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Teaching Research on the Integration of Ideological and Political Education into Probability Theory and Mathematical Statistics

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Abstract: Probability Theory and Mathematical Statistics is an important fundamental discipline that investigates random phenomena and their laws. By delving into the necessity and significance of implementing ideological and political education in the course of Probability Theory and Mathematical Statistics, along with the relevant strategies and approaches, and by connecting it to real life, we can deeply explore the ideological and political education elements inherent in the course within specific cases. By unifying explicit and implicit education, we can integrate the course knowledge with ideological and political elements, form a favorable interaction between course knowledge and ideological and political teaching, and achieve the organic unity of course knowledge learning and ideological and political education. While enriching students' knowledge and expanding their horizons, we can enhance their patriotic consciousness, strengthen their ideals and beliefs, cultivate their striving spirit, and boost their comprehensive qualities.

Keywords: Probability Theory and Mathematical Statistics; Ideological and Political Education; Teaching Cases

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1. Introduction

Probability theory and Mathematical Statistics, as an important fundamental discipline to study random phenomena and laws, are widely used in production and life. They are basic courses in colleges and universities of science and technology. Because the courses of Probability Theory and Mathematical Statistics are closely related to life practice and scientific experiments, and because of the rapid development of science and technology in recent years, Probability Theory and Mathematical Statistics are accelerating their integration with many emerging and frontier disciplines such as cybernetics, information theory, reliability theory and artificial intelligence. The course content of Probability Theory and Mathematical Statistics mainly includes random events and probabilities, random variables and their distribution, two-dimensional random variables and their distribution, numerical characteristics of random variables, large number theorem and central limit theorem, sample and sampling distribution, parameter estimation, etc. This course plays a unique and irreplaceable role in improving students' ability of logical reasoning, contingency, analysis and problem solving, and is of great significance in cultivating research-oriented, exploratory and innovative talents.

From the ideological and political perspective of the curriculum, the dialectical materialism contained in the probability theory can guide students to understand the world from the two sides of things, and help students establish a correct world outlook, outlook on life and values. The mathematical statistics part mainly studies how to effectively collect, sort out and analyze the data with randomness,

make inferences or predictions about the problems under investigation, and provide reference and basis for scientific decision-making and effective countermeasures, which is closely related to everyone's life. Therefore, Probability Theory and Mathematical Statistics are one of the important courses to realize the organic integration of curriculum, ideology and politics. Through the reasonable integration of ideological and political cases in the teaching implementation process, it can not only arouse students' interest and resonance, but also cultivate students' innovative thinking and innovation ability, form a scientific world view and methodology for them, and promote their comprehensive and coordinated development.

2. Strategies for Developing Curriculum Ideology and Politics in the Course of Probability Theory and Mathematical Statistics

To integrate curriculum thought and politics into the teaching process of Probability Theory and Mathematical Statistics, we should keep pace with The Times, closely combine with value shaping, knowledge imparts and ability training, and comprehensively improve students' quality. Specific strategies include:

2.1 Teachers lead by example and set a good example for students

Teaching teachers should start from themselves, enhance their awareness of ideological and political education, update their teaching concepts, improve their teaching abilities in ideological and political education, strictly discipline themselves, lead by example, love teaching, care for students, set an example in speech, behavior, and interpersonal relationships, strive to be good teachers with the "Four Haves", become role models for students' learning, awaken their internal motivation for learning, and promote their better learning and growth.

2.2 Integrating theory with practice to enhance students' moral character

The course of Probability Theory and Mathematical Statistics is highly practical. The introduction of cases in the course of teaching can not only combine theory with practice, but also cultivate students' mathematical modeling thoughts and improve students' ability to analyze and solve problems with the knowledge they have learned. For example, the problem of artillery shelling missiles is applied to strengthen students' understanding and application of event independence, teach students that as long as they persevere, small probability events will certainly occur, and tell students the importance of persistence.

3. Practice of Ideological and Political Education in the Course of Probability Theory and Mathematical Statistics

3.1 Understand the curriculum development and learn the patriotism of scientists

Baolu Xu, a pioneer in the development of Probability Theory and Mathematical Statistics in China, was one of the most creative statisticians in the 20th century and pioneered the education and research of Probability Theory and Mathematical Statistics in China. He has achieved fruitful results in Neyman-Pearson theory, multivariate analysis, parameter estimation theory, and limit theory, and is considered one of the founders of multivariate statistical analysis [1]. Baolu Xu devoted his entire life to the research and teaching of Probability Theory and Mathematical Statistics. He went to foreign universities multiple times to study and teach, but also repeatedly refused to be hired by foreign universities. In the war years, he resolutely returned to his homeland and served the country during its most difficult times. Despite his own physical illness in the later stage, he persisted in teaching and scientific research, cultivating a group of outstanding workers for China's probability and statistics research.

Through the introduction of Baolu Xu, students are guided to learn the dedication of scientists to the motherland and science. Encourage students to work hard and strengthen their cultural self-confidence; Learn from scientists to boldly pursue ideal wisdom and spirit, set up lofty ideals, for the benefit of mankind; Study scientists for the progress of the motherland, at the expense of the great spirit of self.

3.2 Classical models of probability: Accurate positioning, recognize own ability

Reference (Raffle Ticket Problem) [2]: Suppose a supermarket sells raffle tickets with prizes, and a total of n tickets are distributed, of which only 1 has a prize. Each customer can draw 1 ticket. Calculate the probability of the k -th customer winning $(1 \le k \le n)$.

Solution: The raffle tickets activity is not to put back the sample, and let Event A as the k -th customer wins the prize. The total number of sample points generated from raffle tickets to the k -th customer is $n \times (n-1) \times \cdots \times (n-k+1)$. The sample points that are favorable to A must meet the following criteria: the first $k-1$ customers did not win, while the k -th customer won. Therefore, the sample points in favor of A are $(n-1) \times \cdots \times (n-k+1) \times 1$, then

$$P(A)=\frac{(n-1)\times\cdots\times(n-k+1)\times 1}{n\times(n-1)\times\cdots\times(n-k+1)}=\frac{1}{n}.$$

Indicating that winning or not is not related to the order in which customers appear.

It can be seen that the size of the probability is actually just a feeling of people, so when others say that a thing is easy to complete, you cannot relax yourself, may not be so handy for you to do it. When everyone says they can't do a certain job, we shouldn't be discouraged. What others can't do well may be easy for you to do. We should not be blindly confident, nor should we blindly belittle ourselves. Success or failure, never depends on whether the probability is large or small, but depends on whether you can clearly recognize your own ability: Whether you can complete the easy things seriously and responsibly, and whether you have the ability to solve the difficult things.

3.3 Independence of Event: Adhere to own bottom line, without any sense of luck

Reference (Insurance Compensation) [3]: Assuming that people purchase 1-year personal accident insurance from an insurance company and the probability of each policyholder experiencing an accident within one year is 0.01, calculate:

(1) The probability of the insurance company making a claim within one year;

(2) What size of n or more can make the probability of compensation exceed 0.5.

Solution: (1) Let A_i ={The i-th policyholder has an accident}, A ={Insurance company compensation}, then $A_1, A_2, \cdots, A_n$ are independent of each other, and $A=\bigcup_{i=1}^{n}A_i$. Thus, $P(A)=1-P\left(\overline{\bigcup_{i=1}^{n}A_i}\right)=1-\prod_{i=1}^{n}P\left(\overline{A_i}\right)=1-(0.99)^n$.

(2) Note: $P(A)\geq 0.5 \Leftrightarrow (0.99)^n \leq 0.5 \Leftrightarrow n\geq \frac{\lg 2}{2-\lg 99}\approx 684.16,$ then if there are no less than 685 insured individuals, the probability of insurance company compensation is greater than 0.5, indicating that although a probability of 0.01 is a low probability event, if n experiments are repeated, as long as $n\geq 685,$ the probability of this low probability event occurring at least once must exceed 0.5. Therefore, low probability events cannot be ignored.

Through this example to remind the students to bear in mind the "thousand miles of the dike, destroyed in the ant nest" truth, warned the students should not despise small changes. Any accident has a process from small to large, from quantitative change to qualitative change, a small negligence and lack of rigor in life or work may lead to a major accident, so we need to start small, not overlook any details, stick to our bottom line, and not harbor any sense of luck. Similarly, we should not neglect doing good things just because they are small. "Without accumulating small steps, one cannot reach a thousand miles; without accumulating small streams, one cannot reach rivers and seas", anything is a process of accumulation, only down to earth, perseverance to succeed.

4. Conclusion

The world belongs to those who understand probability and are good at creating favorable conditions for it. The famous mathematician Laplace once said: "The vast majority of the most important problems in life are probability problems". As teachers, it is necessary to cleverly combine classroom teaching, ideological and political education with real-life examples, and use Probability Theory and Mathematical Statistics courses as carriers to comprehensively implement moral education, curriculum design, ideological and political education, and organically unify knowledge transmission and value guidance. This can not only enable students to learn scientific knowledge and discover the close connection between subjects and life, but also help enhance the political literacy of college students and realize their own value.

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