Exploration of integrated teaching model for undergraduate and graduate students -- taking the course of questionnaire survey design and data analysis methods as an example

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Abstract. Colleges and universities undertake the task of cultivating talents. The integrated training mode of undergraduate and graduate students adapts to the development trend of the times. Relying on the curriculum reform project of the integration of undergraduate and graduate students at Beijing Jiaotong University in China, and taking the course of questionnaire design and data analysis method as an example, this study puts forward the necessity of integrated teaching of undergraduate and graduate students, and the construction ideas and teaching reform measures of the integrated teaching of undergraduates and postgraduates. The integrated teaching and training mode of undergraduate and graduate students not only helps to arouse students’ enthusiasm and initiative in learning, but also helps to cultivate students’ critical thinking ability, innovative practice ability and teamwork ability.

1. Introduction

As the main battlefield for talent cultivation, the cultivation of graduate and undergraduate students in universities will directly affect the future construction of a country\(^1\). Colleges and universities undertake the task of cultivating highly competitive talents. In order to better integrate the knowledge learning emphasized by undergraduate education with the ability training emphasized by graduate education, it is imperative to establish an integrated education system\(^2\).

In order to optimize the integrated training system for undergraduate and graduate students, and comprehensively improve the quality of talent cultivation, Beijing Jiaotong University launched the construction of integrated courses (cross-level courses) for the undergraduate and graduate study in 2021, and established the construction project of “interdisciplinary advanced course group for undergraduate and graduate studies”. This format of course organizes undergraduate and graduate students to study together in the same classroom, and the courses are offered to students from different disciplines.

Questionnaire is one of the most commonly used research methods in investigation and research, and it is widely used in data collection in modern research. A questionnaire is a tool which can be used in any type of research\(^3\). How to design the questionnaire and how to make a statistical analysis of the data collected by the questionnaire survey is what students need to know in the practice of the questionnaire survey.

2. The necessity of the course construction of questionnaire design and data analysis methods

This course intends to introduce how to design questionnaires, how to obtain data through questionnaires, and how to conduct scientific analysis of data to obtain new knowledge. From the perspective of theoretical knowledge and practical experience, this course helps students understand and master questionnaire survey design and basic analysis methods, laying a foundation for research on related economic issues and social phenomena. The teaching objectives of this course include the following aspects. The course enables students to become familiar with the main areas and precautions of questionnaire surveys, the main ideas of variable design in questionnaire surveys, master the simple random sampling method, master the basic skills of designing general questionnaires, and master the research methods of obtaining data through questionnaire surveys. This course also aims to cultivate students’ independent and innovative thinking abilities. Carrying out questionnaire survey design through groups can help train students’ communication...
skills and teamwork spirit, and cultivate students’ practical ability in questionnaire survey. During the teaching process, the course also focus on cultivating students’ humanistic spirit and correct ideological orientation, improving their sense of responsibility and social responsibility, and guiding students to establish correct stances and values.

2.1. Cultivating students’ logical thinking ability in quantitative research

Whether they are students of humanities and social sciences or students of science and engineering, they are often accustomed to using qualitative methods to think about problems. In fact, qualitative analysis and quantitative research are two complementary methods, and the starting point of quantitative research is usually in-depth interview and qualitative research. Quantitative research can often get more profound research conclusions when data are available. This course is mainly about how to obtain data through questionnaire survey and then conduct scientific analysis of the data. The basic logic is (questionnaire investigation-data acquisition-scientific analysis). The process of questionnaire survey and data analysis is the process of cultivating students’ logical thinking ability.

The quality of questionnaire survey design largely depends on the depth of understanding of the problem. The deeper the understanding of the problem, the more in-depth the early in-depth interviews and pre-surveys, the more exciting the later questionnaire design will be. At the same time, this process can cultivate students’ quantitative logical thinking ability.

2.2. Serving the needs of students’ graduation thesis and curriculum practice

Compared with social survey methods such as interview survey, observation survey and so on, questionnaire survey is a method often used by college students in curriculum practice. Graduate students and undergraduates often need to use questionnaires to obtain data when carrying out graduation thesis or graduation design. Graduate students often need to collect data through designing survey questionnaires when conducting scientific research, as well as undergraduate students in research activities such as the Research Mentor Program and the College Student Innovation and Entrepreneurship Program. The quality of the questionnaire will directly affect the authenticity and applicability of the survey data, affect the recovery rate of the questionnaire, and then affect the follow-up data analysis and research. This course can systematically explain the elements of the questionnaire, the design of the questionnaire structure, the design of the auxiliary content of the questionnaire, the implementation of the questionnaire survey, the management of the questionnaire survey, the analysis of the data obtained by the questionnaire and so on, helping students effectively design the questionnaire and carry out research.

2.3. The necessary method for in-depth understanding of the grass-roots

When the size of the study object is small, interviews and other methods can be used to obtain the necessary grass-roots information. If the size of the study population is not very large, the information obtained by direct observation is relatively accurate. However, if the study population is very large, the efficiency of obtaining information through direct observation method will be reduced. At this time, the questionnaire method can solve the problem of collecting information.

2.4. An important tool for analyzing causality in economics in the big data era

In the era of big data, the social phenomenon can be better explained by the combination of big data analysis and random sampling survey. Questionnaire analysis tools adapt to the new requirements of the era of big data.

3. The necessity of the integrated teaching system for undergraduate and graduate students

The course of questionnaire survey design and data analysis methods, as a general education course in Beijing Jiaotong University, is of great help to undergraduate and graduate students in their learning. However, there are currently shortcomings in the teaching of the course.

3.1. There is insufficient connection between undergraduate and postgraduate teaching content

The existing curriculum design neglects the connection between undergraduate and graduate education. Currently, undergraduate and graduate education are seen as isolated stages4. During undergraduate studies, emphasis is placed on textbooks and theory, while during graduate studies, emphasis is placed on specialization and practice. But theory and practice are equally important and should run through both undergraduate and graduate stages. For the course of questionnaire design and data analysis methods, undergraduate students may focus more on how to design questionnaires and how to conduct data analysis. Since there are few cases where undergraduate students start to conduct scientific research at the undergraduate level, it is difficult to truly apply the knowledge they have learned to scientific research. The graduate level focuses on scientific research. Graduate students can help undergraduates further understand the theoretical knowledge they have learned from a practical perspective. There is therefore a need to link teaching at undergraduate and postgraduate levels.
3.2. The teaching contents at undergraduate and postgraduate levels are repeated

There is much repetition in the content of undergraduate and postgraduate courses. The teaching at both undergraduate and postgraduate levels shows a lot of repetition, leading to students re-learning content from their undergraduate studies during their postgraduate studies, wasting a lot of learning times. Especially for general education courses like questionnaire design, there is no need to repeat learning. The course of questionnaire design and data analysis methods is also a method course. No matter what stage of study, the course will almost never change. If a student takes the course as an undergraduate and takes it again as a graduate student, it results in duplication of study.

3.3. The course on questionnaire design and data analysis methods is a general education course

The course on questionnaire design and data analysis methods is a general education course. General education is a type of education, which is different from professional education. The goal of the general education is to provide educated people with knowledge and values that are common among different groups of people in a modern pluralistic society. General education is an important way to prevent students from choosing subjects. General education provides a breadth of basic knowledge. This broad knowledge education can help learners understand themselves and society, understand civilization and culture, understand science and technology, understand the past and the future, thereby gradually establishing a complete knowledge system framework. The general course of questionnaire survey design and data analysis methods belongs to a method course, which is suitable for any discipline that requires the use of questionnaire methods to obtain data. The characteristics of this course determine that it is suitable for the construction of integrated courses for undergraduate and graduate students at different levels. This can not only optimize the knowledge structure of undergraduates, but also play the role model of postgraduates.

3.4. The integrated training mode of undergraduate and graduate students is the basic direction of the new round of education reform.

This teaching model aims to break the boundaries of separate management of undergraduates and postgraduates in the past, focusing on the student as the main body. Starting from the basic point of cultivating high-level research talents, it comprehensively considers the basic laws of student learning, organizes teaching and management of undergraduate and postgraduate education as a coherent whole, creates a more favorable environment for student development.

4. Ideas for integrated undergraduate and postgraduate course construction

4.1. Improve the concept of education

The course of questionnaire design and data analysis methods will be student-centered and adopt the educational philosophy of OBE. The OBE (Outcome based education, OBE) education concept is an educational philosophy of OBE. The OBE (Outcome based education, OBE) education concept is a curriculum system construction concept that is goal-oriented, student-oriented, and adopts reverse thinking. It is an advanced education concept. This course will use the OBE education concept to provide new ideas for the teaching reform and construction of undergraduate and postgraduate interdisciplinary courses.

4.2. Integrate ideological and political cases into the course teaching process

The course objectives, teaching tasks, course content and teaching process are closely combined with the fundamental task of cultivating morality and cultivating people, and the teaching content is combined to improve the teaching methods of ideological and political teaching, and the ideological and political cases are embedded in the course teaching process. This course is conducive to strengthening patriotic education, guiding students to pay attention to the “real questions” with theoretical value and important practical significance when conducting questionnaire survey, and carrying out practical investigation based on the basic knowledge theory learned in the course. This course is conducive to the cultivation of noble ideals and beliefs and sense of responsibility. Through the analysis of typical cases, it is helpful to cultivate students’ patriotism and international vision.

4.3. Integration of theoretical course system

The design of the course system is the foundation of talent cultivation. The course on questionnaire design and data analysis methods should first design a curriculum system suitable for both undergraduates and postgraduates. The basic logic of the course is questionnaire survey - data acquisition - scientific analysis. In practice, the course should be divided into several modules (see Table 1). The first module is the explanation of basic theory, while the second module is the explanation of data analysis methods, and both of them are theoretical modules. The third module is practical activities. Module one includes an overview of questionnaire surveys, how to design questionnaires, approaches to questionnaire surveys, steps in questionnaire surveys, how to sample, and organizing survey questionnaires. In the overview of questionnaire surveys, students are introduced to common mistakes in questionnaire surveys, the relationship between questionnaire surveys and in-depth interviews, academic ethical issues in questionnaire surveys, and reliability and validity. In the part about how to design questionnaires, students are introduced to the principles
and structure of questionnaire design. In the approaches to questionnaire surveys, the advantages, disadvantages and applicable situations of concentrated surveys, such as face-to-face interviews, telephone interviews, and online surveys, are introduced. In the steps of questionnaire surveys, the importance of pre-surveys, how to conduct pre-surveys, and handling various trivial matters before the survey are introduced. In the part on how to sample, students are introduced to the importance of sampling and several forms of sampling. In the organization of survey questionnaires, the necessity of timely questionnaire organization and points to note during questionnaire entry are introduced. Module two, the data analysis part, mainly includes basic data analysis and statistical analysis methods for different types of questions. In this module, students will learn about basic regression.

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4.4. Conduct systematic practical teaching

The third module of this course is the practical topic part. The course will conduct practical questionnaire surveys in the form of groups. The course plans to divide students into groups to design and analyze questionnaire surveys. Students are required to complete the entire process of a questionnaire survey through teamwork and analyze the data collected through the questionnaire survey, ultimately submit a completed research report.

In practice, this course suggests that undergraduates and postgraduates form a group together, which not only optimizes the knowledge structure of undergraduates but also demonstrates the exemplary role of postgraduates, fully utilizing the advantages of integrated training for undergraduates and postgraduates. The course also suggests that students from different disciplines form a group, which can utilize interdisciplinary advantages and improve students’ self-efficacy. Five people form a group, choose a survey form, determine the research topic of the group, conduct a questionnaire survey, and then analyze the data. Each group needs to present the research results in the classroom.

4.5. Adopt diverse teaching methods

This course will use diverse teaching methods such as lecturing, classroom discussion, case teaching, and practical teaching. The main teaching of the course will be student-centered, guided and led by teachers, using heuristic teaching to stimulate students’ interest in active learning, and cultivate students’ abilities to think independently, analyze and solve problems. Classroom discussion is aimed at students’ learning and mastery of the course, and two collective discussions will be arranged to purposefully solve students’ doubts. Case teaching will be based on textbooks and combined with typical research cases, so that students can master the specific process and main content of questionnaire surveys. Through the implementation of case teaching, students’ strong critical thinking skills can be cultivated. The purpose of practical teaching is to bring out students’ enthusiasm. By conducting questionnaire survey design in groups, students can exercise their communication skills and teamwork spirit, and cultivate their practical ability in questionnaire survey.

5. Conclusion

Questionnaires are a tool that can be used in any type of research. The course on questionnaire design and data analysis methods is a general education course offered to the entire university. Through the teaching reform, practice, and exploration of this course, the implementation of an integrated teaching model for undergraduates and postgraduates will enhance students’ classroom participation, critical thinking skills, practical abilities, and teamwork skills.

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References
