Research and Practice of Integrating Ideological and Political Education Into Probability Theory and Mathematical Statistics Teaching

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This paper first analyses the reasons for the low effectiveness of ideological and political education in the current probability theory and mathematical statistics teaching, then puts forward the contents, methods, and approaches of integrating ideological and political education into the teaching of the course on this basis, and finally finds out the points for needing attention in the integrating ideological and political education into the teaching of the course.

Keywords: probability theory and mathematical statistics, contents of ideological and political education, methods of ideological and political education, approaches of ideological and political education

Introduction

In short, ideological and political theories teaching in all courses is that all courses in colleges and universities should play the role of ideological and political education. In 2016, Shanghai took the lead in putting forward it. Over the past few years, it has been increasingly recognized and has become the key, hot spot, and focus of close attention and in-depth research by universities and teachers in the teaching reform. However, the research and practice of integrating ideological and political education into probability theory and mathematical statistics teaching is still in the exploratory stage. From design and implementation to assessment and evaluation, it needs to be constantly tried and improved to do better.

Probability theory and mathematical statistics studies and reveals the statistical regularity of random phenomena, with strict logic, high abstraction, and wide application. It is a very important public basic course in university education. Through the study of it, students can learn the knowledge of probability and statistics, and can also improve their logical thinking ability, abstract thinking ability, scientific reasoning ability, data processing ability, mathematical modeling abilities, and the ability to analyse and solve practical problems with the knowledge of probability and statistics, improve mathematical literacy, and provide the necessary mathematical foundation and tools for the follow-up courses and future work. The contents and the development history of probability theory and mathematical statistics contain rich philosophical thoughts and ideological and political education resources, have rich humanistic values and important educational functions, and can train students to form dialectical philosophical thinking, scientific spirit of seeking truth from facts, and
feelings of serving the country with science and technology. At present, the theories and methods of probability theory and mathematical statistics have been applied to many fields and various departments. They play an important role in making decisions, processing information, and designing experiments. Because there are a large number of random phenomena in the real world, some theories of probability theory and mathematical statistics come from reality, and the course is closer to real life than other mathematics courses and has advantages in the aspect of ideological and political education. Therefore, it is of great significance to integrate the research and practice of ideological and political education into the teaching of the course.

In the literature on the integration of ideological and political education in probability theory and mathematical statistics teaching, Wu, Huang, and Ji (2021), Yang (2021), and others studied the significance and necessity of integration; Han, Xia, Pang, and Li (2020), Li and Chen (2021), Wu, Huang, and Ji (2021), Yang (2021), Fang (2021), Feng, Shi, and Xing (2021), Zhang (2021), and others researched and practiced the contents, methods, cases, and approaches of integration; You and Li (2021), Feng, Shi, and Xing (2021), and others studied the matters needing attention and effect evaluation of integration. The literature mainly studies the significance, necessity, contents, methods, cases, approaches, matters needing attention and effect evaluation of integration. It does not comprehensively analyse the true reasons for the low effectiveness of integration; there is a little literature about the contents, methods, approaches, and matters needing attention of integration. In practice, for a long time, the teaching of the course lacks the integration of ideological and political education, and the effectiveness of integration is not high. Therefore, it is not enough the research and practice of integrating ideological and political education into the teaching of the course.

This paper first carefully analyses the reasons for the low effectiveness of ideological and political education in the current teaching of the course, then on the basis, puts forward the contents, methods, and approaches of integrating ideological and political education into the teaching of the course, and finally finds out the points for attention of integration.

The Reasons for the Low Effectiveness of Ideological and Political Education in Current Probability Theory and Mathematical Statistics Teaching

It is a systematic project to integrate ideological and political education into the teaching of the course. At present, the effectiveness of integration is still not high. There are five reasons for the low effectiveness.

Probability Theory and Mathematical Statistics Have Some Characteristics

Because the research objects of probability theory and mathematical statistics are mainly random phenomena, the research methods are mainly probabilistic statistical methods and analytical methods, and the course has strict logic and high abstraction, it is mostly presented in systematic contents and the form of deductive reasoning, and lacks the effective combination points of explicit ideology and politics, and because it is difficult and teaching objects are many and involve a wide range, but the class hours are limited, teachers often find it difficult to take into account the ideological and political education.

There Are Problems and Deviations in Thinking and Action

At present, the idea of ideological and political theories teaching in probability and mathematical statistics has not yet formed a general consensus in colleges and universities, nor has it been translated into the conscious action of all probability and mathematical statistics teachers. A few teachers are not very satisfied with the practice of ideological and political theories teaching in the course. Some teachers do not pay enough attention
to ideological and political theories teaching in the course and do not understand it deeply. They are also not good at excavating the elements of ideological and political education and do not teach the truth in life.

The Syllabus Is Too General, the Contents of the Course Are Outdated, and the Methods Are Not Effective Enough

At present, the syllabus of the course in most Chinese colleges and universities is highly generalized, and there is no detailed integration into ideological and political education. The contents of integration do not fit well with the national policy guidance, current hot issues, students’ life reality, and focus of attention, and are not attractive and infectious enough. The methods of integration are not effective enough. Ideological and political theories teaching in all courses requires teaching the knowledge of temperature, thickness, and heat. However, in the current ideological and political education in colleges and universities, there still exist the methods of preaching and the practice of “quick mobilization”. On the other hand, due to lack of understanding, excavation, and design, the situation of “hard copy after cutting and splicing” often occurs.

The Atmosphere and Environment of Ideological and Political Education Have Changed

With the arrival of the social transformation period and the economic development, the ideological and political education atmosphere where college students are has changed. Among college students, there are many problems such as dishonesty, lack of gratitude and respect for others, and poor sense of responsibility. The role of campus culture in creating the atmosphere of ideological and political education is not obvious enough, and the role of recessive education is not enough. In the current era of economic globalization, the introduction of active social trends and decadent values has a significant impact on students. Some students show the tendency of individualism, utilitarianism, and liberalism in value choices. In the new era, new media such as Internet, Wechat, and microblog are widely used, which makes the information highly developed, and it is difficult for students to distinguish the true from the false and make correct judgments.

The Evaluation System Suitable for Ideological and Political Theories Teaching in the Course Has Not Been Established

Most colleges and universities pay more attention to implementing the idea and process of ideological and political theories teaching in the course, and do not do enough to track and evaluate the implementation effect. Some colleges and universities have considered the effect of practicing ideological and political theories teaching in the course, but failed to design a scientific evaluation index and feedback system. By establishing a scientific evaluation system suitable for ideological and political theories teaching in the course, we can discover the implementation effect of ideological and political theories teaching in the course, and then improve the design and its implementation.

The Contents, Methods, and Approaches of Integrating Ideological and Political Education Into Probability Theory and Mathematical Statistics Teaching

This paper puts forward the contents, methods, and approaches of integrating ideological and political education into the teaching of the course in the following.

Excavate the Ideological and Political Education Resources of the Course, and Pay Attention to the Development History of Probability Theory and Mathematical Statistics in Ideological and Political Education

Probability theory and mathematical statistics is to study the problems that contingency imply necessity.
Some theories of it contain rich ideological and political education elements such as philosophy, values, and scientific spirit, especially the dialectical relationship. The random phenomena in probability theory have uncertainty for each observation, but after a large number of observations, the results show a completely certain regularity. The statistical inference in mathematical statistics is the method of inferring the whole from the part. Some basic concepts in probability theory and mathematical statistics embody the law of unity of opposites, such as random phenomena and deterministic phenomena, basic events and complex events, inevitable events and impossible events, probability and conditional probability, independence and non-independence, discrete and continuous, population and sample. It is necessary to pay attention to the growth and struggle history of mathematicians in probability theory and mathematical statistics and their spirit of pursuing truth, working tirelessly, overcoming difficulties, and dedicating themselves to science, inspire students with their experience, and guide students to learn from them. Probability theory originated from the study of chance games and gambling. It was born in the production practice and social activities of human beings in the middle of the 17th century. The 18th century was the formal formation and development period of probability theory. Cardano, Huygens, Fermat, Pascal, and others were early researchers of probability theory. When talking about simple probability theory, we can talk about the story of Tian Ji’s horse racing. There is a shadow of probability behind the story, which also pioneered game theory. When talking about the probability theory of the 19th century, we can introduce Laplace, Gauss, Maxwell, Gibbs, et al. Most people think that the formation of mathematical statistics was in the 1940s when Carmer’s book *Mathematical Methods of Statistics* was published. Pearson was the founder of mathematical statistics. When talking about the development of recent mathematical statistics, we can introduce Gauss, Laplace, Bayes, and Galton. When talking about the stage from the starting point to the maturity of modern mathematical statistics (from the 19th century to the end of World War II), it can be introduced that British Statistics School led by Fisher and Pearson played a leading role in this stage. In the introduction, when talking about Chinese probability scientist and statisticians, we can introduce Hsu Paolu and Wang Zikun. Professor Hsu Paolu is the first Chinese mathematician with international reputation in mathematical statistics and probability theory, one of the founders of multivariate statistical analysis, and one of the most creative statisticians in the 20th century. He initiated the teaching and research of probability theory and mathematical statistics in China. Professor Wang Zikun is an outstanding probability scientist and educator, as well as a pioneer and major academic leader in the study of probability theory in China. When talking about the statistical definition of probability, we can introduce De Morgan, Buffon, Pearson, and Romanovsky carried out a large number of monotonous coin tossing experiments, which reflected the scientific spirit of patience and perseverance. We can also say that the dialectical relationship between frequency and probability reflects the unity of opposites between contingency and necessity. When talking about the classical definition of probability, we can use classic probability model to calculate the probability of winning the lottery, tell students that the event of winning the lottery is a small probability event, and let students live in a down-to-earth manner and arm their minds with knowledge. When talking about the geometric definition of probability, we can introduce French scientist Buffon combined probability with geometry and began the study of geometric probability. When talking about the axiomatic definition of probability, we can introduce Bernstein and Kolmogorov. In 1917, Soviet mathematician Bernstein first proposed the axiomatic structure of probability theory and later developed it. In 1933, the Soviet mathematician Kolmogorov gave the axiomatic definition of probability and put forward the axiomatic structure of probability theory in a more complete form. Since then, the complete probability theory in a more modern sense has been
completed. When talking about the full probability formula, we can introduce the idea of simplifying complex problems and breaking them into parts. When talking about Bayesian formula, we can introduce that the mathematician Bayes is one of the founders of probability theory and the founder of Bayes statistics and has a great impact on the early development of probability theory and statistics. We can also introduce Bayesian formula can integrate the existing knowledge and updated data of a field to continuously improve human cognition. It reflects the importance of integrity and is widely used in the field of integrity evaluation. When talking about the independence of events, we can analyse the proverb “three coppers are better than Zhuge Liang” to inspire students to have a sense of teamwork in their study and work. When talking about the Bernoulli probability model, we can introduce the outstanding contribution of Swiss mathematician Bernoulli, and we can also say it contains the law of quantitative and qualitative change of small probability events. When talking about random variables, we can introduce the relationship between them and functions in higher mathematics, which reflects the “objectivity, universality and diversity of connections” and the “dialektical relationship between generality and individuality”. When talking about Bernoulli distribution, we can introduce the Bernoulli family’s contribution to the development of science and tell students the importance of atmosphere and environment. When talking about binomial distribution, we can explain that although some things in life seem trivial, if you persist in doing them, there will be unexpected results. Therefore, small probability events cannot be ignored in a large number of independent repeated trials. We can also remind students to do everything well at the moment and make continuous efforts in the right direction to achieve their life goals. When talking about Poisson distribution, we can introduce Poisson. French mathematician Poisson turned to mathematics from medicine. His strong interest in mathematics prompted him to exert great potential in mathematics. It can be seen that if you find your interest and work hard for it, you will have unexpected gains. When talking about normal distribution, we can introduce French mathematician De Moivre derived the frequency curve of the normal distribution as an approximation of the binomial distribution and German mathematical prince Gauss introduced the normal distribution from describing the error of astronomical observation. When talking about $t$ distribution, we can introduce $t$ distribution also known as student distribution. Its discovery has opened a new era of statistical inference with small samples. When talking about the distribution function, we can make students feel the importance of rational thinking of “seeing the essence through the phenomena”. When talking about mathematical expectations, we can introduce that mathematical expectations can be said to be expectations for the future and mathematical expectations for future events are based on the distribution of previous events, so that students have realistic expectations for the future and understand that only by setting reasonable goals, paying attention to accumulation, and being practical and diligent can they achieve something. We can also be combined with the “mixed test grouping” problem of nucleic acid detection, so that students can feel the power of probability knowledge and we can stimulate their patriotism. When talking about Chebyshev law of large numbers, we can introduce Chebyshev. Russian mathematician Chebyshev is physically disabled and morally noble. With his unique charm and outstanding talent, he founded the “Petersburg School of Mathematics”. When talking about Bernoulli law of large numbers, we can introduce Bernoulli and the philosophy principle that quantitative change causes qualitative change, so as to inspire students to persevere and accumulate. When talking about Khinchin law of large numbers, we can introduce Khinchin. During his scientific research, he made further in-depth research on the law of large numbers through thinking about the work of his peers, so that the law of large numbers has a wider scope of application. When talking about the application of De Moivre-Laplace central limit theorem, we can inspire
students not to be restricted by the conventional way of thinking when solving difficult problems, but to transform the mode of thinking, analyse problems dialectically, and solve problems from multiple angles and dimensions. When talking about sampling deviation, we can inspire students that in our study and work, we should not look at problems in a partial way, so as to avoid losing comprehensive understanding and correct judgment. When talking about interval estimation, we can infer that strengthening quality management requires the introduction of statistical thinking and methods. When explaining the maximum likelihood estimation, we can introduce its inventor, Fisher. We can tell Professor Fisher’s research experience on the farm in the suburb of London to the students to inspire them not to be discouraged and give up at any time. When talking about hypothesis testing, we can introduce the theoretical system of what we now call hypothesis testing began with the work of Neyman and Pearson in the 1920s-1930s. When talking about statistical inference, we can explain that “see big things through small ones”.

Influence Students Through Knowledge, and Words and Deeds, Adopt Ideological and Political Education Methods Close to Students’ Actual Life and Adapt to Students’ Personality, and Constantly Improve these Methods

Teachers should exert a subtle influence on students through their own knowledge, and words and deeds, so that they can not only learn professional knowledge, but also learn the rules of conduct. Teachers should understand various educational policies of the party and the state, constantly expand their knowledge, understand the frontiers of disciplines, prepare teaching materials carefully and responsibly such as teaching plans and courseware, pay attention to their own image, spread positive energy, and motivate students by telling their own experiences. We should adopt ideological and political education methods that are close to the actual life of students and adapt to their personality, hobbies, and growth characteristics, design these methods for new problems, new focuses, and new hot spots, and use diversified methods. With the help of internet information technology, more ideological and political education elements can be integrated into the teaching of the course through intuitive pictures, videos, audio, and other multimedia. In the teaching of the course, teachers should combine with the actual needs, according to the characteristics of ideological and political case analysis, situational teaching, emotional cultivation, model demonstration, reasoning and persuasion, probability theory and mathematical statistics development history analysis, group discussion, teaching, moral practice, and other methods, select them pertinently, so as to improve the attraction and appeal to students. Ideological and political education methods should be constantly improved with the changes of the times, social development, and educational objects. In the teaching of the course, we should consciously pay attention to strengthening morality and cultivating young persons. From the perspectives of the process of knowledge discovery, the development history of probability theory and mathematical statistics, and the beauty of mathematics, we should constantly improve the ideological and political quality of students.

Integrate Ideological and Political Education Elements Into the Syllabus of Course, Deeply Excavate the Ideological and Political Elements and Cases in the Course, and Give Full Play to the Influence of Environmental Edification and the Role of Cultural Cultivation

Integrating ideological and political education into the syllabus is a necessary condition for the implementation of ideological and political theories teaching. The value, spirit, and thought behind the knowledge can be excavated and integrated into the syllabus, and the ideological and political education elements can be integrated into the teaching objectives, teaching contents, and teaching strategies. Set up the
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curriculum teaching objectives with ideological and political education as the core, combining knowledge teaching with value guiding, and strive to achieve the maximum of the established teaching objectives of the curriculum and the educational objectives of ideological and political education. Deeply excavate the ideological and political elements in the course, integrate the elements into the teaching objectives and contents of the corresponding chapters and sections, and formulate the specific ways and methods of teaching activities. In combination with practical problems, deeply excavate the cases that are suitable for the course, closely related to practical life and easy to be understood by students, and carry out case teaching to make students realize the importance of learning the course and help students identify and establish correct values. Colleges and universities should give full play to the advantages of gathering talents and famous teachers, let students accept the influence of the environment, release the role of cultural cultivation, and imperceptibly integrate ideological and political education into the teaching of the course.

The Points for Needing Attention of Integrating Ideological and Political Education Into Probability Theory and Mathematical Statistics Teaching

The following three points for needing attention in integrating ideological and political education into the teaching of the course are found.

Follow the Laws of Ideological and Political Education, Teaching, and Students’ Growth, and Improve the Attraction and Acceptance of Ideological and Political Theories Teaching in the Course

We should follow the laws of ideological and political education; the integration of ideological and political education must be combined with the educational objectives, environment, and reality. We should follow the laws of imparting knowledge and educating people, improve professional quality, ideological and political accomplishment, and ideological and political education level of teachers, and guide teachers to adhere to the unity of words and deeds, and the unity of focusing on research and paying attention to society. We should follow the laws of students’ growth, because the current students are independent, self-confident, and have wide range of interests, so we should pay attention to the shaping of their values and the cultivation of their emotional psychology. Teachers should realize that ideological and political education will not only not affect the teaching of professional knowledge of the course, but also enhance the ideological and humanistic nature of teaching and deepen the connotation of teaching. Teachers should strive to organically combine the knowledge, theory, and ideology of teaching contents with the acceptability of teaching methods, and constantly enhance the attraction and appeal of ideological and political education. Teachers should teach students by their own example in ideological and political education and influence students with their own personality charm. Teachers should also establish a democratic, equal, and harmonious relationship between teachers and students, become good teachers and helpful friends of students, be strict with students, and patiently help students, so that students can accept knowledge and understand truth in a pleasant atmosphere and get enlightenment in emotional blending.

Grasp the Scale Well and Use the Methods Well to Integrate Ideological and Political Education

Because the contents of the course are many and abstract, and based on calculus, they are difficult for most students. Teachers cannot spend too much time on ideological and political education and ignore the teaching of the contents of the course itself. First of all, the contents of ideological and political education in the teaching of the course should not only be targeted, but also adapt to the psychology of college students. Secondly,
teachers should neither superficially connect the teaching contents with ideological and political education contents, nor regard ideological and political education contents as the knowledge of the course to teach. The methods of ideological and political education should be close to the students’ reality and meet their needs. First of all, the integration of ideological and political education into the teaching of the course cannot “copy mechanically”. Secondly, teachers should determine the methods of ideological and political education according to the characteristics of the course and the situation of college students.

**Improve Teachers’ Consciousness and Ability of Ideological and Political Theories Teaching in the course, Carry Out Teaching Reflection, and Reform the Examination and Evaluation Ways of Ideological and Political Theories Teaching in the course**

We should implement the plan to improve teachers’ consciousness and ability of ideological and political theories teaching in the course, and make solid progress by holding special training of ideological and political theories teaching in the course. We should carry out teaching reflection after the teaching of the course through communication, observation, transposition, and other ways. We should select appropriate examination ways of ideological and political theories teaching in the course and establish appropriate evaluation system of ideological and political theories teaching in the course. We can choose case task and other methods to examine ideological and political theories teaching in the course. The evaluation of the effectiveness of ideological and political education in the teaching of the course can be carried out from the aspects of teaching design, teachers, students, and so on. In specific operation, we can use some softwares and platforms to obtain accurate information in all aspects through information collection and big data analysis, and then incorporate emotion, values, and other contents of students into the evaluation system to form a diversified evaluation system of ideological and political theories teaching in the course.

**References**


