



Investigation on Course Evaluation of Building Morality and Cultivating People for Mechanical Manufacturing Technology Based on Improved AHP

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Abstract. By revealing the contradiction of the requirements for “made in China 2025” talents demand with the current teaching status of Mechanical manufacturing technology, the paper pointed out the necessity of ideological and political education in the course of mechanical manufacturing technology. Consequently, based on the improved analytic hierarchy process, a course evaluation method is suggested to measure the teaching effect of mechanical manufacturing technology on the building morality and cultivating people. A level model with three layers is firstly constructed with consideration of teaching attitude, teaching content, teaching method and teaching effect. The weights of indexes at all levels can be determined by achieving the optimal transfer matrices so that a relatively perfect course evaluation system is established reasonably. It is significant to carry out the reform of classroom teaching in order to realize the value guidance for students.

Keywords: Improved AHP · Building morality and cultivating people · Ideological and political education · Course evaluation · Mechanical manufacturing technology

1 Introduction

The goal of “Made in China 2025” is to transform China from a big manufacturer into a strong one. To achieve the strategic goal of “Made in China 2025”, it is necessary to not only a large number of talents with exquisite skills, but also high-quality talents with professional quality. Only as doing can China’s manufacturing industry be better promoted the transformation and upgrading. Therefore, in the talent training of in colleges and universities, attention should be paid not only to the improvement of specialty and skills, but also to the cultivation of ideological and political literacy. In December 2017, the Ministry of Education officially issued the **Implementation Outline of the Quality Improvement Project of Ideological and Political Work in Colleges and Universities**. It pointed out that the ideological and political education elements contained in

professional courses and the ideological and political education functions are sorted out to integrate into classroom teaching links which is the realization of the organic unity of ideological and political education with knowledge system education [1–3].

Course ideological and political education is the new trend of current course reform in colleges and universities. The integration of mechanical manufacturing technology and classroom ideological and political education will provide support for China's transformation from a big manufacturing country to a power manufacturing country.

2 Necessity of Ideological and Political Education in Mechanical Manufacturing Technology

Mechanical manufacturing technology is a main course for the major of machinery and near machinery [4, 5]. It involves every link in the manufacturing process of mechanical workpieces.

At present, the course “Mechanical Manufacturing Technology” has more teaching contents and less class hours. In the process of teaching, it mainly imparts theoretical knowledge and lacks ideological and political education such as professional ethics, values and patriotic dedication. In addition, for students majoring in mechanical engineering and near-mechanical engineering, the courses of humanities and social sciences are also relatively few. They pay less attention to and understand the national policies, guidelines and social development. Usually, few students think about what is the purpose of learning “Mechanical Manufacturing Technology”? What is the future use of learning “Mechanical Manufacturing Technology”? In addition, the students did not consider how to learn professional knowledge and skills for the development of the country.

Although the above contents are involved in the political course. However, political courses and professional courses belong to different curriculum systems [6, 7]. The correlation between them is relatively small and independent. As a result, it is difficult for students to connect the two to learn. The separation of professional knowledge and ideological education has led many students to be confused about college learning and unable to plan their career well. It not only affects the enthusiasm and effect of course learning, but also affects the future development. In addition, the specialized courses of science and engineering are highly theoretical so that students feel boring.

Therefore, the ideological and political elements contained in “Mechanical Manufacturing Technology” should be actively explored to integrate into classroom teaching skilfully. It is of great practical significance to organically combine the ideological and political education with the study of professional knowledge. Thus, a collaborative education mechanism can be form to improve the quality of talent training and in turn, realize the goal of building morality and cultivating people.

3 Objective of Ideological and Political Education in Mechanical Manufacturing Technology

The teaching objective should start from the three fundamental issues of “what kind of people to cultivate, how to cultivate people, and for whom”. They should lead students to establish a correct outlook on career, life and values.

In order to give full play to the educational value of the course, it is necessary to construct a three-in-one course content system of ideological and political theory, comprehensive quality and professional knowledge, so as to realize the course goal of “combining knowledge teaching and value guiding” [8]. Through the ideological and political construction of Mechanical Manufacturing Technology, the social responsibilities of college students are summarized to train the comprehensive and application-oriented talents with correct politics, advanced ideas and excellent technology.

Therefore, by concluding the teaching practice of “Mechanical Manufacturing Technology”, several mining rules of ideological and political elements are summarized for the course of mechanical manufacturing technology as follows.

One is the way from major events of current political news about manufacturing field. The current political news has the characteristics of strong generality and overall view, which can reflect the principles, policies and activities of the Party and the state in dealing with social economy and international relations. Two is the way from the innovative practice of the Chinese nation. Innovation is the soul of the development of the Chinese nation, the source of national prosperity, and the deepest genetic endowment of the Chinese nation. Three is the way from typical pillars of a great power. The pillars of a great power represent a country’s international status, and also reflect the hard power of national defense and security. In the process of innovation and development, China’s equipment manufacturing industry has created a series of major equipment. The research and development process of these important equipment of China is full of Chinese wisdom, showing the glorious journey of China’s equipment manufacturing industry from small to large to catch up with the world’s advanced level. Four is the way from outstanding representatives of major country craftsmen. Scientific spirit is a kind of belief, will, attitude, courage and rational thinking formed by scientific and technological workers in the process of exploring truth and revealing the laws of nature. It includes exploring innovation, advocating rationality, seeking truth, work together, selfless dedication, and so forth. Scientific spirit plays an important role in cultivating students’ professional interest and ability to discover problems. Five is the way from outstanding representatives of major country craftsmen. In their own posts, craftsmen from major countries have made great efforts to refine their products at their posts, devoted themselves to the research and innovation of technology, and dedicated themselves to the work. They have formed a heavy craftsman spirit in the long-term accumulation. This valuable spiritual quality is the inner support of made in China. With their hard work, they have created many national equipment that shocked the world. These pieces of great equipment of China show the unique charm of made in China. Six is the way from practical experience of environmental protection. The rapid development of industrial economy leads to the increasing of waste, which makes the natural environment seriously polluted. For example, air, water and soil pollution. These environmental pollutions have destroyed the natural ecological balance, and brought threats to people’s health and food production. The final is the way from safety accidents of dangerous operation. Safety awareness is a psychological state of alert and vigilance for the external environmental conditions that cause harm to themselves or others in production activities. Safety accidents at work will bring serious consequences to individuals, families and units.

4 Strategy to Promote the Ideological and Political Education of Machinery Manufacturing Technology

By combining the building morality with the cultivating people, the talent training objective is taken as a core to establish a scientific and reasonable evaluation system for the teaching status of machinery manufacturing technology.

4.1 Construction of Level Structure Model

The level structure model can be constructed for evaluating a course, as shown in Fig. 1. It includes three layers. The first layer has only one factor A . There are four factors B_1 , B_2 , B_3 and B_4 in the second layer. The third layer has thirteen factors, i.e., from $C_{1,1}$ to $C_{4,3}$.

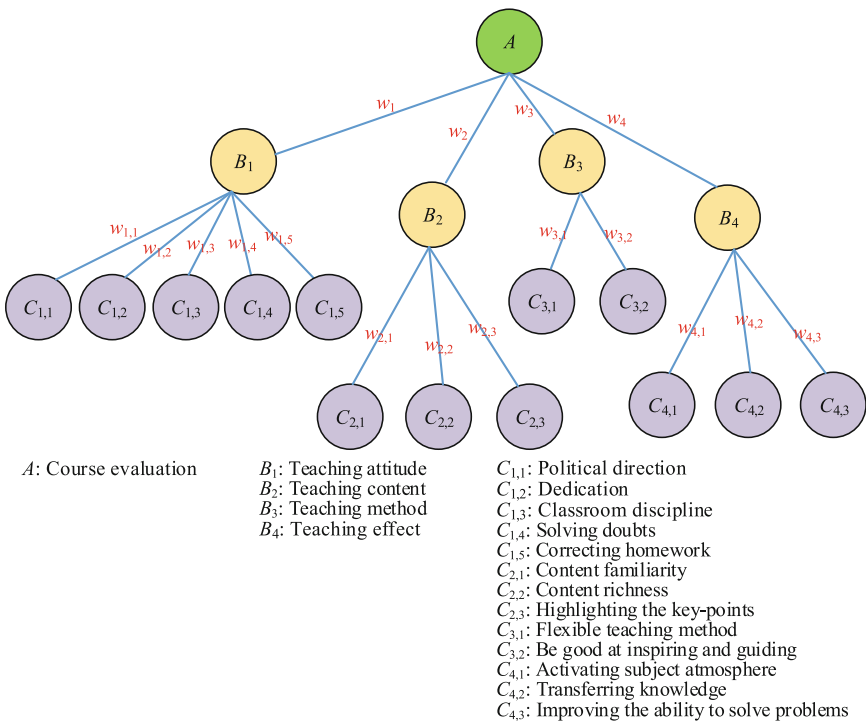


Fig. 1. The level structure model of course evaluation system [self-drawing]

4.2 Construction of Optimal Transfer Matrices

Because there is only one factor in the first layer, unique judgement matrix $P_{A \rightarrow B}$ of the second layer relative to the first layer [9] can be constructed as

$$P_{A \rightarrow B} = \begin{matrix} & B_1 & B_2 & B_3 & B_4 \\ \begin{matrix} B_1 \\ B_2 \\ B_3 \\ B_4 \end{matrix} & \begin{bmatrix} 0 & 1 & 0 & 1 \\ -1 & 0 & -1 & 1 \\ 0 & 1 & 0 & 1 \\ -1 & -1 & -1 & 0 \end{bmatrix} \end{matrix} \tag{1}$$

Thus, the improved AHP (AHP, Analytic Hierarchy Process) can be used to obtain the corresponding optimal transfer matrix $P_{A \rightarrow B}^*$ as

$$P_{A \rightarrow B}^* = \begin{bmatrix} 0 & 0.75 & 0 & 1.25 \\ -0.75 & 0 & -0.75 & 0.5 \\ 0 & 0.75 & 0 & 1.25 \\ -1.25 & -0.5 & -1.25 & 0 \end{bmatrix} \tag{2}$$

4.3 Calculation of Weight Values

Obviously, the eigenvector $W_{A \rightarrow B}^*$ of the matrix $P_{A \rightarrow B}^*$ can easily be calculated. Thus, it can be normalized as the layer weight value, i.e.,

$$w_{A \rightarrow B} = [0.3625, 0.1712, 0.3625, 0.1038]^T \tag{3}$$

By analogy, other weight vectors can facily be calculated according to the improved AHP [10], as listed in Table 1.

It is worth mentioning that the comprehensive evaluation can be described as follows when thirteen factors $C_{i,j}$ ($1 \leq j \leq 5$ when $i = 1$. $1 \leq j \leq 3$ when $i = 2$. $1 \leq j \leq 2$ when $i = 3$. $1 \leq j \leq 3$ when $i = 4$.) are scored with percentage system, i.e.,

$$\begin{cases} A = \sum_i w_i B_i \\ B_i = \sum_j w_{i,j} C_{i,j} \end{cases} \tag{4}$$

Table 1. The weight of evaluation system

Weight	Value	Weight	Value	Weight	Value	Weight	Value
$w_{1,1}$	0.3625	$w_{1,2}$	0.1712	$w_{1,3}$	0.3625	$w_{1,4}$	0.1038
$w_{2,1}$	0.1158	$w_{2,2}$	0.2110	$w_{2,3}$	0.3845	$w_{2,4}$	0.2110
$w_{2,5}$	0.0776	$w_{2,6}$	0.2889	$w_{2,7}$	0.5627	$w_{2,8}$	0.1483
$w_{2,9}$	0.7311	$w_{2,10}$	0.2689	$w_{2,11}$	0.5627	$w_{2,12}$	0.1483
$w_{2,13}$	0.2889	—	—	—	—	—	—

5 Conclusions

In order to cultivate high-quality talents with both morality and ability to meet the requirements of the new era, only holding the integration of professional knowledge with ideological and political education, and combining the cultivation of innovative practical ability with the guidance of values, can Mechanical Manufacturing Technology, as a professional course of mechanical design, manufacturing and automation, achieve the goal of establishing morality and cultivating people with “San Quan” education system.

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