

# *The Exploring of Curriculum Ideology and Politics in the Teaching of Operational Research*

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**Abstract:** With the development of social economy, college students are facing all kinds of continuous temptations every day, and their views on world, life and values are severely impacted at anytime and anywhere. It is the foundation of the school to build moral principle and educate people. The school should integrate the ideological and political education into the teaching according to the actual situation to realize the whole process of educating people and all-round educating people. Therefore, this article first introduces several ideological and political breakthrough points of Operational Research course, which provides a reference for how to introduce thought into professional course. Secondly, the author enumerates some implicit ideological and political elements in the Operational Research, which provides reference for concrete teaching implementation. Finally, taking the linear objective programming graphic method as an example, this paper introduces how to naturally integrate the ideological and political education of college students into the knowledge point explanation of Operational Research, which provides a vivid example for the teaching design of professional courses integrating ideological and political education.

## **1. Introduction**

As the society attaches high importance to the education of colleges and universities, more and more educators are thinking about what kind of people should be cultivated in colleges and universities, how to cultivate people and cultivate for whom, how to insist on establishing moral principle and educate people as the central link, and realizing the essential issue of ideological and political work throughout the whole process of education and teaching [1-3]. The longest course type of college students in university is the professional course, which runs through the whole learning process of the university. Therefore, the professional course should give full play to its moral education effect [4-6]. "Operational Research" is a major professional course offered by many colleges and universities. Operational Research is mainly used in the military initially, providing precise scientific basis for strategic deployment. Now it has been more and more used in the civil field, becoming a powerful tool for scientific management of all walks of life. Thus, it is required that the Operational Research teacher should not only teach the curriculum content in classroom like it before, but also excavate the thought elements contained in the curriculum, [7] and combine it with professional knowledge, so that the students' views on world, life and values can be cultivated correctly and the students' national sense of mission is stimulated [8]. Therefore,

according to the characteristics of Operational Research curriculum, this paper analyzes the breakthrough point of the ideological and political elements in the course [9], and enumerates the ideological and political elements contained in the curriculum. And illustrate with example how to introduce ideological and political education into professional education naturally through classroom teaching design [10].

## **2. The Breakthrough Point of Curriculum Ideology and Politics**

By sorting out the teaching contents of Operational Research and the understanding of the “construction course of ideological and political”, the author summarizes the following breakthrough points of integrating ideological and political education into the education of Operational Research.

(I) With the scientific spirit and striving spirit of Operational Research and development, three-views education is conducted for students. In the development of Operational Research, the birth of each branch is promoted by operational researchers, including Westerners and, of course, also Chinese. These scholars' life experience, scientific spirit embodied in them and struggle spirit can be said to be an invaluable spiritual wealth. Teachers can insert stories of masters of operational research in teaching, and implicitly use these masters' spirits to educate students and cultivate students' correct three-views.

(II) Integrate ideological and political factors into the explanation of curriculum content, transfer positive energy to students and actively guide students' growth. Through Operational Research, the aim is to cultivate students' ability to describe the problems of practical system and system optimization by using quantitative methods and systematic viewpoints. In the teaching process, teachers can integrate patriotic thought, responsibility consciousness and cultural self-confidence into classroom elements such as teaching goal, teaching content, teaching link, teacher's personal charm and so on.

(III) Cultivate students' ability to solve practical problems through practice and enhance students' sense of professional mission. In addition to teaching students' knowledge in books, it is more important for teachers to teach students how to apply knowledge in practice. For example, teachers can arrange extracurricular assignments for students in conjunction with a micro-lesson platform. Find out some mathematical modeling contest questions and send them to students through videos of micro-lessons, so that students can be divided into several groups to solve them together, so as to realize the importance of solidarity and cooperation.

(IV) Teachers should always pay attention to the integration of operational research and cutting-edge science and technology, and cultivate the sense of mission in the times. Since the emergence of the term operational research in World War II, whether military or civil, OR has always played a vital role in the historical stage of social development. Teachers should not only let students understand the development history of OR, but also let them understand the relationship between them and the current development of science and technology.

## **3. The Implicit Ideological and Political Elements in the Course of Operational Research**

The chapters of Operational Research are self-systematized, corresponding to different optimization ideas, which contain different ideological and political elements. The following is a brief list of above contents.

(1) The first chapter, Introduction of Operational Research, introduces development history and the life experience of the masters of operation research, cultivates the scientific spirit, striving spirit and craftsman's spirit. In the course introduction, you can combine the teacher's own experience of studying this course, to tell students how to learn, what problems you have encountered in your

study, how to solve and so on. In explaining operational research outlook, you can find some related science and technology introduction to students, encourage students to develop and improve themselves, have innovative spirit.

(2) One of the steps of the graphical method of linear programming model is to determine the objective function contour, which is a straight line where the objective functions are equal. It unifies some irregular points to the common feature of objective function equality. Here we can guide the students to realize that they should see the essence through phenomena and be good at grasping the commonality of things. Guide students to encounter problems in daily life without blindly solving problems, but to see its root through the appearance of the problem and simplify the complex problem. In addition, the last step of the graphical method is to move the contour line along the optimal direction of the objective function until it is tangent to a vertex of the feasible domain. Here, we can guide the students to often set some small goals frequently for themselves, such as finishing reading a book for several days, remembering a few English words every day, etc., making them smaller. Every day, you will find yourself getting better and better.

(3) The fundamental properties of the dual problem are complementary relaxations: "if  $X$  and  $Y$  are the feasible solutions of the original problem and its dual problem, then  $Y_s X = 0$  and  $X_s Y = 0$  are true if and only if  $X$  and  $Y$  are the optimal solutions". In explaining this property, it can be combined with the law of the unity of opposites. The primal problem and the duality problem of linear programming are two opposite expressions of the unity problem from different positions. When  $X$  is the optimal solution of the original problem, the optimal solution of the dual problem can be derived by complementary relaxation. That is to say, if the optimal solution of the original problem exists, then the optimal solution of the dual problem also exists, and can be found from the original problem, and vice versa. Although the original problem and the dual problem are opposite, they are complementary. Everything in the material world is through the mutual restriction between the opposite things. Interacting and evolving.

(4) There is a maximized integer linear programming model, and the widely used solution is branch-bound method. Branch-and-bound method essentially divides feasible regions of the model by adding integer constraints to the linear programming model with de-integral constraints, gradually reduces the upper bound of integer model, increases the lower bound of integer model, and finally obtains the optimal solution of the model and the optimal objective function value. Here, it can guide students to understand the dialectical materialist view of universal connection between things. Everything in the world is a whole composed of various interrelated parts, which are not isolated from each other, but are universally and objectively interrelated. We should learn to look at the problem from the perspective of connection, and be good at discovering the difference between things. You can better use their connections to solve problems.

(5) All constraint conditions of linear programming must be met without deviation, which may lead to empty feasible domain of the model and no solution can be found. However, the objective constraints in the objective constraint model are also called soft constraint. That is, the solution of the model is allowed to have positive or negative deviations. Therefore, the solution obtained by the model is satisfactory, thus avoiding the situation of not getting a solution. Here, the students can be guided to understand the values of harmony. Students should be taught to seek common interests while accepting differences. We should be good at mediating various conflicts and getting along with people harmoniously, at the same time, we should not blindly accommodate, but also have our own independent opinions. When their views conflict with others, to learn to communicate, to respect the opinions of others.

(6) Dynamic planning is an optimization method for solving multi-stage decision-making problems. When explaining the method to deal with the problem by stages, it can guide students to learn how to deal with problems flexibly. When do not know how to deal with a problem, we can

consider dividing the big problem into several small problems to solve one by one. In addition, we can teach students what is the spirit of group collaboration. In today's era, no matter at present student stage or later work, a person who lacks the spirit of collaboration cannot develop greatly.

(7) The composition of queuing system consists of a queuing rule, when explaining here, can guide students to pay attention to the rules. In addition, students must have consciousness of rights, know to defend their rights. When encountering unreasonable queues for no reason in life, it should be resisted, rather than simply succumbing, so the society can have order and harmonious development. However, in special situations, students should be know how to be comity, such as giving way to ambulances, fire trucks and other rescue vehicles on the highways, to guide students to establish the right three-views, be a caring college student.

#### 4. Example of Teaching

The following is how to naturally insert curriculum ideology and politics into the classroom teaching by taking the GP graphical method of Operation Research as an example.

##### 4.1. Introduction of GP Graphic Method

Before explaining how to introduce the curriculum ideology and politics, the specific steps of the GP graphical method are introduced with examples:

Example:

$$\text{min}Z = P_1d_1^+ + P_2(d_2^+ + d_2^-) + P_3d_3^- \quad (1)$$

$$\begin{cases} 2x_1 + x_2 \leq 11 \\ x_1 - x_2 + d_1^- - d_1^+ = 0 \\ x_1 + 2x_2 + d_2^- - d_2^+ = 10 \\ 8x_1 + 10x_2 + d_3^- - d_3^+ = 56 \\ x_1 \geq 0, x_2 \geq 0, d_i^- \geq 0, d_i^+ \geq 0, i=1,2,3. \end{cases} \quad (2)$$

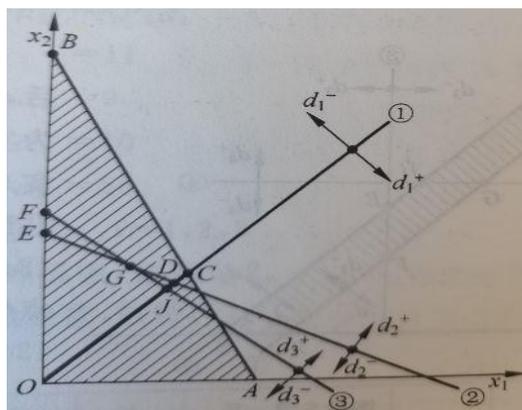


Figure 1: Constrained Set of Model

(1) Draw the coordinate system with abscissa axis of  $x_1$  and ordinate axis of  $x_2$ . In this coordinate system, the absolute constraints  $2x_1 + x_2 \leq 11$  are drawn with respect to the conditions of  $x_1 \geq 0, x_2 \geq 0$ . At this time, the feasible field is the triangle OAB shown in Figure 1.

(2) Make each  $d_i^+, d_i^-$  value as 0, and draw all objective constraint line. While lining out the

variation of each  $d_i^+, d_i^-$ , the direction in which the objective constraint line can move in parallel. Take drawing objective constraint  $x_1 - x_2 + d_1^- - d_1^+ = 0$  as an example. So when we draw the objective constraint, we first draw the line  $x_1 - x_2 = 0$ , which in two dimensions is a line with slope 1 going through the origin. Then, the direction of change in  $d_1^-, d_1^+$  marked on the line.  $d_1^-$  is the part where the actual decision value is less than the target value 0, and  $d_1^+$  is the part where the actual decision value is more than the target value 0. The upper left half plane of the line  $x_1 - x_2 = 0$ ,  $x_1 - x_2$  is all less than 0, so the side of the arrow pointing to the upper left plane should be marked with  $d_1^-$ , and the side pointing to the upper right plane should be marked with  $d_1^+$ , as shown in Figure 1. Finally, draw the remaining target constraints in sequence.

(3) The satisfactory solution of the model is solved according to the objective function. According to the order of priority, the satisfactory solution region satisfying the level  $P_1$  target (at this time, other levels are not considered). The  $P_1$  level target is to keep  $d_1^+$  as small as possible, and  $d_1^+$  is 0 on the line  $x_1 - x_2 = 0$  and in the upper left plane, so  $d_1^+$  is the minimum at this time. However, after satisfying the absolute constraint, the feasible domain is in the region of triangle OAB, so  $x_1, x_2$  satisfying the  $P_1$  level target can only be evaluated in the region where triangle OAB intersects the line  $x_1 - x_2 = 0$  and its upper left plane. That is, the boundary of the triangle OBC and its inner region shown in the figure above. Then determine the satisfactory solution regions of the other target levels in turn. It should be noted that the target of the latter level should not be destroyed when determining the target of the former level. Finally, the satisfactory solution of the model is line segment GD as shown in Figure 1.

#### 4.2. Mathematical Thoughts Contained in GP Graphical Method

(1) Thought of the Symbolic-graphic Combination. Although GP graphical method can only deal with two variables GP models, it is convenient for scholars to understand the essence of the model and to solve practical problems better.

(2) Classified Discussion Thoughts. Constraints in GP models are often contradictory, and the solutions will have certain deviations, either positive or negative. It should be determined according to the actual situation, so when drawing the objective constraint in graphical method, the direction of change of positive and negative deviation variables should be marked on the line respectively, which can make the objective constraint line have a law.

#### 4.3. Ideological and Political Elements of GP Graphical Method

On the basis of the knowledge points of GP graphical method and the mathematical thought implied in it, the ideological and political elements contained in it can be found out as follows:

(1) Nothing can be accomplished without norms or standards. When drawing constraints, GP graphic method requires that absolute constraints should be given priority to draw an absolute constraint. When we determine the model satisfactory solution according to the priority of each deviation variable in objective function, it must be found in the feasible domain of satisfying the absolute constraint.

(2) Every little makes a mickle. In GP graphical method, the final satisfactory solution should be determined step by step according to the priority level of each positive and negative deviation variable in the objective function. Here, the positive energy of "every little makes a mickle" is conveyed. All kinds of difficulties will be encountered in the process of doing anything, as if when

finding the GP solution, the positive deviation variable should be as small as possible, and sometimes the negative deviation variable should be as small as possible. However, as long as step by step, solidly to do it, eventually, you will eventually find a satisfactory solution.

(3) A man can take temporary setbacks. In GP graphical method, it is required that after drawing objective constraint line, the direction of positive and negative deviation variables should be marked on the line, indicating that the straight line can move parallel along this direction. In practice, it is explained that the actual decision value can deviate from the planned target value, thus avoiding the situation of no feasible solution. In society, it is also the same with people, sometimes it requires to seek common interests while accepting differences; we should be good at mediating various contradictions and getting along with people harmoniously student.

## 5. Conclusions

With the development of the times, the traditional teaching thoughts and methods cannot adapt to the times. More and more people devote themselves to the innovation and development of teaching, so they have the result of "curriculum ideology and politics". College teachers are exploring how to integrate ideological and political education into limited classroom teaching. Therefore, combining with the characteristics of science professional course, taking the teaching of "Operational Research" as an example, this paper introduces how to excavate ideological and political elements in professional course and how to combine the teaching of mathematics course with ideological and political education naturally. It provides some reference for the teaching of majors in the tide of ideological and political education in colleges and universities.

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