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An Innovate Evaluation Index Method of Electronic Technology Teaching Quality based on Outcomes-based Education

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Abstract. In the association rules, evaluation index can mine the associated data hidden in the data items or data attributes, and is widely used in communication engineering, efficient management and so on. The innovate evaluation index method has an important influence on the employment and postgraduate entrance examination of college students. With the emergence and development of the outcomes-based education, people expect to predict and evaluate scores by using evaluation index technology. This paper uses evaluation index technology to analyze and excavate a large amount of data. The association rules are used to find the relation among them, and the teaching quality evaluation system is constructed through the improvement of evaluation index.

Introduction

How to predict and evaluate the relationship between students' usual electronic technology performance and passing rate has been one of the problems studied in teaching quality research. Through the excavation of teaching or student data, the internal relationship between data is found. The electronic technology teaching quality is an important symbol to measure ability. How to use evaluation index to correctly evaluate students is a common concern of teachers and students. The electronic technology teaching quality is related to many factors, such as the scores in college entrance examination. This paper uses evaluation index technology to analyze and excavate a large number of data, and uses association rules to find out the relationship between the results of college entrance examination and electronic technology performance by outcomes-based education.

The Innovate Evaluation Index Model

An evaluation analysis method combining qualitative analysis is studied and the overall influence factors on the evaluation of teaching quality, teaching theoretical knowledge, knowledge development and cultivation of professional ability can be explained by the research on the electronic technology teaching quality evaluation. This evaluation system of electronic technology teaching quality includes teachers' professionalism, work attitude, teaching methods etc.

The teaching quality evaluation index system was initially constructed to judge the electronic technology teaching level. The calculation method of correlation score was as follows:

Let y be a dependent variable, $x_1, x_2,..., x_m$ is all independent variables, $y_i, x_{i1}, x_{i2},...,x_{im}$ ($i = 1, 2,...,n$) is an independently extracted n group sample. The significant level of the independent variable was selected as the model, and the significant level of the excluded model was as follows,

Step 1. Calculation of deviation matrix S,

$$S = S_{m\times m} = \begin{pmatrix} s_{11} & s_{12} & \cdots & s_{1m} & s_{1y} \\ s_{21} & s_{22} & \cdots & s_{2m} & s_{2y} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ s_{m1} & s_{m2} & \cdots & s_{mm} & s_{my} \end{pmatrix} \tag{1}$$

Step 2. The gradually screened independent variables

Calculate the contribution of each variable

$$V_j^{(1)} = \frac{s_{jy}^2}{s_{jj}} \tag{2}$$

Maximum value

$$V_{k_1}^{(1)} = \max_{1 \le j \le m} V_j^{(1)} \tag{3}$$

Whether the effect of step 3 is statistically significant or not, then

$$F = \frac{V_{k_1}^{(1)}}{S_E^{(1)} \big/ (n-1-1)} \tag{4}$$

$$S_E^{(1)} = S_T - V_{k_1}^{(1)} \tag{5}$$

If $F \le F_{\alpha_1}(1, n-1-1)$ all the independent variables were independent of *y*, and the regression equation could not be established.

If $F > F_{\alpha_1}(1, n-1-1)$ then x_{k1} is selected into the model, and *S* is converted to $S_{m\times(m+1)}^{(1)}$.

$$S_{m\times(m+1)}^{(1)} = \begin{pmatrix} s_{11}^{(1)} & s_{12}^{(1)} & \cdots & s_{1m}^{(1)} & s_{1y}^{(1)} \\ s_{21}^{(1)} & s_{22}^{(1)} & \cdots & s_{2m}^{(1)} & s_{2y}^{(1)} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ s_{k_1 1}^{(1)} & s_{k_1 2}^{(1)} & \cdots & s_{k_1 m}^{(1)} & s_{k_1 y}^{(1)} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ s_{m1}^{(1)} & s_{m2}^{(1)} & \cdots & s_{mm}^{(1)} & s_{my}^{(1)} \end{pmatrix} \tag{6}$$

$$s_{ij}^{(1)} = \begin{cases} \dfrac{s_{k_1 i}}{s_{k_1 k_1}} (i = k_1, j \ne k_1) \\ s_{ij} - \dfrac{s_{ik_1} s_{k_1 j}}{s_{k_1 k_1}} (i \ne k_1, j \ne k_1) \\ \dfrac{1}{s_{k_1 k_1}} (i = j = k_1) \\ -\dfrac{s_{ik_1}}{s_{k_1 k_1}} (i \ne k_1, j = k_1) \end{cases} \tag{7}$$

Calculate the contribution of each variable according to $S_{m\times(m+1)}^{(1)}$.

$$V_i^{(2)} = \frac{\left(s_{iy}\right)^2}{s_{ii}} \tag{8}$$

$$V_{k_1}^{(2)} = \frac{\left(s_{k_1 y}^{(1)}\right)^2}{s_{k_1 k_1}^{(1)}} \tag{9}$$

Take the maximum contribution of the independent variables outside the model, that is

$$V_{k_2}^{(2)} = \max_{j \ne k_1} V_j^{(2)} \tag{10}$$

$$F = \frac{V_{k_2}^{(2)}}{S_E^{(2)} \big/ (n-2-1)} \tag{11}$$

$$S_E^{(2)} = S_T - V_{k_2}^{(2)} \tag{12}$$

If $F \le F_{\alpha_1}(1, n-2-1)$ then the optimal regression equation is established.

If $F > F_{\alpha_1}(1, n-2-1)$ then the election x_{k_2} entry model is

$$S_{m\times(m+1)}^{(2)} = \begin{pmatrix} s_{11}^{(2)} & s_{12}^{(2)} & \cdots & s_{1m}^{(2)} & s_{1y}^{(2)} \\ s_{21}^{(2)} & s_{22}^{(2)} & \cdots & s_{2m}^{(2)} & s_{2y}^{(2)} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ s_{k_2 1}^{(2)} & s_{k_2 2}^{(2)} & \cdots & s_{k_2 m}^{(2)} & s_{k_2 y}^{(2)} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ s_{m1}^{(2)} & s_{m2}^{(2)} & \cdots & s_{mm}^{(2)} & s_{my}^{(2)} \end{pmatrix} \tag{13}$$

$$s_{ij}^{(2)} = \begin{cases} \dfrac{s_{k_2 j}^{(1)}}{s_{k_2 k_2}^{(1)}} (i = k_2, j \ne k_2) \\ s_{ij}^{(1)} - \dfrac{s_{ik_2}^{(1)} s_{k_2 j}^{(1)}}{s_{k_2 k_2}^{(1)}} (i \ne k_2, j \ne k_2) \\ \dfrac{1}{s_{k_2 k_2}^{(1)}} (i = j = k_2) \\ -\dfrac{s_{ik_2}^{(1)}}{s_{k_2 k_2}^{(1)}} (i \ne k_2, j = k_2) \end{cases} \tag{14}$$

Construction and Result Analysis of Outcomes-based Education Achievement Model

The students at a school are selected as the research objects and each sample contains the scores in college entrance examination. Their scores in college entrance examination are achieved, and the simulation results are selected as the research data source to excavate and analyze the association rules between the results and the scores in college entrance examination.

Data Processing. The part of the data in database is shown in Table 1.

Table 1 Database part of the data sample

Name	Scores of university entrance examination	Average achievement at school	Scores	Average scores
Wang*	120	75	538	469
Zhao*	117	77	546	460
Liang*	126	80	520	531
Xiao*	102	71	499	450
An *	111	73	512	428
Ren *	105	67	521	449
Hao*	121	78	498	427
Liu *	98	66	500	449
Xie*	115	75	569	527
Feng*	95	74	496	413

The dispersing processing of data is performed below. According to the university performance evaluation standards and different scores, they are divided into excellent, fine, medium, poor, inferior and other grades, as shown in Table 2.

Table 2 Segmentation level of scores

Segmentation Level of Scores				
Excellent	Fine	Medium	Poor	Inferior
90-100	80-89	70-79	60-69	0-59

The database D is scanned to get a new database D', and the converted data is shown in Table 3.

Table 3 Converted database

Identification T	X_1	X_2	X_3	X_4
T_1	1	1	1	1
T_2	1	1	1	1
T_3	1	0	1	1
T_4	1	1	1	1
T_5	0	0	0	0

Summary

With the new media era is coming, the comprehensive analysis in all aspects of people's life has infiltrated a variety of new media tools and platforms, which greatly affected the students' learning and life. It is also beneficial to the innovation of electronic technology teaching in colleges and universities. The teachers should actively apply the convenient new media conditions, break through the constraints of traditional teaching mode, and carry out constant innovation. With the openness of the new media, the communication with learners in different regions of the world should be strengthen to look for a new way of electronic technology teaching in the process of continuous learning and reference. At the same time, we must pay attention to the research of outcomes-based education platform, integrate all kinds of teaching resources, promote resource sharing, enrich outcomes-based education methods, and strengthen the interest of electronic technology teaching.

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