Teaching Cases of Curriculum Ideological and Political Education in Biostatistics

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Abstract. The amalgamation of ideological and political theory into the significant courses in the curriculum offered by the educational institutions has gained more attention in recent years. The primary goal of this process is to enhance the learners' comprehensive quality not only in knowledge education but also in ideological education. This work focuses on the study of integration of curriculum ideology and politics into the biostatistics course. In the section of data collection and sorting, calculation of data characteristic number and hypothesis testing, this paper introduces detailed analysis of specific problems and the main and secondary aspects of contradictions in the teaching content. At the same time, it also carries out the education of cultural self-confidence and integrates the ideological content of the curriculum into the teaching practice. This work also proposed questionnaire survey-based method to find the relationship between biostatistics course and ideological and political education.

Keywords: Ideological and political education · Data materials · Biostatistics Teaching · Statistical Analysis · Marxist principles

1 Introduction

Inclusion of ideological and political theory in curriculum for conveying the knowledge of professional courses is very important besides imparting the professional knowledge. Since, it helps students to achieve the primary objectives of high moral standards, value, ideological idea and belief. Of late, an ideological and political theory is incorporated for several courses such as Mathematics [1, 2], English [3], Information Security [4], Entrepreneurship Education [5], Medical English [6] and many more. Biostatistics is an optional course for biological science and related majors [7]. It combines theory with practice, and syndicates course content with the flexible application of theoretical course knowledge. It puts theory into practice and expands on theory. Experiment design and statistical analysis are involved in the course. In teaching design, we should find the right entry point and introduce ideological and political elements imperceptibly, which will help students form a spirit of perseverance in scientific research and enhance their enthusiasm to participate in it; In terms of teaching content, we should fully tap the materials

that are consistent with Marx's philosophy, scientific thinking, and other thoughts, and integrate them into the teaching process. In terms of teaching methods, through the introduction of ideological and political elements involved in different contents, students can practice the scientific thinking of "hypothesis inference" in specific practice; Through heuristic teaching, different forms of teaching activities are carried out in the classroom, such as preview before class, cooperative learning in class, summary, discussion, and reflection after class, so as to fully mobilize students' enthusiasm for learning, stimulate their interest in learning, and cultivate their ability to learn independently, think independently, and solve practical problems [8, 9]. The better education and teaching outcomes can be accomplished in endorsing college students' quality of knowledge in Biostatistics and effectiveness. The main reason is to support students launch precise ideas and enhance the success rate of answering research questions in biology, medicine and public health.

The primary contributions of this work are to:

- applying the theory of Marxist basic principles to biostatistics course teaching design.
- analyze the relationship between the college students' biostatistics education and ideological and political education using questionnaire survey.

The remaining sections of this paper is structured as follows. Section 2 discusses about proposed research methods related to the integration of Ideological and Political Education in Biostatistics. Section 3 elaborates about the Biostatistics course teaching content and design with ideology and politics using Marxist basic principles. Statistical analysis of finding the relationship between the college students' biostatistics education and ideological and political education using questionnaire survey is discussed in Sect. 4. Section 5 concludes the research work.

2   Materials and Methods

This section discusses about the research material related to applying the theory of Marxist basic principles to course teaching design and analysis of relationship between the college students' biostatistics education and ideological and political education using questionnaire survey.

2.1   Marxist Basic Principles to Course Teaching Design

Marx emphasized human beings can comprehend the world in four ways: artistically, spiritually, religiously, and theoretically. In the context of education, elementary principles of Marxism still pertinent. In terms of teaching content, we should fully tap the materials that are consistent with Marx's philosophy, scientific thinking and other thoughts, and integrate them into the teaching process. In terms of teaching methods, through the introduction of ideological and political elements involved in different contents, students can practice the scientific thinking of "hypothesis inference" in specific practice; Through heuristic teaching, different forms of teaching activities are carried out in teaching, such as preview before class, cooperative learning in class, summary, discussion and reflection after class, so as to fully mobilize students' enthusiasm for learning,

stimulate their interest in learning, and cultivate their ability to learn independently, think independently and solve practical problems. To the teaching design, we should find the right starting point and introduce ideological and political elements imperceptibly, which will help students form a spirit of perseverance in scientific research and enhance their enthusiasm to participate in the can; In terms of teaching content, we should fully tap the materials that are consistent with Marx's philosophy, scientific thinking and other thoughts, and integrate them into the teaching process. In terms of teaching methods, through the introduction of ideological and political elements involved in different contents, students can practice the scientific thinking of "practice and understanding" in specific practice; Through heuristic teaching, different forms of teaching activities are carried out in teaching, such as preview before class, cooperative learning in class, summary, discussion and reflection after class, so as to fully mobilize students' enthusiasm for learning, stimulate their interest in learning, and cultivate their ability to learn independently, think independently and solve practical problems [10].

2.2 Questionnaire Design of Biostatistics Course for Students

Here, questionnaire survey is devised to inspect the association between teaching Biostatistics course and ideological and political education in educational institutions and study college students' opinions on integrating Biostatistics course into ideological and political education. This survey is separated into three fragments, including college students' perceptions and understanding of Biostatistics course, the present circumstances of college students' Biostatistics education, and the development of ideological and political education in college students' Biostatistics education. The structure is shown in Fig. 1.

This questionnaire consists objective questions and accompanied by subjective questions. The respondents of this analysis are college students of educational institutions who study Biostatistics course. The insides of this study emphasis on college students' opinions, recommendations, and acknowledgement of ideological and political education. The subjects are college students. This work adopts blend of stratified sampling and random sampling for observing the number of participants, as well as qualitative and quantitative analysis to arrange time scientifically and reasonably. The questions utilized in the analysis are shown in Table 1.
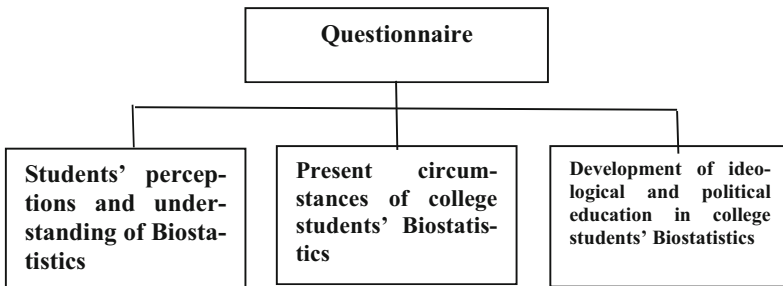

Fig. 1. Three aspects of proposed method

Table 1. The question settings and options for the questionnaire survey

Questions	Options
Are you interested in learning Biostatistics course?	A. Very Interested B. Interested C. Neutral D. Not Interested
Do you think it is essential to set up systematic Biostatistics course education in a college?	A. Absolutely Necessary B. Necessary C. Indifferent D. Not Necessary
Do you think ideological and political teaching of the curriculum for Biostatistics course is necessary?	A. Absolutely Necessary B. Necessary C. Indifferent D. Not Necessary
Do you think the integration of Biostatistics education with ideology and politics is effective in improving your ability?	A. Very Effective B. Effective C. Indifferent D. Not Effective

The structural validity of the test is done by using the correlation analysis. The validity of the test is assessed by the correlation between several factors in the scale and the relation between the each and every factor and total score of the scale.

3 Discussion on Biostatistics Course Teaching Content and Design with Ideology and Politics Using Marxist Basic Principles

This section presents the detailed analysis of Ideological and Political teaching Design, methods and Content for the Biostatistics course using Marxist principles.

3.1 Course Ideological and Political Teaching Design and Content

In the process of teaching interaction, in view of the current college students' lack of social responsibility, patriotism, political sensitivity, as well as the lack of goals, self-discipline, poor teamwork, and other problems, the curriculum teachers need to consciously combine the teaching content to carry out the ideological and political teaching of the curriculum, and imperceptibly improve the ideological and moral level of students.

In terms of teaching content, the theories and laws of many courses are also applicable to the rules of human society's operation. The explanation can be naturally introduced based on professional knowledge to guide students to think deeply and naturally integrate the concepts of patriotism, dedication, equality, fraternity, and correct outlook on life.

The ideological and political teaching of this course is designed along three main lines: first, the theoretical teaching realizes the knowledge goal and integrates the moral education viewpoints related to teaching knowledge points; The second is to achieve the goal of ability through practical teaching, and improve teaching skills and scientific analysis ability by combining students' lectures; and third to achieve the quality goal through the teaching process. In the teaching process, the teacher uses a rigorous working attitude to imperceptibly cultivate students to be serious and responsible, closely follow

the biology curriculum standards of middle schools, and love the students' character in the process of education.

Example of ideological and political education in this course is as following:

Chapter II Collection and Arrangement of Data and Calculation of Data Characteristic Number.

First, show the known data to the students, and let them find the characteristics of the data. After the students' analysis and discussion, the teacher told us that we should first learn "data sorting and characteristic number calculation", and then analyze this group of data.

In this case, one of the contents of the frequency distribution table is the relationship between the sample size and the number of groups. For example, 30–60 samples are divided into 5–8 groups. The teacher told the students that there was no rule dictating how many groups should exist in the world. Students can set a convenient number of groups according to their own data samples. For example, 30 samples can be divided into 5 or 6 groups. As long as it is convenient for them to process the data, they can meet the requirements. This is called "specific analysis of specific problems." Introduce the ideological and political content of scientific thinking as "specific analysis of specific problems", so that students can fully realize that "specific analysis of specific problems" is required for everything they do.

Through the explanation of this case, the students realized that the processing of scientific data requires thinking were introduced the ideological and political content of scientific thinking through "specific analysis of specific problems," and fully realized that: specific questions and specific analysis are necessary scientific thinking methods.

Chapter IV Statistical Inference.

Statistical inference includes hypothesis testing and parameter estimation. Hypothesis testing completes the inference in a certain probability sense by putting forward hypotheses, determining significance level, calculating statistics, making inference, and other steps. Here, we first propose two contradictory hypotheses: H0 and HA. Biostatistics has been conducting hypothesis testing. The default test assumption is the null hypothesis. First, assume that the test processing results in a value difference of zero (even if the difference is not zero, it is assumed that the difference is zero, and the difference between the two values comes from the sampling error). When we test that the probability of the zero hypothesis is less than 0.05, we reject the zero hypothesis and admit the alternative hypothesis. The hidden principle of small probability (when an event's probability is very small, we believe it is impossible to occur in the sampling). This method belongs to the Marxist principle of "the relationship between the main aspects and the secondary aspects of contradictions." We focus on the main aspects of contradictions. The dominant aspect in a contradiction is the main aspect of the contradiction; The side that is in the dominant position but plays a subordinate role is the secondary aspect of the contradiction.

The relationship between the main and secondary aspects of the contradiction: mutual exclusion, interdependence, and mutual transformation under certain conditions. The methodology it teaches us is to adhere to the unity of the two-point theory and the key-point theory. When analyzing problems, we should focus on the main aspects of the contradiction, distinguish between the mainstream and the tributary, and adhere to the

specific analysis of specific problems., Cultivate students to practice the theory of "the relationship between the main aspects and the secondary aspects of contradictions."

By learning the principle and method of hypothesis testing, I can operate the steps of hypothesis testing, use software to test the hypothesis of sample average, know the hypothesis of sample frequency, and know the interval estimation of parameters [10]. After teaching the core professional ideas of this chapter, teachers can follow the trend: first we should put forward two contradictory hypotheses: H0 and HA. Biostatistics has been conducting hypothesis testing. The default test assumption is the null hypothesis. First, assume that the test processing results in a value difference of zero (even if the difference is not zero, it is assumed that the difference is zero, and the difference between the two values comes from the sampling error). When we test that the probability of the zero hypothesis is less than 0.05, we reject the zero hypothesis and admit the alternative hypothesis. The hidden principle of small probability (when an event's probability is very small, we believe it is impossible to occur in the sampling). This method belongs to the Marxist principle of "the relationship between the main aspects and the secondary aspects of contradictions." We focus on the main aspects of contradictions. The dominant aspect in a contradiction is the main aspect of the contradiction; The side that is in the dominant position but plays a subordinate role is the secondary aspect of the contradiction.

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At the same time, the teacher took advantage of the situation to introduce Chairman Mao Zedong's famous work "On Contradiction" and told the students that our Chairman Mao Zedong wrote a book in 1937. Combine Marxist philosophy with the practical experience of the Chinese revolution and the outstanding achievements of Chinese traditional philosophy. This work is also a bright pearl among the world's philosophical works. It can be seen that our country also has great philosophers and an excellent national culture. This also teaches students to build up the cultural self-confidence of our country.

3.2 Teaching Methods and Means

Curriculum Ideological and Political Plus Offline Classroom Teaching
In the process of explaining knowledge points, we should pay attention to the causal relationship between various parts and pay attention to the logic of the content. This is also to cultivate students' scientific thinking. After the teacher leads the students to learn the steps of hypothesis testing in the classroom, at the same time, the online and offline classrooms should ask questions and spot check the students' answers to test whether the students' knowledge of scientific ideas about hypothesis testing meets the requirements.

Curriculum Ideological and Political Plus SPOC Plus Flipped Classroom Teaching
Teachers advance the teaching content on the SPOC platform based on the teaching

progress. It should include both professional knowledge and ideological and political education content. This is the first step in introducing learning tasks for teachers.

The second step is to ask students to teach themselves online, organize groups, develop group projects, and discuss independently. At the same time, students are required to prepare corresponding content for offline flipped classroom teaching.

The third step is the interaction between teachers and students in the classroom. The teacher will preside over the classroom, first explain the knowledge context of this lesson, and then run through the knowledge points; The student lecturer will then prepare a group report; the content will be supplemented with group members; questions from other research team members will be answered; and finally, the teacher will comment and summarize, emphasizing the key and difficult knowledge. Finally, the students participate in scoring to enhance their sense of responsibility.

This teaching mode turns the main body of the curriculum into students, and the task of teachers is to organize teaching resources, rather than simply teach knowledge. At the same time, it has cultivated the team consciousness and cooperation spirit; the ability to find, analyze and solve problems; Improve the ability of language expression; and students' ability to learn independently and deeply. In terms of course teaching process, the course is designed according to students' independent learning and discussion, teachers' random questions and key explanations, and classroom online testing. In terms of teaching space, the classroom and network are integrated in an all-round way and switched at any time according to teaching needs; In terms of teaching methods, multiple tools, such as traditional teaching materials, multimedia, mobile social software, and online examination software are comprehensively used for three-dimensional teaching. After class, difficulties, hot spots, online discussion, and online independent learning are supplemented. In the process of learning and discussion, the students' team cooperation ability, oral expression ability, and thinking ability were trained.

4 Experimental Evaluation

This section presents a detailed experimentation on statistical analysis of questionnaire survey for finding the relationship between the college students' biostatistics education and ideological and political education. This paper summarizes the spiritual characteristics, prevailing issues and associated influencing factors of institution innovation and ability in Biostatistics, and build the ideological and political education model grounded on educational psychology, with the intention of pointing out the route for cultivating university innovation and student ability.

In respect of this work, the following research question is framed.

Research Question: Do the integration of ideological and political education with Biostatistics course using Marxist principles improves the learners' comprehensive quality not only in knowledge education but also in ideological education?

By using this question, Null and Alternative Hypotheses are framed.

Null Hypothesis (H_0): Ideological and political education has no effect on enhancing students' quality using Marxist principles.

Alternative Hypothesis (H_1): Ideological and political education has effect on enhancing students' quality using Marxist principles.

100 learners were arbitrarily divided into the control group and experimental group, with 50 students in each group. The control group received traditional education, whereas the experimental group received ideological and political education based on Marxist principles for one month. Students' ideological and moral levels are measured in conjunction with their ability on the Biostatistics scale. The scale has 9 items and uses a 5-level scoring system. The higher the score, the higher the students' ideological and moral level. Excel software is used for statistical processing. t-test is utilized to compare the mean between two groups. The formula for calculating t-value and degrees of freedom for a paired t-test is:

$$T = \frac{\mu_1 - \mu_2}{\frac{s(d)}{\sqrt{n}}} \qquad (1)$$

where:

μ_1 and μ_2 are the mean values of each of the sample sets

s(d) is the standard deviation of the differences of the paired data values

n is the sample size (the number of paired differences)

$n - 1$ is the degrees of freedom

Here, we consider that if a p-value testified from a t-test is less than 0.05, then that outcome is considered to be statistically significant [11]. Table 2 shows the illustrates the comparison of the scores of students' ideological and moral levels between the two groups of students. In general, compared with the conventional teaching model, after the employment of the ideological and political education involvement grounded on Biostatistics for one month, the total score of learners' ability and the scores of all magnitudes are enhanced, which demonstrates that the ideological and political education model based on Marxist principles for Biostatistics course can effectively improve students' ability.

Table 2. Comparison of scores of abilities in Biostatistics course between the two groups of college students (n = 100)

Attributes	Control Group (n = 50)	Experimental Group (n = 50)	p
Social responsibility	2.15	4.63	<0.05
Patriotism	2.17	4.59	<0.05
Political sensitivity	2.44	4.39	<0.05
Goal setting ability	2.26	4.15	<0.05
Self-discipline	2.18	4.17	<0.05
Teamwork ability	2.63	4.44	<0.05
Equality	2.56	4.26	<0.05
Dedication	2.39	4.18	<0.05
Correct outlook on life	2.63	4.78	<0.05
Total Score	21.41	39.59	<0.05

In the process of accomplishing the better education and teaching outcomes, it is important work by endorsing college students' quality of knowledge in Biostatistics and effectiveness. Through the Marxist principles for education, students' multifaceted talents can be enhanced which will drive the activities of the whole society and development of national economy. The quality of the modern students can be significantly improved with the fusion of ideological and political education model with the Biostatistics course.

5   Conclusions

Through the explanation of the principle of small probability, this case introduces ideological and political content such as "the relationship between the main and secondary aspects of contradictions", so that students can fully learn Marxist Mao Zedong Thought, guide students to analyze problems and data processing problems, conduct specific analysis of problems, and cultivate students to learn the essence of Marxist ideology of "the relationship between the main and secondary aspects of contradictions". At the same time, it also teaches students to establish cultural self-confidence.

This course is appropriately integrated with the ideological and political cases of the course in teaching, which enriches the classroom teaching content and achieves good teaching results. Students generally reflect that they have mastered the ability to solve practical problems through the study of Biostatistics, and their learning results have been significantly improved. They agree with the teachers' ideological and political attempts in the course of Biostatistics teaching. Statistical analysis shows that integration of ideology and politics in Biostatistics course teaching significantly improve the classroom teaching content and achieves good teaching results. Cases will be offered as learning components in the future in a computer-assisted format, allowing learners to review and practice problem-solving skills in self-faceted environments, as well as explore independently.

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