowledge

Statistics under the big data is practical. If you want students to effectively use the knowledge learned in the classroom, the best way is to guide students to implement various algorithms and models. Teachers can change the teaching method, set rules and introduce simulated topics in the classroom or show past good practice projects. They can also guide students to practice research topics with big data in combination with various types of topics, projects, and competitions for students.

In short, with the development of the technology, the use of statistical software to explain real problems has become a trend way of solving current analyzing problems. The functions of graphic processing and computational inference in statistical software can not only train college students 'practical skills, but also train students' thinking in analyzing problems. Nevertheless, the teaching model of statistics of economics and management in many applied undergraduate colleges remain on the memory of the theory and the derivation of formulas, while neglecting the ability to apply theoretical knowledge to solve practical problems.

References

[1]   Hu Yunxia. Research on Statistics Teaching Reform and Innovation under the Background of Big Data [J]. Modern Business Industry, 2018, 39 (35): 188-189.

[2]   Kang Yuanbao. Reflection on the Reform of Statistics Teaching Actions in the Era of Big Data [J]. Journal of Higher Education, 2018 (20): 126-128.