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Ideological and Political Case Teaching of Mathematical Modeling Courses

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Abstract

This paper takes the investment problem of the linear programming model as an example. Firstly, establish the mathematical model by introduction of the current investment background. Then, seek the numerical solution by modern science and technology to develop students' scientific awareness. And finally, build linear programming model to develop students' scientific awareness. In teaching of the practical course of the linear programming model, ideological and political elements are infiltrated from multiple angles and aspects. It is intended to enable students to master professional knowledge, guide the value concept of scientific and rational investment of college students, and stimulate students' rational thinking and the spirit of scientific research with the courage to explore.

Keywords

Mathematical Modeling; Curriculum Ideological and Political education; Linear Programming.

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1. Introduction

Mathematics as a science that studies the quantitative relationship and spatial form of the real world has always been closely related to the actual needs of people's life. As a bridge and road connecting the application fields of mathematics, mathematical modeling occupies a special and important position in mathematics. Mathematical modeling course is usually problem-driven and in-depth exploration around practical problem throughout the teaching [1].

Mathematical modeling organizes students' learning, discussion and research through the teaching steps of raising questions, establishing models, solving models, analyzing the rationality of models, and solving practical problems, so as to facilitate the change of teaching structure, innovate teaching methods, give full play to students' participation, stimulate Students' innovative ability is suitable for course ideology and political education in moistens everything silently [2]. In The course Ideological and political education is mainly to integrate ideological and political elements into various courses. By mining ideological and political elements contained in various courses, the synergy between various courses and ideological and political theory courses is formed to realize the guidance of ideas and values [3]. The following takes the linear programming model and its application as an example to explore how to practice curriculum ideology and political education in teaching content.

2. To introduce the subject by the current economic investment

Mathematical modeling mainly introduces the theory and ideas of modeling through practical problems in life. A good teaching case is very important to the teaching of mathematical modeling. In recent years, the upsurge of personal investment and financial management has flooded into the campus, and college students are a huge and special social group. Their financial management ideas and behaviors reflect their living conditions and value trends to a certain extent. Therefore, as a contemporary college student, we should fully realize the importance of investment and financial management, have a certain understanding of the investment and financial management market, and master certain investment and financial management skills.

In modern business and financial investment, any rational investor always hopes to maximize returns, but also faces risks caused by uncertainty and uncertainty. Moreover, large returns are always accompanied by high risks. In order to take into account the benefits and risks at the same time, the pursuit of large benefits and small risks constitutes a two-objective decision-making problem, which is transformed into a single-objective optimization problem according to the decision-maker's understanding and preference for benefits and risks. As investors pay more and more attention to returns and risks, how to choose a better investment portfolio is the fundamental guarantee for improving investment efficiency. The traditional investment portfolio follows the principle of "don't put all the eggs in one basket" to diversify the investment so as to achieve the investment goal of low risk and high return. Teachers introduce topics by taking the social hotspots around college students as the breakthrough point, which can not only stimulate students' interest in further learning, but also show that ideological and political elements of mathematical modeling course are mainly derived from reality and have the characteristics of advancing with the times.

3. To develop students' scientific awareness by building LP models

The case in this article comes from the returns and risks of investment in Chapter 1 of "Mathematical Modeling Algorithms and Applications" written by Si Shoukui et al. Among,

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investment income is directly related to the investor's assets M, the average rate r_i of return of the investment project s_i, the risk loss rate q_i, the transaction rate p_i, etc. In a variety of investment products, in order to minimize the risk to investors and maximize the benefits, a reasonable LP model is established on the basis of the given assumptions.

Suppose x_i means the capital of investment project, and the investment amount M is assigned as 1 to facilitate calculation. The overall risk is measured by the largest risk of investment project and expressed, $n+1$ kinds of project investment are independent of each other. In this period of investment, r_i, p_i, q_i are constant values, which are not affected by unexpected factors, the net return and overall risk are only affected by r_i, p_i, q_i, and not affected by other factors.

The multi-objective linear programming model is used to make the net income as large as possible and the overall risk as small as possible, and add relevant constraints to establish the following LP model:

The objective functions are:

$$\begin{cases} \max \sum_{i=0}^{n} (r_i - p_i)x_i, \\ \min \left\{ \max_{1 \le i \le n} \{q_i x_i\} \right\}. \end{cases} \tag{1}$$

The constraint conditions are:

$$\text{s.t.} \begin{cases} \sum_{i=0}^{n} (1+p_i)x_i = M, \\ x_i \ge 0, \quad i = 0, \ 1, \cdots, n. \end{cases} \tag{2}$$

In actual investment, investors bear different degrees of risk. If a risk bound is given and the maximum risk is a, i.e. $\frac{q_i x_i}{M} \le a$ $(i = 1, \cdots, n)$ the corresponding investment scheme can be found. Therefore, the complex multi-objective programming is transformed into the following single-objective linear programming model:

$$\max \sum_{i=0}^{n} (r_i - p_i)x_i \tag{3}$$

$$\text{s.t.} \begin{cases} \frac{q_i x_i}{M} \le a, \ i = 1, \ \cdots, \ n, \\ \sum_{i=0}^{n} (1+p_i)x_i = M, x_i \ge 0, i = 0, \ 1, \cdots, n. \end{cases} \tag{4}$$

In teaching, teachers should advance with the times, and think deeply to change the phenomenon of valuing wisdom and neglecting morality in the course of teaching [4]. On the one hand, teachers should permeate scientific methods, use logical analysis methods to

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simplify practical problems, and combine the factors such as low risk, small investment in the objective function and risk change in the constraint conditions, so as to ensure that the established LP theoretical model has the mathematical expression that can withstand scrutiny. On the other hand, it is necessary to guide students to grasp the essence of problems, simplify complex practical problems, establish mathematical models from simple to complex, and continuously revise them until they can solve the problems, so as to improve students' ability to solve practical problems with mathematics and reflect the practical value of mathematical modeling courses.

4. To enhance students' awareness of reasonable investment by solving LP model

For investment problems, there is no need to obtain analytical solutions, but only numerical calculations with the help of optimization theory. Teachers should guide students to use the internal functions of Matlab mathematical software to independently explore the solution method of linear programming and seek mathematical laws, and learn to use the software to realize relevant numerical calculations independently.[5] This is a process in which students practice, explore, and discover on the basis of existing theories, which will be valuable accumulations on the road to life in the future.

For investment, the greater the risk, the greater the return. When the investment is more dispersed, the risk that the investor takes is smaller. According to the data given in the book, draw a diagram of the relationship between investment risk and return, as shown in Fig 1, it is shown that risk a =0.006 is a turning point. for investors who have no special preference for risk and return, they should choose the investment plan corresponding to the point. In fact, how to make decisions is also related to the risk preference of the decision makers. Some people are risky optimistic decision makers, and some people are conservative pessimistic decision makers. This is an opportunity to introduce the curriculum ideology and political education, and students should learn to invest rationally and scientifically in combination with their own actual situation.

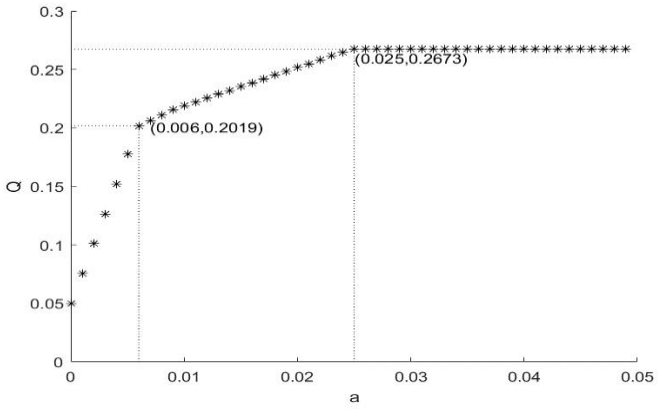

Fig. 1 The relationship between investment risk and return

Simplify the abstract investment problems in life into mathematical models and solve them, and show them to the students in a scientific and reasonable way with pictures and texts. They are aware of the importance of scientific and reasonable financial management, and constantly learn new knowledge, explore economic mysteries, provide scientific guidance for their own financial management, and at the same time make contributions to the country's economic development in the future.

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5. Conclusion

Curriculum ideology and political education is an effective innovation in the field of ideological and political education. In the specific process of curriculum ideological and political construction, it is also more necessary to create innovative thinking, to promote new thinking with new thinking, to seek new development with new thinking, to promote new methods with new development, to solve new problems with new methods, to achieve the innovative development of curriculum ideological and political education. it is necessary to build a full-staff, whole-process education pattern and ideological and political theory to walk in the same direction to form a synergistic effect, and constantly explore the ideological and political elements of the curriculum, including the theoretical knowledge, value concepts and spiritual pursuit of ideological and political education. It is integrated into the teaching of mathematical modeling to realize the multiple unity of knowledge imparting, value shaping and ability training, which will subtly affect students' ideology and behavior. This paper, through a case study, integrates moral education elements from various angles and aspects, and penetrates Ideological and political education into the whole process of linear programming teaching. It cultivates students' innovative ability, improves students' scientific literacy, and guides students' values of scientific and rational investment through examples.

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