Analysis of Learning Quality Evaluation for University Student Courses with Process Assessment

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Abstract

With the progressive exploration and application of formative assessment in university pedagogy, this evaluative method has become widely adopted for appraising students' everyday learning attitudes and conditions. Drawing upon pertinent data regarding classroom learning experiences of students at a specific university, this paper employs machine learning, K-means clustering, the TOPSIS evaluation model, and the entropy weighting method to investigate the relationship between formative assessment and the quality of university student learning, culminating in the creation of an evaluation model. This model allows us to pinpoint the key factors influencing student learning attitudes and offers support for formative assessment in the university context.

Keywords: University Process Assessment, attitude toward learning, machine learning, TOPSIS Evaluation model

1. Introduction

With the continuous deepening reform of education and teaching mechanism, the educational method of process assessment has been widely explored and applied by more and more universities. Compared with the outcome assessment, the process assessment can better evaluate the students' learning attitude and state [1].

In the process assessment, students' learning attitude is mainly affected by the objective environment and subjective initiative [2]. This paper will explore which factors have a greater impact on students' learning attitude, build a mathematical model that can reasonably evaluate the school's learning style and class style, and build an evaluation model that can reflect the level of students' learning enthusiasm.

The rest of this article is organized as follows. The second part analyzes the data and explores the factors that reflect students' learning attitude. The third part introduces the construction of evaluation model. The fourth part analyzes the evaluation model and the results obtained. The fifth part summarizes the main content of this paper.

2. Data Analysis

The data collected students' student number, college, class, course code, class code, teacher code, test name, test time, test full score, student score and normalized score. It should be noted that students choose different courses within the scope of core basic courses, some students choose multiple courses, some students choose only one course; Some students may have done work that was not posted by the class teacher; Some students don't take every test for some reason; Teachers in the same course don't publish pre-class tests the same often.

In order to explore which factors have a greater impact on students' learning attitude, it is necessary to explore the control variables. The following will explore the influence of college factors, the number of courses selected by students, the attendance rate of students, and the factors of major, class, course, teacher and classroom on students' learning attitude.

2.1. College factor

By calculating the average scores of students in different colleges of the same course, and then summarizing all colleges, the average and variance of the scores of students in each college are obtained. The data are shown in Fig. 1.

Fig. 1 College factor visualization

The average score of students in different colleges is different, and the stability of grades is also different. Therefore, the learning atmosphere of different colleges is different, and students' learning attitude is also different. Therefore, students' learning attitude is affected by the factor of college.

2.2. The number of courses taken by students

We define the average of each student's normalized scores on several tests as the student's representative score. The number of courses selected by each student is 1, 2, and 1 of 3. The representative scores of students with 1, 2, and 3 courses selected respectively are calculated, and the corresponding scatter map is shown in Fig. 2.

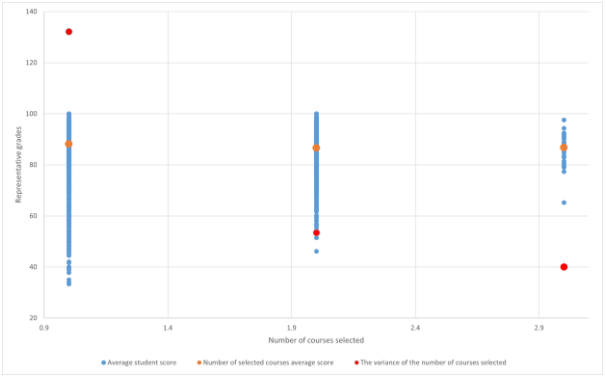

Fig. 2 figure of the number of selected courses

As can be seen from Fig. 2, with the increase in the number of courses selected by students, the average scores of students are basically the same, and the overall scores of students are higher and more and more stable. It can be inferred that the more courses a student chooses, the higher the student's enthusiasm for the course and the better the attitude.

2.3. Student attendance

When the total number of tests for each course is taken as the number of the last measurement for this course, that is, the total number of tests organized by the teacher for this course, the attendance rate of each student is obtained. The scatter plot corresponding to the attendance rate of students and the representative score is shown in Fig. 3.

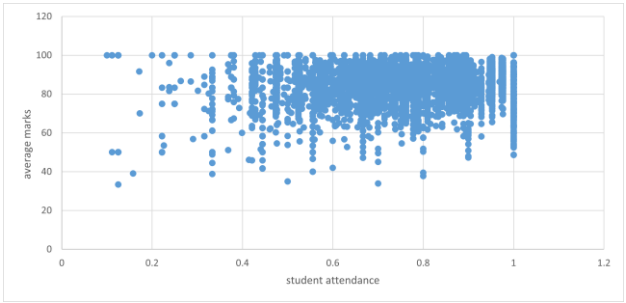

Fig. 3 Scatter plot of attendance

Count the number of people with scores greater than 80 in each attendance range and draw a bar chart, which is shown in Fig. 4.

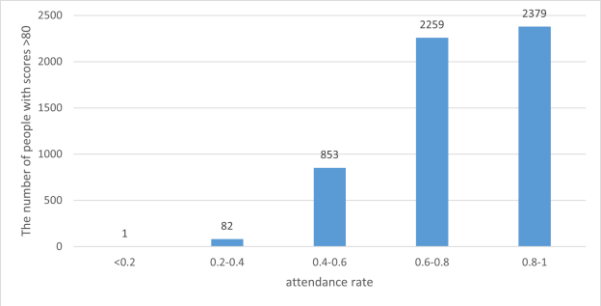

Fig. 4 attendance and high score statistics chart

As can be seen from Fig. 3 and Fig. 4, when students' attendance rate is small (0-0.4), students' high scores are compared. With the increase of students' attendance rate, students' scores are generally higher, and with the increase of students' attendance rate, the number of students who get high scores is increasing. Therefore, students' attendance rate has a great impact on students' scores and can better reflect students' learning attitude.

2.4. Major, class, curriculum, teacher factor

Calculate the average grade and variance of grades for each major, each class, each course, and each classroom, as well as the average grade and variance of students taught by each teacher.

After analysis, the following conclusions are reached:

(1) Students' learning attitude is influenced by their major, but the influence is small. (2) On the whole, students' grades and the stability of grades are also different depending on the class they belong to. Therefore, students' learning attitude is affected by class factors. (3) The overall performance of students taught by some teachers is poor and unstable; The rest of the teachers taught students different overall grades, but the fluctuation is not large, can reflect the true level. Therefore, students' learning attitudes are influenced by their teachers and courses.

3. Construction of Evaluation Model

Data for all students in each college and class is aggregated to get an average of average test scores, average test participation rates, and number of courses taken by students in each college and class. This will result in a dataset consisting of the college (or class), average test score, average test participation rate, and number of courses taken. Since there are few indicators, TOPSIS method is adopted here [3].

3.1. Data standardization

Since attendance, grade point average, and average number of courses taken are all positive indicators, it is only necessary to standardize the dataset consisting of college (or class), average test score, average test participation rate, and number of courses taken.

3.2. Calculate index weight

To ensure the objectivity and scientificity of the index weights, entropy weight method and analytic hierarchy process are used to determine the index weights, and the weights are shown in Fig. 5.

	attendance rate	grade	Average number of courses selected
College weight	0.24935	0.3984	0.35225
Class weight	0.28405	0.3831	0.33285

Fig. 5 index weight

3.3. Calculating the score

Define the maximum value Z^+ as the maximum value of each column in the vector matrix and define the minimum value Z^- as the minimum value of each column in the vector matrix. Define the distance of the $i\,(i = 1,2,\dots,n)$evaluation object to the maximum value as:

$$D_i^+ = \sqrt{\sum_{j=1}^{m} \omega_j \left(Z_j^+ - z_{ij}\right)^2} \tag{1}$$

Define the distance of the $i\,(i = 1,2,\dots,n)$ evaluation object to the minimum value as:

$$D_i^- = \sqrt{\sum_{j=1}^{m} \omega_j \left(Z_j^- - z_{ij}\right)^2} \tag{2}$$

Then, we can calculate the non-normalized score of the $i\,(i = 1,2,\dots,n)$ evaluation object as:

$$S_i = \frac{D_i^-}{D_i^+ + D_i^-} \tag{3}$$

It is evident that $0 \le S_i \le 1$, and the larger S_i the smaller D_i^+, indicating closer proximity to the maximum value. By incorporating the obtained indicator weights into the calculation of sample distances, we obtain the score for each sample [3].

4. Introduction of Result

According to the above model construction, MATLAB is used to calculate, and the final answer is obtained.

4.1. Evaluation hierarchy

The hierarchy of evaluation models is shown in Fig. 6.

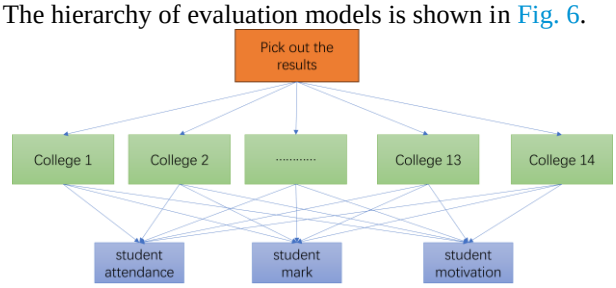

Fig. 6 evaluation hierarchy diagram

4.2. Personal evaluation model

Here, we want to find the best and worst people, and we first cluster them using K-Means into better and worse groups. Then, the two groups were evaluated by TOPSIS, and the evaluation index was the student attendance rate, the number of courses selected, and the individual performance [2].

5. Conclusion

Through the students' usual performance to construct the process evaluation model, get the factors that affect students' learning attitude, and can find the class, college, and students with better performance through the data.

This research will help colleges and universities to carry out process assessment better.

References

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