

# Research on the Influencing Factors of Student Satisfaction in Labor Education in Hebei Province —Variable Selection and GLM Regression Analysis based on the Lasso Model

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**Abstract:** ***Objective:** With the improvement of national attention to labor education, and a more comprehensive understanding of the impact of various factors on student satisfaction, this paper investigates the universities currently implementing labor education in Hebei Province, establishes the index, and selects the main influence index based on the Lasso model. **Methods:** The GLM model conforming to Gaussian distribution is used to conduct regression analysis of the main influence indicators, comprehensively explore the effect of each main index on student satisfaction, and actively respond to the requirements of the country, society and individual for labor education in colleges and universities in the new era. **Conclusions:** The regression results show that the effects of student demand, talent training objectives, labor education organization, labor education practice implementation and labor education management supervision have a significant positive influence on student satisfaction.*

**Keywords:** Labor education, Lasso model, Variable selection, GLM regression.

## 1. Introduction

As an important position of talent training, colleges and universities bear the important responsibility of training qualified workers and innovators. Strengthening the labor education of college students and striving to cultivate the socialist builders and successors is not only an important part of college education, but also an important symbol of their education quality.

Labor education in colleges and universities is not only about teaching skills, but also about the shaping of values and personality. Therefore, many scholars have made a comprehensive and in-depth evaluation of the effect of labor education in colleges and universities, and establish the evaluation system of labor education in colleges and universities. It is mainly divided into two aspects: theoretical model establishment and hierarchical analysis. On the one hand, Zheng Guoping et al. (2023) constructed the evaluation system of theoretical labor education in combination with the characteristics of university labor education. On the other hand, after constructing the theoretical labor education evaluation system, CAI Ruilin et al. (2023) used the fuzzy comprehensive index method of Saaty's to empower the evaluation indicators, which makes the indicators within the labor education evaluation system rank important. Finally, Cheng Jiafu et al. (2024) and Zhou Lei et al. (2023) used the CIPP model to establish the labor education system in colleges and universities from four perspectives of background evaluation, input evaluation, process evaluation and achievement evaluation.

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system of labor education in colleges and universities, but after calculating the score with the evaluation system, the relevant research on the influence direction of student satisfaction is slightly insufficient. Therefore, this paper selects college students in Hebei Province as the main body, and uses the method of combining Lasso model screening variables and GLM model analysis to screen and analyze the main influence of various indicators of labor education on students' satisfaction in Hebei Province.

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## 2. Metric Selection

The main body of the research for college students in Hebei province, at the same time according to the questionnaire scale questions will be divided into environmental basis, student demand, talent training objectives, curriculum system, teachers, funding, facilities, labor education organization, labor education practice, labor education management supervision and student satisfaction. The index evaluation is obtained from the arithmetic average of the scale problem, and the specific variables are as follows:

**Table 1:** metric interpretation

| metric        | variable         | scale problem   |
|---------------|------------------|---|
| Environmental | Education policy | "Local education administrations have paid attention to it and have formulated supportive policies related to labor education." |

|   |  |  |
|---|--|--|
| basic   | Social environment                                 | "I think the school has gained support and recognition for labor education from all walks of life."  |
|   | School environment                                 | "The school often propagandises the importance of the labor education curriculum and has formulated specific implementation plans for labor education in line with students' development." |
| Student demand                                    | Student participation intention                    | "I am willing to actively participate in labor practices such as labor and public welfare activities."   |
|   | Students engage intrinsic motivation               | "I got involved in labor education because I wanted to learn new skills and knowledge."  |
|   | Students engage in extrinsic motivation            | "I participate in labor education mainly to meet course requirements or get extra credit."   |
|   | Students participate in social motivation          | "I participate in labor education because I want to contribute more to society."   |
| Talent training objectives                        | Decision-making management level of attention      | "The school has not only incorporated labor education into its training system for us, but also established complete and clear training standards."  |
|   | The clarity of decision training objectives        | "The talent training goals of my major have clear requirements for labor education goals."   |
|   | Precision of target execution                      | "My school is able to clearly reflect training goals in the implementation of labor education and effectively communicate these goals in teaching activities."                             |
| Curriculum system                                 | course offered                                     | "The school has all kinds of special labor education courses for us to learn."   |
|   | Course distribution                                | "I can complete labor education in different time periods and earn credits."   |
|   | Curriculum rationality                             | "The school labor education schedule is in line with my learning rules and physical and mental development characteristics."   |
| Teacher engagement                                | Full-time teacher                                  | "The teachers who taught me labor education courses have rich professional background and teaching experience."  |
|   | External teacher                                   | "The school has brought in excellent teachers from outside to teach labor education-related content, such as business mentors and industry experts."                                       |
|   | Number of instructors                              | "I think my school has enough teachers for labor education."   |
| Fund input  | The ratio of teachers to teachers                  | "The lecturers have dual qualifications (theoretical and practical)."  |
|   | School special fund investment                     | "My school has sufficient funds for labor education."  |
| Site facilities                                   | Fund rationality                                   | "I think the school labor education funds should be reasonably used to build the campus labor culture and improve the teaching level."   |
|   | Number of site facilities                          | "My school has enough space and facilities to carry out labor education."  |
|   | Match the supply and demand of site facilities     | "The school's labor education facilities have a high degree of matching with labor education, which can meet my learning needs."   |
| Organization of labor education                   | Site maintenance and management                    | "I think the school is very strict about the maintenance and management of labor education sites and facilities."  |
|   | Organization management                            | "My school has set up specialized labor education institutions or departments at all levels to effectively coordinate and manage the school's labor education work."                       |
|   | System formulation and operation                   | "I think the school's labor education management system and regulations are perfect and can be strictly enforced."   |
| Implementation of labor education practice        | Resource integration degree                        | "I was able to experience labor education smoothly by utilizing the various resources integrated by the school, such as human, material and financial resources."                          |
|   | Design and arrangement of teaching activities      | "I think the curriculum design of school labor education has the characteristics of comprehensiveness, advanced nature and innovation."  |
|   | Teachers' teaching methods and methods             | "In terms of labor education organization, labor knowledge, labor concepts and labor skills, I can better adapt to and accept the teaching methods of the teachers."                       |
| Administration and supervision of labor education | Student involvement                                | "Teachers can motivate me to participate in labor education and practice."   |
|   | Monitor and evaluate the teaching process          | "I think the teacher did a good job of preparation and planning before teaching the course. I was able to listen carefully under the teacher's step-by-step guidance."                     |
|   | Provide training and guidance to teachers          | "My labor education instructors regularly participate in special training and guidance activities, so they can update their education concepts."   |
| Student satisfaction                              | Curriculum implementation and management mechanism | "The high efficiency of course management makes me more comfortable to devote myself to labor education activities."   |
|   | Labor values                                       | "Through labor education courses and practical activities, I have established a more correct labor value."   |
|   | Labor emotional quality                            | "Through labor education courses and practical activities, I love labor more and am willing to participate in labor."  |
| Student satisfaction                              | Labor knowledge and skills                         | "I have mastered basic labor knowledge and skills, and can apply what I have learned to solve practical problems."   |
|   | Labor practices and habits                         | "I have developed good working habits and can consciously keep the fruits of work and respect the fruits of work."   |
|   | Student labor skills identification                | "I have obtained relevant labor skill certificates, and the level and number of these certificates can reflect my labor skill level."  |
| Student satisfaction                              | Teacher's labor literacy                           | "All the teachers have very high labor literacy, and they can set a good example for me by example."   |
|   | Teacher labor education consciousness              | "Teachers often emphasize the importance of labor education to me, and can lead me to actively participate in labor education and strive to improve the effect of labor education."        |
|   | Teachers labor education ability                   | "The teachers can guide me to carry out various labor education teaching activities. With the help of the teachers, I can master basic labor knowledge and skills."                        |
| Student satisfaction                              | Labor education resource sharing                   | "My school has established a resource bank of labor education courses, and uses the information platform to build and share high-quality resources to achieve sustainable development."    |
|   | Labor education concept and top-level design       | "I think the school has a scientific concept of labor education and top-level design."   |
|   | Typical case of labor education                    | "Our school has many successful typical cases of labor education, which can be demonstrated and promoted, and can provide reference for other universities."                               |
|   | Social repercussion of labor education             | "I think the school's typical cases of labor education are well received by the public."   |

### 3. Research Methods

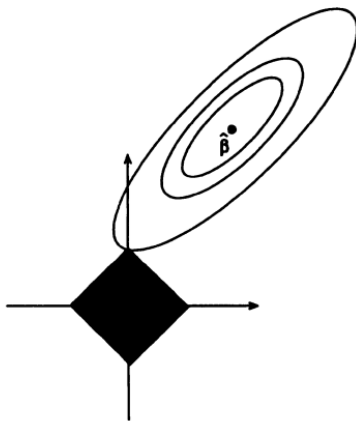
#### 3.1 Factors Selected by the Lasso Regression Model

$$(\hat{\alpha}, \hat{\beta}) = \arg \min \left\{ \sum_{i=1}^N (y_i - \alpha - \sum_j \beta_j x_{ij})^2 \right\} \text{ subject to } \sum_j |\beta_j| \leq t. \quad (1)$$

Lasso is a linear regression model for feature selection and regularization, whose coefficients are defined as:

It can be seen that the Lasso regression model uses the penalty term to screen the variables.

The following figure shows the geometric significance of the solution vector under constraints in the context of the Lasso regression model:

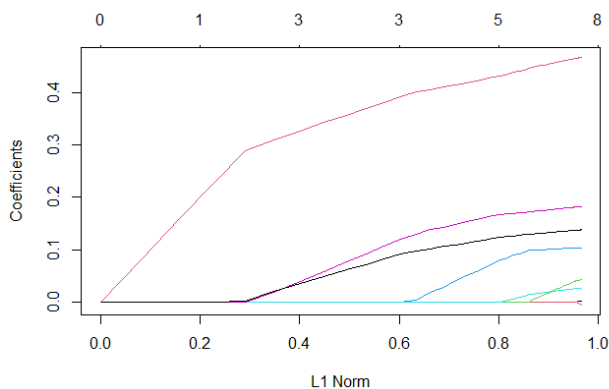


**Figure 1:** Geometric significance of the solution vector  $\beta$  under the constraints

Lasso regression takes into account the advantages of subset selection and ridge regression. At the same time, it can screen out some irrelevant or small coefficient variables to avoid overfitting of the model and enhance the interpretation of the model.

There are many indicators collected in this time, so the ordinary linear regression may cause the low explanatory power of the model overfitting. In this paper, Lasso is used to screen the indicators first, and then the selected indicators are used to conduct the regression analysis of the generalized linear model, which simplifies the model and improves the interpretation degree.

In this paper, glmnet package in R software is used to select the independent variables for modeling. The specific results are as follows:

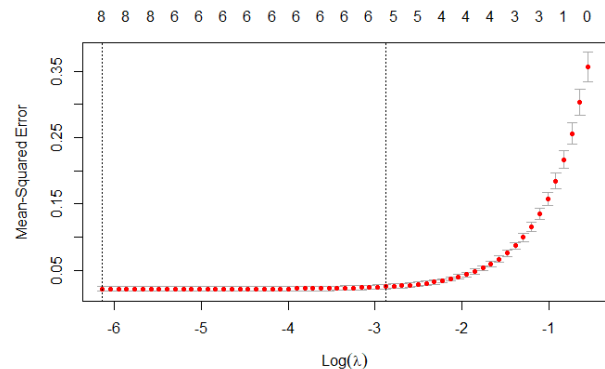


**Figure 2:** Variable selection results

Each curve in the figure above corresponds to a variable, which shows the path of the coefficient of this variable for the normative number of the entire coefficient vector when changes. The above axis represents the number of non-zero coefficients in the current  $\lambda$ , which is the effective degree of freedom (df) of Lasso.

The glmnet package in R uses a ten-fold cross-validation method to select the value of  $\lambda$ . The lower panel shows the cross-validation error plot, the cross-validation error in the conditions of different  $\lambda$ , the red dashed line representing the

cross-validation curve, and the error bars represent the upper and lower standard deviation curves along the sequence. Two special values along the sequence are represented by vertical dashed lines.



**Figure 3:** Cross-validation error plot

After cross validation to determine the parameters found that in 14 variables in 6 variables were selected, gender, age, grade, whether for class cadre, environmental basis, teachers investment, funding and site facilities coefficient of eight variables is 0, can be considered in other under the condition of the same condition, the eight variables for the influence of student satisfaction. The Lasso coefficient of student demand, talent training objectives, curriculum system, labor education organization, labor education practice implementation and labor education management supervision is positive, indicating that this variable has a positive impact on student satisfaction;

**Table 2:** Lasso main factor selection

| metric                                     | variable | Lasso coefficient |
|--|----------|-------------------|
| student satisfaction                       | y        | 0                 |
| sex  | x1       | 0                 |
| age  | x2       | 0                 |
| grade                                      | x3       | 0                 |
| Is it a class cadre                        | x4       | 0                 |
| Student needs                              | x5       | 0.004389081       |
| Environmental basis                        | x6       | 0                 |
| Talent training goals                      | x7       | 0.098436104       |
| curriculum system                          | x8       | 0.015090046       |
| Teacher input                              | x9       | 0                 |
| Funding input                              | x10      | 0                 |
| site facility                              | x11      | 0                 |
| Labor education organization situation     | x12      | 0.173008355       |
| Implementation of labor education practice | x13      | 0.130171157       |
| Labor education management and supervision | x14      | 0.448634600       |

### 3.2 Analysis of the Results from the GLM Gaussian Distribution Model

Suppose the dependent variables  $Y_1, Y_2, Y_3, \dots, Y_n$  are  $n$  independent observations and conform to the exponential distribution, that is, they have a density function:

$$f(y_i | \theta_i, \phi) = \exp\left(\frac{y_i \theta_i - b(\theta_i)}{\phi} + c(y_i, \phi)\right) \quad (2)$$

The and in the formula are parameters, and  $b(\theta_i)$  and  $c(y_i, \phi)$  are functions.

Also assuming that  $X_1, X_2, X_3, \dots, X_n$  correspond to the observed values of the  $p$ -dimensional independent variable  $X$  of  $Y_1, Y_2, Y_3, \dots$ . Note:  $\eta_i = x_i^T \beta$ , where is the  $p$ -dimensional

vector. Suppose that and is related to  $\eta_i$

$$\eta_i = g(\mu_i), i = 1, 2, \dots, n \quad (3)$$

This model is a generalized linear model, called the natural parameter, called the discrete parameter, and called the connection function, and different connection functions will produce different generalized linear models.

According to the indicators selected by Lasso model, this paper tested the student satisfaction of the core explanatory variables using Stata 17.0, and found that the student satisfaction met the normal distribution, so as the dependent variable, student needs, talent training objectives, curriculum system, labor education organization, labor education practice implementation and labor education management supervision as the independent variable, the Gaussian distribution was selected in the GLM model construction of Stata 17.0, and the connection function was identity. The following results are obtained:

**Table 3: Results of the GLM Gaussian distribution regression**

| metric                                     | coefficient |
|--|-------------|
| Student needs                              | 0.0444***   |
| Talent training goals                      | 0.1036***   |
| curriculum system                          | 0.0265*     |
| Labor education organization situation     | 0.1817***   |
| Implementation of labor education practice | 0.1375***   |
| Labor education management and supervision | 0.4691***   |

The regression results show that the influence of student demand, talent training goal, labor education organization, labor education practice implementation and labor education management supervision on student satisfaction is significantly positive, and the influence of labor education management supervision on student satisfaction is the most significant, followed by labor education organization and labor education practice implementation. The least affected is student demand. The curriculum system has a positive effect on student satisfaction, but the effect is not very significant.

Lasso variable selection and GLM regression results show that students' satisfaction with labor education pays more attention to the results brought by labor education in the form of visual form, and students do not pay much attention to the process of implementing labor education. In the results, students attach the most importance to management supervision, and the better the management effect of the school for labor education, the better the supervision. The higher students' satisfaction with labor education. Students pay less attention to the organization of labor education and the implementation of labor education practice than management supervision, and students pay less attention to the needs of students and the goal of talent cultivation than the first three, which further shows that students pay more attention to the results of intuitive form.

#### 4. Conclusion

We investigate the labor education students in Hebei province, collected the corresponding data, according to the questionnaire scale developed the related indicators, at the same time using Lasso regression model screening out the student satisfaction of the main indicators for students demand, talent training target, curriculum system, labor education organization, labor education practice

implementation and labor education management supervision. At the same time, the variables selected by Lasso model were used to meet the Gaussian distribution GLM regression analysis, and the biggest influence is labor education management supervision, while the least impact is students' needs.

According to the analysis results, it is found that students' satisfaction mainly depends on the form of the results. This phenomenon shows that the students for the implementation process is not very concerned about, to its more convincing is the result of labor education, to improve students to the degree of the satisfaction of labor education, colleges and universities to let students to realize the labor education for the benefits and constantly strengthen the importance of labor education and to implement.

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