Research on Flipped Classroom Method Based on Information Internet Platform

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Abstract. Learning engagement is an indicator of students' active learning behavior, which is closely related to students' learning behavior, academic performance, learning status and academic level; The emotional part of the academic situation is also an important factor affecting the level of students' learning engagement. Among them, the more positive academic emotions students experience in learning, the better their learning engagement. With the continuous development of educational technology, researchers have developed innovative classroom teaching models, among which the flipped classroom teaching model has been proved to be effective in the study of academic emotion and learning engagement.

Keywords: study; Status; Flipped classroom; teaching model

1 Introduction

The prototype of the flipped classroom came from two foreign middle school teachers. Because students were absent from class, the teachers used video recording software to record the content taught in class in order to help students make up for the teaching content, and then uploaded it to the network [1-2]. The students completed the learning of the course content through the network. The teachers solved the difficulties encountered by students in learning in the classroom. Later, the school held an open day activity of flipped classroom, Therefore, flipped classroom has become popular abroad. Foreign scholars believe that compared with traditional classroom, flipped classroom has reversed the process of knowledge teaching and internalization [3-5].

In the traditional classroom, teachers impart relevant knowledge in class. Students complete the internalization process of knowledge through exercises and after-school tasks after class. In the flipped classroom, students complete the internalization of knowledge by watching the pre recorded teaching videos distributed by teachers before class, and by discussing in groups, displaying results and expanding teachers' doubts in class. The formation of flipped classroom includes two parts: knowledge learning and internalization [6-9]. But different from the traditional teaching mode, knowledge is learned by using information technology outside the

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classroom, while internalization is completed with the help of teachers and classmates. Cai Baolai and others proposed that in the teaching process of flipped classroom, first of all, teachers should create a teaching video on the Internet before class. The content of this video is the knowledge of the current session [10-13]. Students should watch the video online and complete the learning tasks set by teachers. Then, teachers should communicate with students in the classroom to solve their confusion about learning and students' homework. In addition, some researchers pointed out that the learning materials that learners used in extracurricular activities include other supportive materials and tools in addition to videos.

To sum up, flipped classroom is to flip the teaching links of the traditional classroom. Learners first complete autonomous learning of the teaching content prepared by teachers. Besides videos, the teaching content also includes various forms of learning materials. After that, through communication and discussion with teachers and classmates, knowledge can be absorbed and internalized.

2 Information platform based on flipped classroom

Flipped classroom teaching model has a good effect in the research of academic emotion and learning engagement. For example, in the research of nursing undergraduate students, it is found that the class with flipped classroom teaching mode has lower scores of negative academic emotions than the class with traditional teaching mode; In the research of ideological and political course for college students, it is pointed out that flipped classroom has changed the traditional way of learning, and has significantly improved students' academic mood. By compiling a measuring instrument for students' learning engagement in college English flipped classroom and testing the sample, it is found that students' learning engagement level is significantly higher than the average level; Before and after the implementation of the flipped classroom teaching model, we measured the samples respectively, and analyzed the results of the pre-test and pre-test. It was found that after the use of the flipped classroom, the level of students' learning investment was improved.

In general, flipped classroom teaching mode has been widely used in various groups, showing a trend that applied research gradually dominates over time, with the characteristics of expanding research fields. It has a good application effect in the study of academic emotion and learning engagement. However, in the research on the application of flipped classroom teaching model in the discipline of middle school students, there are few psychological lessons involved.

To achieve the effectiveness of the design of substation equipment inspection system, the CANNY algorithm is used to detect the edge of substation equipment in the software design. In this paper, the Ostu threshold segmentation method is introduced into the CANNY algorithm to reduce the traversal period of the algorithm as much as possible. At the same time, the Newton iteration method is introduced when calculating the threshold variance, which can accelerate the calculation speed of the CANNY algorithm and effectively realize the edge detection of the substation equipment image. Specifically, improvements are made in the following ways:

(1) Optimize the gradient calculation method

The traditional CANNY operator obtains the gradient value through the difference of 2 * 2 neighborhood. In the calculation process, there are only four gradient directions of the first

derivative, which will lead to the problem of edge missing. To solve this problem, this paper optimizes the neighborhood calculation method under the condition of ensuring the mutual balance of positioning accuracy. Through 8-neighborhood calculation, that is, in 3 * 3 neighborhood, the *x* and *y* directions of the substation equipment image, as well as the azimuth and gradient values of 45°and 135°directions are calculated in turn. The convolution kernel of the template is described by formula (1):

$$f_x = \begin{bmatrix} -1 & 0 & +1 \\ -1 & 0 & +1 \\ -1 & 0 & +1 \end{bmatrix}, f_y = \begin{bmatrix} -1 & -1 & -1 \\ 0 & 0 & 0 \\ +1 & +1 & +1 \end{bmatrix}, \\ f_{45^\circ} = \begin{bmatrix} 0 & +1 & +1 \\ -1 & 0 & 1 \\ -1 & -1 & 0 \end{bmatrix}, f_{135^\circ} = \begin{bmatrix} -1 & -1 & 0 \\ -1 & 0 & +1 \\ 0 & +1 & +1 \end{bmatrix} \tag{1}$$

The gradient value can be calculated by using norm ∞, and the gradient value and azimuth Angle of point position (i, j) can be calculated by formula (2) successively:

$$|M(i, j)| = \max\left(|f_x|, |f_y|, |f_{45^\circ}|, |f_{135^\circ}|\right) \\ \theta(i, j) = \arctan\left(\frac{f_y}{f_x}\right) \tag{2}$$

(2) Double threshold calculation

In this paper, the Ostu algorithm is selected to achieve threshold segmentation. Ostu algorithm is an adaptive non-parametric calculation method, which can be used to achieve two-dimensional histogram segmentation. At the same time, due to the high complexity of the two-dimensional algorithm. In this paper, Newton iterative algorithm is used to accelerate the convergence speed. The algorithm calculation process is specifically realized through the following steps:

Step 1: Input the initial grayscale image, and represent the initial threshold of the image through the grayscale average value of the image and its neighborhood two-dimensional vector.

Step 2: Divide the grayscale image (s, v) into two categories, namely the background area A_0 and the target area A_1 through the two-dimensional vector.

Step 3: Calculate the pixel joint density of the two regions in turn, as shown in formula (3):

$$w_0(s,v) = p_r(A_0) = \sum_{i=0}^{s}\sum_{j=0}^{v} p(i,j)$$
$$w_1(s,v) = p_r(A_1) = \sum_{i=0}^{s}\sum_{j=0}^{v} p(i,j) \tag{3}$$

Calculate the average gray values of the two regions simultaneously, as shown in Formula (4) :

$$\mu_0 = (\mu_{0i}, \mu_{0j})^T = \left[\sum_{i=0}^{s}\sum_{j=0}^{v} ip(i,j)/w_0(i,j), \sum_{i=0}^{s}\sum_{j=0}^{v} jp(i,j)/w_0(i,j)\right]^T$$
$$\mu_1 = (\mu_{1i}, \mu_{1j})^T = \left[\sum_{i=0}^{s}\sum_{j=0}^{v} ip(i,j)/w_1(i,j), \sum_{i=0}^{s}\sum_{j=0}^{v} jp(i,j)/w_1(i,j)\right]^T \tag{4}$$

In the formula, the joint probability density is represented by $p(i,j)$; the pixel joint probability density of region A_0 and region A_1 is represented by $w_0(s,v)$, $w_1(s,v)$ respectively; and the average gray level of region A_0 and region A_1 is represented by μ_0 , μ_1 respectively.

Step 4: Assume that the distance measurement function is $tr\sigma_B(s,v)$, and calculate $tr\sigma_B(s,v)$ through formula (5):

$$tr\sigma_B(s,v) = w_0\left[(\mu_{0i} - \mu_{zi})^2(\mu_{0j} - \mu_{zi})^2\right]$$
$$+w_1\left[(\mu_{1i} - \mu_{zi})^2(\mu_{1j} - \mu_{zi})^2\right] \tag{5}$$

Step5: Calculate the new two-dimensional vector threshold: $(s^*, v^*) = \left[(\mu_{0i} + \mu_{1i})/2, (\mu_{0j} + \mu_{1j})/2\right]$.

Step6：Analyze whether the above calculation can simultaneously satisfy the conditions: $(s,v) = (s^*, v^*)$ and $tr\sigma_B(s,v) = tr\sigma_B(s^*, v^*)$. If it can, the output will be the optimal solution, and the iteration will be completed to start the step (*i*). If it is not enough, the step (*g*) will be carried out.

Step7: Analyze whether $tr\sigma_B(s,v)$ is lower than $tr\sigma_B(s^*, v^*)$. If it is, then set $tr\sigma_B(s,v) = tr\sigma_B(s^*, v^*)$; If it is not, execute according to the value of $tr\sigma_B(s,v)$.

Step8：Set $(s,v) = (s^*, v^*)$. Repeat step (*b*) to step (*e*) until the optimal solution is obtained.

Step 9: Calculate the optimal threshold $T^* = (s+v)/2$, which is 2 times the high threshold T^* of the Canny operator T_h, that is , $T_h = 2T^*$. At the same time, the high threshold T_h is 2 times its low threshold T_l, that is $T_l = T_h / 2$.

Step 10: Use the CANNY operator to start research on flipped classroom teaching model.

3 Experiment

Two classes in the first grade of junior high school were selected as the research objects. Class 20 in the first grade of junior high school was the experimental group, and class 17 in the first grade of junior high school was the control group. The same test was used to carry out routine classroom teaching activities of mental health education, and the related teaching contents of academic emotions were not specially carried out. SPSS 20.0 was used to test the homogeneity of the experimental group and the control group by independent sample t test; In the aspect of intervention effect analysis, in order to reduce the interference of irrelevant variables, this study uses covariance analysis to test the intervention effect of academic emotion topic classroom teaching. With two groups of pre-test data as covariates, compare the differences between the two groups of post test data, and then study the predictive effect of pre and post test value-added scores of academic emotion on pre and post test value-added scores of learning input through regression analysis.

The traditional classroom education model is compared with the flipped classroom education model. The comparison effect is shown in Figure 1.

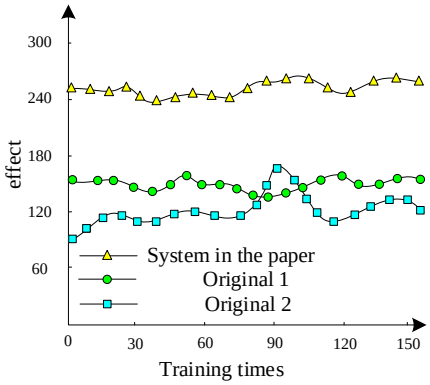

Figure 1 Comparison Effect

This paper uses the comparative method to analyze the changes before and after the application of the information flipped classroom, as shown in Figure 2.

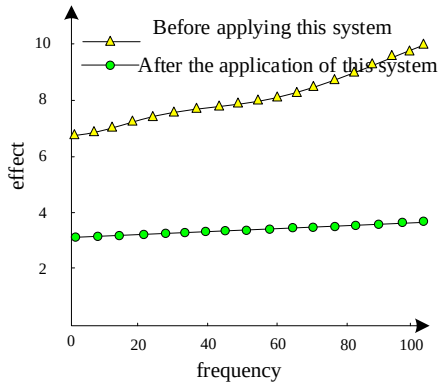

Figure 2 Analysis of the system alarm capability

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