

Teaching Research of “Curriculum Ideology and Politics” Into the Course of Probability and Mathematical Statistics

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ABSTRACT

With the deepening of the “curriculum ideology and politics” research, the educational function of the curriculum is gradually revealed. In order to integrate ideological and political theory into the course of probability theory and mathematical statistics and combine it with the online and offline teaching mode, this paper mainly integrates ideological and political elements into each knowledge point in an organized and planned way according to the learning characteristics of students before, during and after class. Students are mainly asked to look up some national strategies and history of mathematics in the form of tasks before class, so that students can experience the relationship between these knowledge and ideological and political elements when they preview the knowledge. Students can talk about their experience in groups, explain the knowledge points by combining ideological and political cases, and ask students to enumerate relevant examples in class. Students can push some math culture and mathematician stories after class, so that students can feel the beauty of math and learn the spirit of mathematicians who are not afraid of difficulties and climb the peak.

Keywords: *Curriculum ideology and politics, Ideological and political elements, Course, Teaching design*

1. INTRODUCTION

“Curriculum ideology and politics” is a kind of educational concept that regards “cultivating people with morality” as the fundamental task of education [1]. It has become a new guidance for teachers to teach and educate people, and has attracted more and more scholars' attention.

Domestic scholars have different views on “curriculum ideology and politics”. Some scholars believe that “curriculum ideology and politics” is a kind of teaching system, which needs to be integrated with other kinds of courses [2]. Some scholars also believe that “curriculum ideology and politics” is to integrate ideological and political education into each link of curriculum teaching and reform, so as to achieve the goal of cultivating people with morality and educating people [3]. With the passage of time, domestic educational researchers generally believe that “curriculum ideology and politics” is to take the curriculum as the carrier, and excavate the ideological and political elements in college curriculum with the help of classroom teaching, and integrate them into the teaching process.

Probability and mathematical statistics is a very important public basic course in colleges and universities [4]. It is also a compulsory course for

students majoring in science and management in postgraduate entrance examination. At present, the curriculum teaching reform of probability and mathematical statistics has covered many aspects, including teaching content, teaching methods and teaching modes. Many scholars have also done a lot of research on integrating “curriculum ideology and politics” into the curriculum of probability and mathematical statistics [5–7]. On the basis of the previous research and the combination of online and offline teaching mode, this paper studies the “curriculum ideology and politics” into the course of probability theory and mathematical statistics, and illustrates the course design -- mathematical expectation in practice.

2. DIG IDEOLOGICAL AND POLITICAL ELEMENTS TO FORM A SET OF IDEOLOGICAL AND POLITICAL CASES

The most important thing in ideological and political reform is to have ideological and political elements as the carrier. The ideological and political elements of the course vary according to the characteristics of

each course. This paper mainly studies ideological and political elements from three aspects: national strategic tasks, mathematical history and typical cases, focusing on the typicality, rationality and representativeness of ideological and political elements in the sorting process. For example, when teaching mathematics expectation, we can introduce the case of "how to divide the bet" in the example. In the process of case analysis, teachers should remind students to take into account the principle of fairness and justice on the basis of equality, so as to integrate them into "curriculum ideology and politics". The principle of equality and justice is also the basic content of the socialist core values which is put forward by the 18th CPC National Congress, thus it can remind students to remember the principle of fairness and justice no matter what they do or make any decision. This value has been the basic principle that human society should follow since the beginning of history. By studying the knowledge points one by one, the teacher can combine the representative ideological and political cases with the knowledge to form a set of ideological and political cases, which will lay the foundation for the future "curriculum ideology and politics" teaching.

3. THE INTEGRATION PATH OF IDEOLOGICAL AND POLITICAL ELEMENTS BASED ON ONLINE AND OFFLINE TEACHING MODE

With the deepening of information, information teaching methods have been widely used in teaching practice. Many teachers carry out online teaching with the help of some online teaching platforms (such as "Rain classroom", "Learning Access", etc.), and combine online and offline to form a mixed teaching mode. At present, the course of probability and mathematical statistics is also using the blended teaching mode combining online and offline, which mainly adopts the three-stage and two-dimension teaching mode. In order to combine ideological and political elements with this teaching mode and integrate "curriculum ideological and political" elements into teaching, teachers need to choose appropriate paths to integrate ideological and political elements according to the characteristics of each stage, so as to achieve the educational function of the whole process of education.

3.1. Integrating "curriculum ideological and political" into preview knowledge, and realizing the thoughts contained in knowledge

Students mainly use online teaching to preview knowledge in the pre-class stage, so as to cultivate and

improve students' self-learning ability. Teachers can push all contents related to this teaching to students through the selected network teaching platform, and assign corresponding tasks to students at the same time. Since the cultivation and improvement of students' self-learning ability is a long-term process, teachers can allow students to collect relevant documents of national policies, push knowledge about the history of mathematics, and integrate ideological and political education into pre-class preview knowledge.

3.2. The "course ideology and politics" should be integrated into classroom teaching to cultivate students' correct and positive world outlook, outlook on life and values

Classroom teaching is the main part of the whole teaching process. College students are the main force to go into society and build a strong and prosperous China. In order to enable students to develop correct world outlook, values and positive outlook on life while obtaining knowledge and ability improvement, teachers need to help students through ideological and political education while teaching courses. First of all, teachers can integrate ideological and political elements in the process of knowledge teaching so that students can better understand the knowledge they have learned and understand the philosophy behind the knowledge. Secondly, teachers can ask students to enumerate relevant ideological and political examples according to their knowledge, and explain the path implied in the examples to other students, so that students can understand all kinds of truths in the process of learning knowledge points, establish a positive attitude towards life, and enhance the consciousness of serving the people.

3.3. The "course ideology and politics" can be integrated into the after-class review to realize the educational function of the whole teaching process

In order to realize the educational function of the whole process, teachers can push some national policy documents to students in after-class teaching. At the same time, some activities conducive to improving students' scientific literacy can be carried out, and some curriculum-related elective courses can be set up, so that students can become high-quality talents while learning probability theory and mathematical statistics.

4. “COURSE IDEOLOGY AND POLITICS” TEACHING DESIGN-MATHEMATICS EXPECTATION

This paper takes the teaching design of mathematics expectation in probability and mathematical statistics course as an example to illustrate the process of integrating ideological and political elements into the course teaching.

Learning goals:

Knowledge and skills:1. Understanding the background of mathematical expectations. 2.Understanding the concept of mathematical expectations. 3.Mastering the calculation and properties of mathematical expectations

Process and methods:

Through the introduction of "dividing the gambling problem" and "shooting problem", teachers can guide students to analyze and solve problems, cultivate students' ability to transform practical problems into mathematical problems, cultivate students' ability to propose, analyze and understand problems, and then develop the ability to solve practical problems by integrating the knowledge learned.

Emotional attitudes and values:

By introducing the application of probability and mathematical statistics in real life, it stimulates students' interest in learning probability theory and mathematical statistics independently, and also cultivates students' innovation consciousness and exploration spirit.

The teaching process:

Case introduced:1.The split bet problem; 2.Shooting problem.

Teachers introduce cases to help students understand the history of probability and mathematical statistics, and stimulate students' interest. At the same time, through the introduction of the case of “curriculum ideology and politics”, let the students experience the socialist core values of equality, justice principles. Teachers can let students learn to use theory to guide practice and experience mathematics from life.

Knowledge point 1: The concept of Mathematical expectation

1. Mathematical expectation of discrete random variables

Definition: Let the distribution law of discrete random variable X be $P\{X = x_k\} = p_k$ or list as follows:

X	x_1	x_2	...	x_k	...
P	p_1	p_2	...	p_k	...

If the series $\sum_{k=1}^{\infty} x_k p_k$ converges absolutely, the convergent value is the mathematical expectation or mean value of the random variable X , denoted as

$$E(X) = \sum_{k=1}^{\infty} x_k p_k .$$

Otherwise, the mathematical

expectation of a random variable X does not exist.

2. Mathematical expectations of continuous random variables

Definition: The density function of the continuous random variable X is set as $f(x)$, and if the integral

$$\int_{-\infty}^{+\infty} xf(x)dx$$

converges absolutely, the convergence value is the mathematical expectation or the mean value of X . If the integral $\int_{-\infty}^{+\infty} |x| f(x)dx$ diverges,

then the mathematical expectation of the random variable X does not exist. Teachers teach the definition of mathematical expectation, and guide students to understand the concept, return to the question just raised, and further understand the nature of mathematical expectation.

Example 1. When a newborn is born in a hospital, doctors should score the newborn according to its skin color, muscle elasticity, reaction sensitivity, heart beat and other aspects. The score of newborn is a random variable, and according to the previous data, the distribution law is

X	0	1	2	3	4	5	6	7
p_k	0.002	0.001	0.002	0.005	0.02	0.04	0.18	0.37

Ask for the mathematical expectations $E(X)$ of X .

Example 2. It is supposed that the density function of a continuous random variable is

$$f(x) = \begin{cases} 2x, & 0 < x < 1, \\ 0, & \text{others.} \end{cases}$$

Ask for the mathematical expectations $E(X)$ of X .

Exercise 1: If it is supposed that $X \sim U(a,b)$, lets find the mean value $E(X)$ of X .

Exercise 2: How to determine the direction of investment decision?

Someone who has \$100,000 in cash and wants to invest in a project estimates the chance of success at 30%. The profit is 80,000 yuan. The chance of failure is 70%. The loss will be 20,000 yuan. If I deposit it in a bank, the interest rate for the same period is 5%. Shall I make this investment?

In fact, how to make decisions is also related to the personality orientation of decision-makers, some of whom are risk-oriented optimistic decision-makers, and some of whom are conservatively pessimistic. Mathematical expectations are the basis of rational decision making. We make any decision, we can not only consider the ideal result and think about ten times the return, but also to the ideal results and other results of probability and its occurrence probability, otherwise, if only considering the ideal result, everybody should drop out of college drop out of university, the most ideal is to become the world's richest man who named Bill Gates. Under the background of the new era, investment, insurance, campus loans and so on are

various, to be rational, withstand the temptation, not credulous blindly, no matter how attractive. Don't try to get rich overnight. Whether it is a casino or a lottery, the lucky person is bound to be accompanied by a large number of loving people. The reason why lottery is called welfare lottery is that it is a small chance for you to win the lottery, so your investment is more for charity than for return.

Through this exercise, the teacher introduces "curriculum ideology and politics", and exhorts the students to learn rational investment and to be down-to-earth in everything.

By understanding the concept and calculation method of mathematical expectation, students learn to use mathematical expectation to solve practical problems, while the specific calculation of mathematical expectation makes it easier for students to understand the concept and consolidate the practice of calculation.

Knowledge point 2: Mathematical expectations of a function of a random variable

In many practical problems, we often need to calculate the mathematical expectation of the function of the random variable. For example, the effect of the pressure $W = kV^2$ on the wing of an aircraft, where V is the wind speed is the random variable. We need to know the average pressure on the wing. For this purpose, the mathematical expectation formula of random variable function is given below.

Theorem: Let Y be a function of a random variable $X : Y = g(X)$ (g is a continuous function),

(1) X is a discrete random variable and the distribution law is $p_k = P(X = x_k), k = 1, 2, \dots$. Then

$$\text{we have } E(Y) = E[g(X)] = \sum_{k=1}^{\infty} g(x_k) p_k .$$

(2) X is a continuous random variable whose distribution density is $f(x)$, then $E(Y) =$

$$E[g(X)] = \int_{-\infty}^{+\infty} g(x) f(x) dx .$$

The theorem tells us that we don't need to know the distribution of Y , but only need to know the distribution of X .

Further reading: In addition to the classical mathematical expectations, there are nonlinear mathematical expectations, the latter being the present research hotspot in the world. Professor Peng Sige of Our country has made outstanding contribution in this respect. He established the expectation theory of dynamic nonlinear mathematics: G-expectation theory. G-expectation is an important tool for the study of nonlinear dynamic pricing and dynamic risk measurement in financial mathematics. Inspired by the problem of risk measurement and random volatility in finance, Professor Peng introduced another class of nonlinear expectation, G-expectation, and further applied the two nonlinear expectation theories created by him to the actual financial market. Teachers can stimulate students' interest in extra-curricular learning and understand the frontier of the

subject. At the same time, teachers can cultivate students' patriotic feelings by letting students do extended reading.

Class Summary: Through case introduction, teaching and practice, students can understand the concept of mathematical expectations and master the calculation of expectations.

5. CONCLUSION

Integrating "curriculum ideological and political" into the course of probability and mathematical statistics is beneficial to the realization of the course teaching quality goal. The teaching content of this course contains many ideological and political principles and socialist core values. By integrating the two, students' learning enthusiasm can be effectively mobilized, their optimistic spirit and patriotic enthusiasm can be cultivated, and their recognition of socialist core values can be realized.

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