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RESEARCH ARTICLE

Application of Image Processing Supported by Information Technology in Classroom Teaching Mode

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ABSTRACT

The advancement of Information Technology (IT) is of great significance to the education sector and even the society. In the traditional teaching mode, the course is difficult and students have many learning obstacles. The dullness of learning leads to students' low enthusiasm for learning, and the overall teaching quality is also affected. IT has changed the traditional classroom teaching mode and made students' learning interesting and easy to understand, which has minimized the difficulty of learning and improved teaching quality. However, with the rapid progress of IT, various teaching equipment emerge in endlessly. The existing teaching mode can no longer follow the pace of IT update, which leads to its loss of auxiliary value. Therefore, on the basis of IT as the support, this paper put forward the research on the application of Image Processing (IP) technology to classroom teaching mode, and adopted the method of comparative experiment and questionnaire survey. Through practical teaching, the influence of IP on classroom teaching mode was explored. The data of the control experiment proved that after the introduction of IP technology for one month, the scores of the students in the experimental class changed significantly. The number of failed students changed from 12 to 2. There were 23 people who reached the excellence rate and 13 people made significant progress. One month after the experiment, the number of students who failed in the control class maintained the traditional teaching mode increased instead of decreasing. The number of people changed from 12 to 14. There were 2 people whose grades fell behind. The number of students at the middle level was the same as that of the experimental class after the experiment. The number of students at the middle level was the same as that of the experimental class after the experiment, with the same number of 23. It could be seen that IP technology supported by IT could effectively promote students' learning effect and improve classroom efficiency. This study offered reference value for the role of IP in classroom teaching mode, which provided the future direction for the development of classroom teaching mode.

1. Introduction

The change and alternation of IT has set off a large wave of educational reform. Times are updating and IT is advancing. The educational reform is innovating, and the classroom teaching mode should also change with the changes of the times. Otherwise, it would be eliminated by the era of rapid change. The current classroom teaching mode has changed a lot, but it has not yet got rid of the influence of the traditional teaching mode. IP technology can implement the teaching concept of "heuristic" teaching in the new era and create a rich classroom teaching environment. By starting with the application of IP supported by IT in classroom teaching mode, this paper studied the innovation and promotion of IP in classroom teaching mode, and carried out relevant control

experiments and questionnaires. This paper hoped that IP could offer enlightenment for classroom teaching mode to provide text reference for the continuous innovation of classroom teaching mode.

The development of IT has deeper requirements for classroom teaching mode, which has also attracted the attention of many scholars. Ratheeswari K believed that information technology was affecting human life. IT was the catalyst for change, which changed working conditions (Ratheeswari, 2018). Finkelstein Simon said that many people believed that what teachers did in class would directly affect students' learning. However, there was currently a lack of data to determine which teaching practices actually supported learning in inclusive classrooms (Finkelstein, 2021). Shanmugavelu Ganesan discussed the effectiveness of teachers' classroom questioning skills. Correct questioning skills were very important in the teaching process (Shanmugavelu, 2020). Kettler Todd believed that teachers' implicit understanding of creativity might be inconsistent with the current understanding based on creativity and research characteristics related to creative students (Kettler, 2018).

Goh Edmund reviewed the factors that hinder university scholars from incorporating new Information and Communication Technologies (ICT) into their teaching methods, and discussed how to overcome these problems (Goh, 2020). Shatri Zamira Gashi discussed the advantages and disadvantages of using advanced IT to teach primary and middle school students (Shatri, 2020). de Jong Peter GM provided suggestions on how to select the right content and evaluate the quality and practicality of classroom teaching as well as actually create integration in existing courses (de Jong, 2020). Vahedi Zahra investigated students' use of information and communication technology in the classroom, their motivation for using it, their views on it, and their attitudes towards limiting and integrating it in the classroom (Vahedi, 2021)]. IT covered a wide range, and its impact on classroom teaching mode was also extremely far-reaching. Previous studies not deeply explored the application of IP in classroom teaching mode, and there were still some limitations in actual operation.

IT has brought unprecedented pressure as well as development to classroom teaching mode. The society needs development and progress, and the classroom teaching mode also needs continuous improvement and growth. The application of IP in classroom teaching mode has also been studied by many scholars. Blikstad-Balas Marte explained how and for what purpose teachers used technology in daily teaching, which provided important insights for students to cultivate what kind of digital literacy (Blikstad-Balas, 2020). Liu Haixia investigated the internal and external factors affecting the use of technology teaching among Chinese teachers (Liu, 2018)]. Akhmedov Bekjan believed that IT made a breakthrough and brought chances to reconstruct the language learning/teaching environment (Akhmedov, 2020).

Kurbonov Gulomjon Gafurovich explored the role of IT in geometry teaching (Kurbonov, 2021). DeCoito Isha believed that technology could not be effective in the classroom without teachers who understood both technology itself and its educational goals. Although technology were increasingly used, the improvement of learning through application should still be the goal (DeCoito, 2018). Olimov Shirinboy Sharofoviya believed that modern teaching IT was not the technology of students but the technology of teachers. Students did not learn modern IT but use their products as technical means of teaching (Olimov, 2022). Siyam Nur used the technology acceptance model to explore the factors that affected the acceptance and actual use of technology by special education teachers (Siyam, 2019). The existing classroom teaching mode was solidified and could not fully meet the teaching needs. Based on the promotion of IP to classroom teaching mode, this paper studied it.

To reflect the positive role of IP in promoting the development of classroom teaching mode and cultivating students' attitude towards learning, this paper used a controlled experiment to conduct research. Since the third test, the average score of boys exceeded the passing line and reached 67 points. The average score of girls was still the same as that of the second test, and the score was still 71 points; in the fourth test, the average score of boys was 6 points higher than that of girls' 69 points, with a score of 75 points; the average score of boys in the last two tests reached the excellent rate and was higher than that of girls. On the whole, the average score of girls fluctuated between 65-75 points. It could be seen that IP technology could promote classroom teaching and have a good impact on performance.

2. EVALUATION OF IP AND CLASSROOM TEACHING MODE

2.1 Common methods of IP and common software applications

IP refers to the technology that computers analyze images to obtain the desired results. The common methods of IP include six categories. Figure 1 shows the common methods and common software applications of IP.

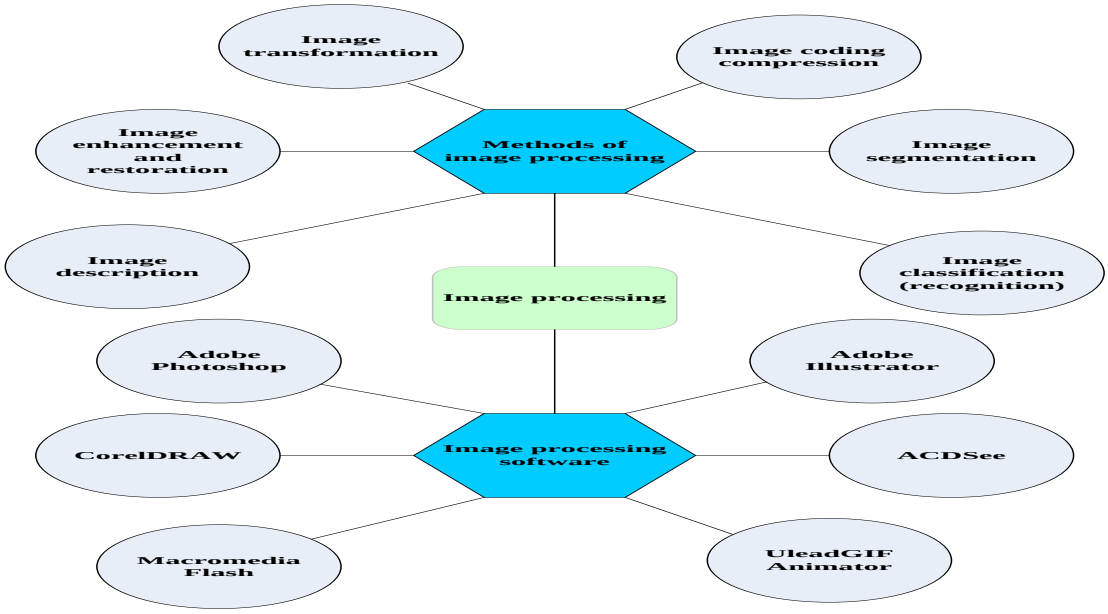

Figure 1: Common methods and software applications of IP

Among them, edge detection is a research hotspot for extracting edge image information in IP technology. There are many algorithms for edge detection. Edge detection can effectively explore the edge of digital images. Therefore, edge detection is often used to detect image edge information. For IP, edge detection can be called a good helper.

In general, the step edge is related to the local peak value of the first derivative of the image. The measure of function change is called gradient, which is the two-dimensional equivalent of the first derivative. The vector can be defined in Formula 1:

$$D(m,n)=\begin{bmatrix} D_m \\ D_n \end{bmatrix}=\begin{bmatrix} \frac{\partial d}{\partial m} \\ \frac{\partial d}{\partial n} \end{bmatrix} \quad (1)$$

Among them, the vector D (m, n) is the direction of the maximum change rate when the function d (m, n) increases, and the gradient amplitude can be obtained as follows:

$$\left|D(m,n)\right|=\sqrt{D_m^2+D_n^2} \quad (2)$$

In practical applications, the gradient amplitude is usually approximated by absolute value:

$$\left|D(m,n)\right|=\left|D_m\right|+\left|D_n\right| \quad (3)$$

Alternatively, it can also be expressed as follows:

$$\left|D(m,n)\right|\approx \max(\left|D_m\right|,\left|D_n\right|) \quad (4)$$

2.2 Application of IP in classroom teaching mode

The IP technology studied in this paper was applied to classroom teaching mode as a teaching method.

In classroom teaching, many conceptual knowledge would often be met. Through IP, these conceptual knowledge can be abstracted into concrete. There are many methods of IP. With the development of modern IT, various IP technologies can be well integrated into the classroom teaching mode.

This paper listed four methods and techniques of IP in classroom teaching mode.

(1) A diagram showing the close combination of efficient synthesis and teaching activities

Teachers often need to rely on high-quality images or videos to attract students' attention. In reality, there are not many sources of high-quality pictures that are exactly consistent with the current teaching activities. Therefore, IP is used to synthesize high-quality images that are closely integrated with teaching activities, thus making them an auxiliary tool for teaching activities. For example, by using IP technology, one image can be easily synthesized into another image. Through image synthesis and reorganization, a new image is formed to show the knowledge principle.

Students can be invited to participate in the process of using IP to synthesize images. Students are invited to interpret and synthesize the development of each stage according to the requirements or characteristics, and then the teacher can synthesize them.

Before making a composite image, a new document should be created in the electronic device. The size of the document should be consistent with the size of the next print. The operation pictures are opened and dragged into the document in turn. According to the specific process steps or requirements, the pictures are arranged and placed. After simple processing, the new images can be obtained after printing. Images can also be used to decorate the classroom after class and create a classroom with a strong knowledge atmosphere, which has a good side effect on cultivating students' learning interests.

(2) Enlarging picture size and maintaining sharpness

When preparing for class activities, teachers often download the picture materials needed in the class process on the Internet in advance. However, the quality of pictures on the Internet is uneven, and some pictures have low resolution, which would become blurred after expansion; some pictures have too much memory, which would affect the viewing effect after compression. Therefore, IP technology can be used for processing.

After finding the corresponding image on the Internet, the teacher can drag it into the IP software to adjust the size, pixel and resolution of the image, and also fix the pixel of the image. Sometimes, by selecting the length and width ratio of the image, the IP software can automatically adjust the matching resolution and pixel for the image. That is to say, this can effectively save teachers' time of preparing for class after class, and make teachers spend more energy on how to have a good class, which can also improve the viewing effect of images.

However, it should be noted that if the size of the original material is relatively small, it would also contain fewer pixels. After the image is expanded by IP, the image would need more pixels. The added pixel is added to the processed image by the IP software after certain calculation, so the new pixel would be different from the original pixel, and the difference would be enlarged with the enlargement of the image. In other words, if a small image is enlarged too much, it would cause the image to be blurred, because the pixel of the image would change.

(3) Improving picture quality to meet classroom needs

The pictures collected by teachers in preparing lessons may not only meet the situation of size mismatch, but also meet the situation of mosaic, color bias, and lack of clarity. Therefore, it is also necessary to use IP technology to filter, adjust and replace the filter, which can effectively reduce the noise of the image. This can change the color of the image and enhance the definition, so as to improve the image quality and meet the requirements of the content of classroom activities.

(4) Displaying research results using IP results

Scientific research spirit is a very important and urgent spirit in modern society. Quality education pays attention to scientific education. In classroom teaching, it is necessary to constantly cultivate students' scientific research spirit. By independently consulting relevant image materials and using

IP to synthesize the image information related to the course, students' hands-on ability can be trained. Students' interest in IP can also be aroused and learning enthusiasm can be mobilized. For students, intuitive image display would be more interesting and easier to accept than dull concepts. Through the observation of interesting pictures, students' interest in scientific research can be effectively excavated, and the foundation for various scientific research achievements of popular science can be laid.

With the development of IT, the classroom teaching mode has launched a new cognition and orientation. The integration of IP technology and classroom teaching mode is a entry point to improve students' learning performance, and the development of IP also facilitates the classroom teaching to better display picture materials. The advantages of IP in classroom teaching activities are very obvious.

3. EXPERIMENTAL EVALUATION OF CLASSROOM TEACHING MODE UNDER THE APPLICATION OF IP

(1) Comparative experiment on classroom teaching model

This paper selected two classes of students from a certain school for a comparative experiment. The class adopting the traditional classroom teaching mode was set as the control group, and the class introducing the IP technology was set as the experimental group. The change of students' academic performance and the interaction within one month were studied. Table 1 was a comparison table of the basic conditions of the experimental class and the control class.

Table 1: Basic information of the experimental class and the control class

Class status		
	Experimental class	**Control class**
Total number of people	48	48
Number of male	28	24
Number of female	20	24

i. The change of students' performance in the experiment

Figure 2 and Figure 3 showed the change of average scores of students in the two classes before and after the experiment. After a one-month experimental period, the students in two classes were tested, and the results were shown in Figure 2 and Figure 3.

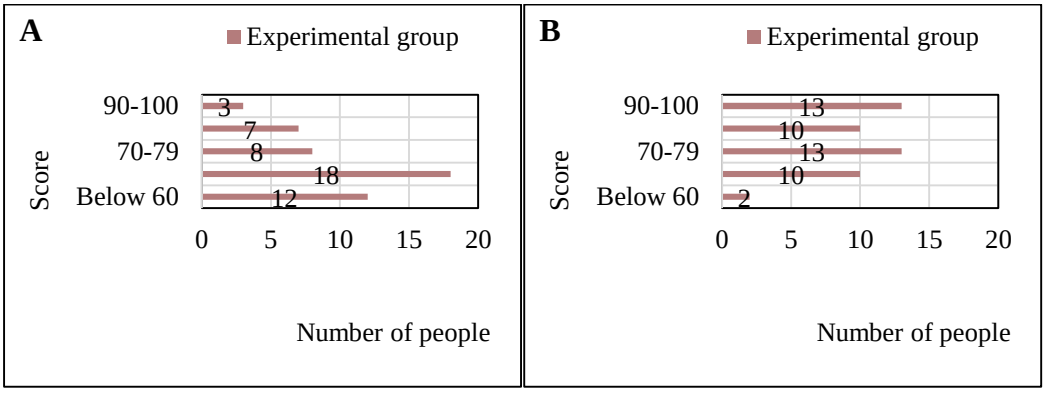

Figure 2: Comparison of achievement changes in the experimental group

Figure 2A shows the results of the students in the experimental group before the experiment

Figure 2B shows the results of the students in the experimental group after the experiment

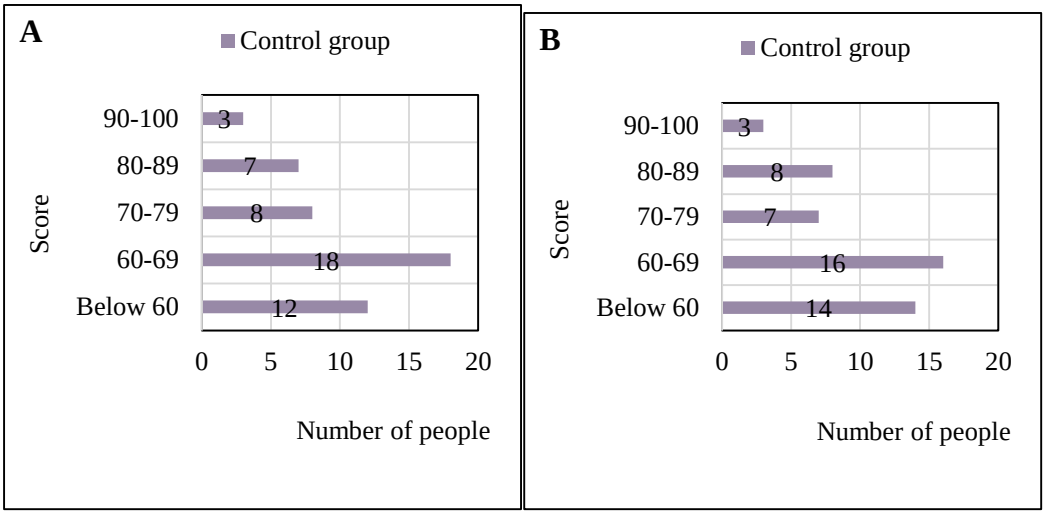

Figure 3: Comparison of achievement changes in the control group

Figure 3A is the students' scores in the control group before the experiment

Figure 3B is the students' scores in the control group after the experiment

It could be seen from the data of the two groups of comparison charts that the students in the experimental class who introduced IP technology made significant progress. The results of the two tests of the students in the control class using the traditional classroom teaching mode fluctuated little and the response was flat. Before the experiment, the learning performance of the students in the two classes was the same. The number of students with average scores below 60 was 12. The number of students with average scores between 60 and 79 was 26, while the number of students with excellent scores above 80 was 10. The data in Figure 2 showed that one month after the introduction of IP technology, the scores in the experimental class changed significantly. The number of failed students changed from 12 to 2, and the scores of 10 students were improved. The number of people with an average score of 60-79 was 23, and the change was not too big. However, the number of people who reached the excellence rate reached 23, and 13 people made significant progress. The data in Figure 3 showed that one month after the experiment, the number of students who failed in the control class increased instead of decreasing, and the number of students changed from 12 to 14. There were 2 people whose grades fell behind. The number of students at the middle level was the same as that of the experimental class after the experiment, with the same number of 23. The number of people with more than 80 points was 11, and only one person made progress. It showed that most of the students in the control class had stable grades and were in the middle and lower levels.

The students in the two classes before the experiment had the same grades. However, after the introduction of IP technology in the experimental class, most of students made progress. The average score in the control class using the traditional classroom model not changed much. It could be seen that the IP technology supported by IT could effectively promote students' learning effect and improve classroom efficiency.

ii. **Interaction of students in the experimental class**

To explore the role of IP in classroom teaching mode, its impact on classroom teaching needed to be observed. Therefore, this paper also recorded the number of teacher-student interactions in the experimental class that introduced the classroom teaching mode of IP technology and the control class that maintained the traditional teaching mode. The impact of IP on classroom teaching mode was reflected by comparing the number of times of interaction in the two classes after the experiment, as shown in Figure 4.

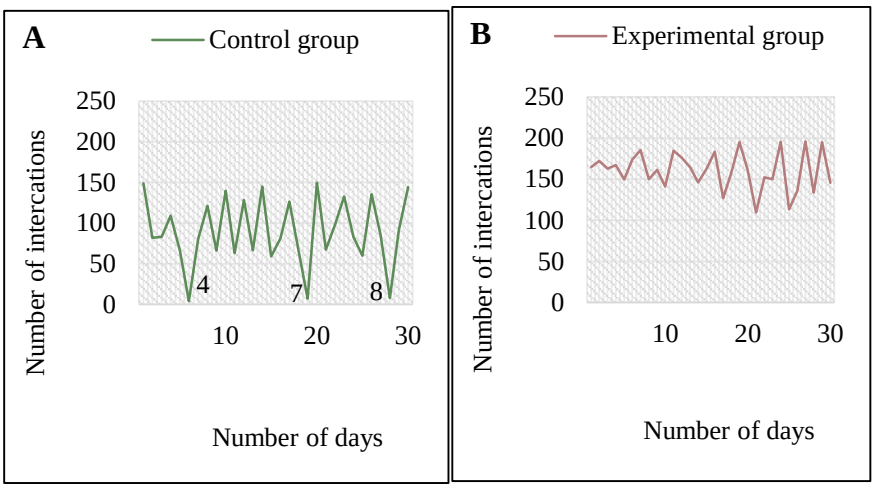

Figure 4: Interactive comparison between teachers and students

Figure 4A shows the interaction in the control group

Figure 4B shows the interaction in the experimental group

By looking at the data in Figure 4, in the traditional classroom teaching mode, the number of interactions in the control class for three days was significantly lower than the average level. The number of interactions during the whole day was only 4, 7 and 8. Such data results were not good for students' and growth. For the experimental class, as a whole, it could be seen that the number of interactions between students and teachers in the experimental class was significantly higher than that in the control class, and the number of interactions was relatively stable. The interaction was not too low. In view of the current "student-centered" teaching concept, good teacher-student interaction was conducive to mobilizing students' thinking and cultivating a rich classroom environment and a warm classroom atmosphere, so that students could learn in happiness and grow in thinking. IP could effectively mobilize students' enthusiasm to participate in the classroom, which could also enhance the classroom atmosphere.

iii. Classified teaching of students in the control class

In order to more truly and accurately reflect the impact of IP on classroom teaching mode, this paper also classified the control class that adopted the traditional classroom teaching mode. According to Table 1, the total number of students in this class was 48. Among them, there were 24 boys and 24 girls. The boys in this class used the classroom teaching mode of introducing IP for teaching, while the girls in this class still used the traditional classroom teaching mode for teaching. The experimental period was one month. During the experiment, six performance tests were conducted. The total score of each subject was used to calculate the average score and compare the change of the average score of boys and girls in the class, as shown in Figure 5.

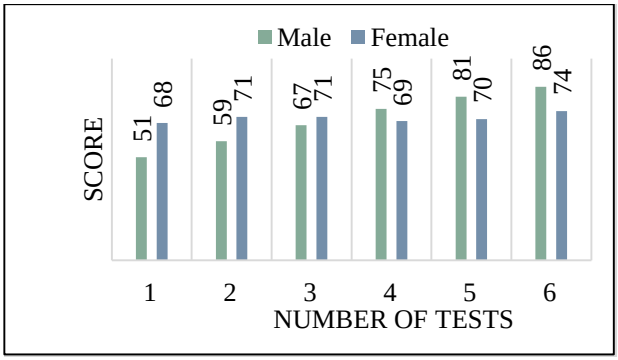

Figure 5: The performance of classified teaching

It could be seen from the data in Figure 5 that the average score of girls in this class was higher than that of boys in the initial stage of classified teaching. The average score of girls in the first test was 68 points. The average score of boys not passed, with only 51 points; the average score of girls in the

second time was 71 points. Although the average score of boys failed, it was 8 points higher than the first time, with a score of 59 points; from the third test, the advantages of the classroom teaching mode supported by IP technology began to manifest. The average score of boys broke the pass line and reached 67 points. The average score of girls was still the same as that of the second test, and the score was still 71 points; in the fourth test, the average score of boys began to catch up with girls, which was 6 points higher than the average score of girls of 69. The score was 75; the average score of boys in the last two tests reached the excellent rate and was higher than that of girls. Overall, the average score of girls fluctuated between 65-75 points. They would not fail, but there was no higher excellent rate than 80 points. Boys made great progress after receiving the one-month classroom teaching mode of IP, and the improvement of boys' performance was gradual rather than overnight. It could be seen that IP technology had a promoting effect on classroom teaching and had an impact on students' performance.

(2) Questionnaire

i. Questionnaire reliability

In order to truly reflect the impact of IP supported by IT on classroom teaching mode, this study carried out a survey on the students of the two classes. It aimed to reflect the influence of IP on classroom teaching mode through students' attitude towards IP technology. The total number of this questionnaire was 96, and the total number of valid questionnaires included in the statistics was 96. The questionnaire results were analyzed by Statistical Product and Service Solutions (SPSS) software, and the Clonbach coefficient α was selected as the reliability coefficient. The Cronbach coefficient α of the questionnaire was 0.918. The data showed that the questionnaire in this study had good reliability.

ii. Questionnaire results

This study investigated the attitudes and roles of students in two classes on the introduction of IP technology into classroom teaching, as shown in figures 6 and 7. Figure 6 showed the proportion of students' willingness to introduce IP technology into classroom teaching, and Figure 7 showed the role and impact of IP on classroom teaching mode (multiple choices were allowed).

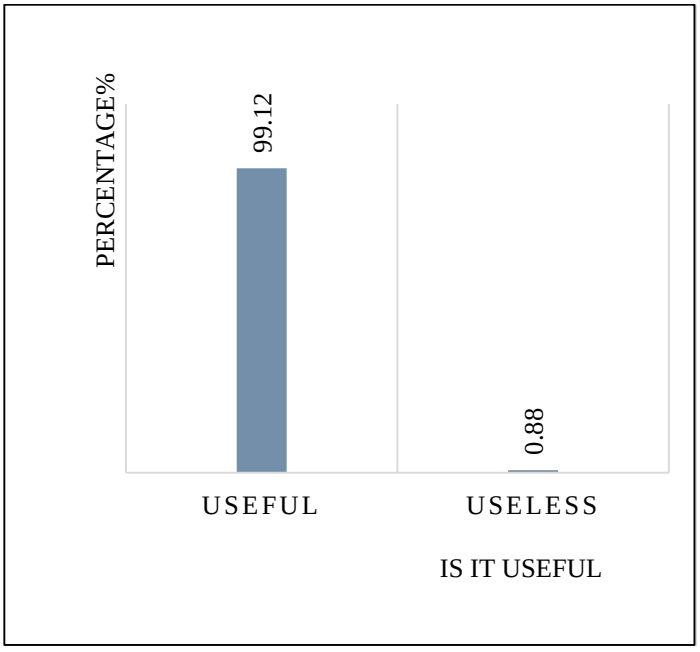

Figure 6: Students' opinions to introduce IP technology into classroom teaching

In Figure 6, 99.12% of students thought that IP technology had an obvious effect on classroom teaching mode. Only 0.88% of the students said they had no effect. This proportion was too low and could even be ignored in the total number of people. It could be seen that after this experiment, the students in both classes expressed a good feeling for IP technology. IP technology could indeed promote the development of classroom teaching mode.

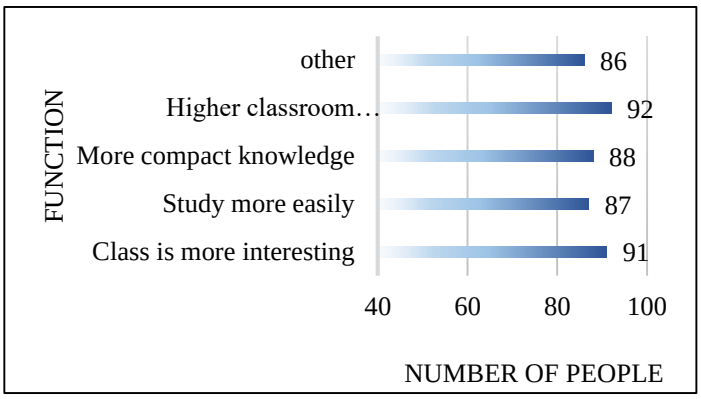

Figure 7: Investigation of the role of IP technology

Figure 7 showed that 91 students think that IP technology made the classroom more interesting; 87 students thought that IP technology made classroom learning easier and classroom environment more interesting. Students could naturally engage in learning at a deeper level, and concentrate on learning to make learning more free and handy; the number of people who thought that IP could make the learning points more compact was 88, because IP could effectively integrate image knowledge and summarize similar knowledge. Classified memory was more conducive to students' learning and absorption; the number of people who thought that IP could make the classroom more efficient was up to 92, and 86 people put forward other functions of IP technology. This fully demonstrated the role and importance of IP in promoting classroom teaching mode.

In this paper, the data from the contrast experiment and the questionnaire jointly proved that the IP technology could promote the classroom teaching mode. The purpose was to find the application results of IP supported by IT in classroom teaching mode. The experiment proved that IP could help the classroom teaching mode develop better, which played a icing on the cake role for the existing classroom teaching mode. It could not be denied that IT brought the renewal and reform of classroom teaching mode. There would be more emerging technologies in social development. If the classroom teaching mode wanted to keep pace with the development of IT, it needed to follow the development of IT to introduce IP technology, so as to make the classroom teaching mode construction better.

4. CONCLUSIONS

The update speed of IT is unexpected. IP has also achieved rapid development in the rapid change of IT. IP could not only effectively enhance the interaction, but also inspire students to think seriously and fantasize actively. This was crucial for implementing the policy of quality education. However, there were some problems in this study while achieving certain results. First of all, due to the urgency of time, the time of this experiment was not long, which might lead to some errors in the experimental results; secondly, in terms of experimental data collection, this paper only selected the data of a certain school as the experimental data, and did not consider the situation of other classes in other schools. The experimental data volume was small and not representative. Finally, the problems existing in the classroom teaching model had a long history and could not be solved overnight. However, with the development of IP technology of IT, it was believed that the solution of these problems would be within reach. To understand the impact of IP technology in the classroom teaching mode at a deeper level, the analysis results would be further improved in the follow-up research based on these issues.

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