



Mining Analysis of Online and Offline Teaching Modes in Colleges and Universities Under the COVID-19 Epidemic

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Abstract. Based on the big data sample of online teaching and questionnaires in a university in Chengdu before and after the epidemic, this paper analyzes and comes up with the advantages and disadvantages of online teaching and online and offline combined teaching, summarizes the impact of changes in teaching modes on college students' study and life against the background of the epidemic, uses SPSS (Statistic Package for Social Science) software to sort out and statistically test the data, analyzes the advantages and disadvantages of different online and offline teaching modes before and after the COVID-19 epidemic, and puts forward reasonable suggestions for the online and offline combined teaching mode.

Keywords: COVID-19 epidemic · Online teaching · Mining analysis · SPSS

1 Introduction

In the face of the sudden outbreak of the COVID-19 epidemic, China's school education was once fully online and this was the only feasible option to suspend classes without stopping learning. This road of teaching, which has never been taken in the history of Chinese education, affects hundreds of thousands of schools, nearly 20 million teachers, and hundreds of millions of students across China [1]. With the full rollout of online education, various new online teaching software and teaching modes for teachers' morality have been launched. In particular, the choice of online education platforms in colleges and universities is more diverse. There are public platforms such as the Treenity that is common across the country and there are network platforms and methods independently developed by schools and selected by teachers. But can the forward movement in the bewildering background go farther after the epidemic is over? This paper takes the data of online education and learning platform for students of a university in Chengdu as the research object, and conducts a mining analysis of students' online learning data during the epidemic period and the post-epidemic period (the data during the epidemic period

Fund: Sichuan University Student Innovation Training Project "Mining Analysis of the Use of Online Education Platforms in Colleges and Universities before and after the COVID-19 Epidemic" (S202114389128).

CLC number: G434; Document identification code: A.

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A. Volodin and I. Roumbal (Eds.): ICECIDT 2022, ASEHR 677, pp. 391–399, 2023.

https://doi.org/10.2991/978-2-494069-02-2_43

is from March 2020 to July of that year and the data during the post-epidemic period is from October 2020 to the present). At the same time, a questionnaire survey is used for college students of different grades [2]. The data analysis uses SPSS software for data processing, frequency statistics and data verification, unified analysis of models and data, analysis of the advantages and disadvantages of online and offline teaching modes, and the most suitable teaching mode for students.

2 Data Specification

It directly summarizes the data of the epidemic period and the post-epidemic period exported by the online education platform. The data includes the student's name, major and class, course name and number, the length of time the student watched the video, the completion of the homework, etc. There are 4,000 pieces of data in total. The questionnaire is in the form of an online questionnaire. The questionnaire includes the student's name, major and grade, used online education Apps, satisfaction with each App, experience with the school's dual-mode online teaching, and suggestions for online or offline teaching, etc. There are 1,000 pieces of data in total. All the obtained data are firstly cleaned to eliminate invalid data.

3 Analysis of Teaching Mode

3.1 Summary of Online Teaching During the Epidemic Period

The teaching interactive platform chooses the online mode of teaching and "Tencent Meeting" provides a platform for online teachers to live broadcast. The online teaching platform is used for general course learning and homework completion. The online teaching period is to use modern information technologies such as the Internet and multimedia to interact. The application of the Internet brings more excitement to the teaching classroom [3]. Online classroom makes teachers' teaching and students' learning more flexible and changeable, and students have a more autonomous and personalized learning experience, which is no longer limited to teachers. Teachers and students can freely arrange the location of the class and students can grasp the learning progress according to their own knowledge and ability. According to the results of the questionnaire, 60%–65% of the students use mobile phones for class, and about 35% of students use laptops or tablet computers for class. In addition to the fixed courses arranged by the school's educational administration system, online teaching can realize the sharing of high-quality teaching resources. Students can replay relevant videos on the teaching platform according to their own learning conditions, and at the same time, they can study by themselves after class and discuss their doubts with teachers at any time through the Internet.

Through data analysis in the background, the school can evaluate teaching more accurately and continuously improve the teaching plan. However, online teaching in colleges and universities faces many problems. The most important thing is that students' learning environment and learning methods have changed. Online teaching mainly relies on students' self-awareness and self-management ability. A large number of students don't

have a deep understanding of online teaching and the quality of online teaching is uneven. Many students are still not used to online teaching and gradually feel less enthusiastic and less active from the feeling of freshness in the beginning, resulting in a low quality of online learning. At the same time, during online teaching, teachers and students are in a state of spatial separation. For students with poor self-management ability, it is difficult for teachers to grasp the real learning state. At the same time, the flexibility and complexity of teaching have brought challenges to the teaching management of colleges and universities, and there is a lack of corresponding exploration and practice in the student assessment system [4].

In addition to subjective conditions, the limitations of objective conditions can't be ignored. Judging from the responses of the questionnaire, some students encounter a stuttering or delay in the live broadcast class due to network reasons, and some teachers are not proficient in the use of live broadcast equipment, resulting in incorrect debugging. In remote rural areas, power outages often occur. Students here are not very receptive to online teaching, which leads to different learning experiences for students in different areas, resulting in inconsistent learning progress.

3.2 Summary of Online and Offline Combined Teaching in the Post-epidemic Period

The online and offline combined teaching mainly includes traditional classroom learning and online learning methods using Internet platforms and information technology. It uses information technology to combine "online + online" teaching. In this mode, the scientific and technological resources of the traditional classroom and the Internet can be combined to meet the learning needs of different students. When teachers conduct online teaching, they can show some rigid formulas and theorems in other ways, so that students can easily understand and accept them. The teaching of theoretical professional courses is mainly based on online teaching, which enhances the influence of a good atmosphere of mass learning on students' attending class [5]. The practical activity class is mainly based on offline teaching and students can browse related resources through the Internet to achieve resource sharing. Physical education that can't be completed by online education can be completed by offline education, while the teaching of traditional knowledge in the past should be completed by online education.

The online and offline combined teaching not only solves the problem of online teachers' grasp of the classroom, ensures the learning effect of students, and effectively meets the needs of students, but also improves students' autonomous learning ability and self-management ability.

4 Data Mining Analysis of Teaching Mode

4.1 Data Statistics of Learning Duration During the Epidemic Period and Post-epidemic Period

As shown in "Table 1", according to the data, the learning duration of online teaching during the epidemic period is between 175–225 h, and the learning duration of about

Table 1. Data of online learning duration during the epidemic period and post-epidemic period, unit: hour

Data arrangement	Online learning duration during the epidemic period	Online learning duration during the post-pandemic period
Mean value	183.49	59.27
Median	176.00	62.17
Mode	3	3
Standard deviation	46.69	63.76
Minimum	47.10	0
Maximum	267.37	157.00

210 h accounts for the highest proportion, reaching 36%. Through the data in the post-epidemic period, it can be found that most of the students' online learning duration is in the range of 50–80 h, accounting for 66%. The proportion of students who study for less than 20 h reaches 2.3%, the success rate of homework submission reaches 82%, and the proportion of students who submit 0 assignments is 4.6%. Therefore, through the analysis, it can be concluded that during the epidemic period, the use of online teaching methods has increased the use of online teaching platforms by students. Due to the different circumstances of students of different classes, the different ways of attending classes will affect the learning duration [6]. In the post-epidemic period, schools have adopted an online and offline combined teaching mode, and some courses for students need to be conducted in offline classrooms, thus reducing the use of online teaching platforms.

4.2 Check Analysis of Students' Online Learning Duration of Different Grades

Due to the fact that there are few courses for senior students and the school arranges internships, the data analysis of this research doesn't include senior students. The results show that during the epidemic, there is a significant difference between the online learning duration of junior students and freshmen, and the average online learning duration of freshmen is higher than that of junior students. In the post-epidemic period, there is no significant difference between the online learning duration of junior students and freshmen [7, 8].

It can be seen that the impact of online teaching on senior students is higher than that of lower grade students. After getting acquainted with university life, the senior students don't pay more attention to learning than the lower grade students, and their learning attitude towards online teaching is not as correct as that of the lower grade students. However, there is no significant difference in the impact of online and offline combined teaching on senior students and lower grade students. It can be seen that the students' degree of academic completion is higher under the school regulations and teachers' requirements than in the unwatched phase.

Table 2. Analysis of factors affecting students' online learning

Influencing factors	Counts	Frequency	Influencing factors	Counts	Frequency
Weak willingness to attend classes	73	10.7%	Being addicted to electronics	11	1.6%
Lack of learning conditions	28	4.1%	Having no time for class	125	18.2%
Network stuttering	147	21.5%	The rest	209	30.5%
Environmental disturbance	92	13.4%	Total	--	100%

4.3 Analysis of Factors Affecting Online Learning Duration

According to the results of the questionnaire survey, there are many factors that affect the students' online learning duration, such as the lack of self-learning willingness, network stuttering, lack of online learning conditions, and large environmental disturbance. As shown in "Table 2", a multi-option frequency analysis is carried out on the factors affecting students' learning duration, and after excluding other factors, from the output data, it can be seen that network stuttering and no time for class account for a large proportion, accounting for 21.5% and 18.2%, respectively. It can be told that the disadvantage of online teaching is mainly that many students are not self-conscious and think that online education is unwatched, which leads to lax thinking [9]. Or many students think that online teaching is not important and their willingness to take classes is not strong, and this part accounts for 10.7%.

4.4 Comparative Analysis of Online Teaching and Online and Offline Combined Teaching

As shown in "Table 3", the testing of output results shows that the significant level value is 0, that is, the students' learning duration and homework completion are not significantly related to the test scores. In other words, students can get good grades in final exams even though their online learning duration is not up to the standard time. Through the investigation and analysis, it is found that students have a fluke mind in the process of online learning. During the final exam, there are cases of answers of violations, such as using the Internet to search for answers or asking for help from classmates. The grades thus obtained influence the results in the sample statistics. It can be seen that online teaching is not conducive to teachers' comprehensive evaluation of students, and it is impossible for teachers to see the overall situation of students' learning. At the same time, those students who study hard and achieve the same results have an unequal mentality [10, 11].

According to the survey data, about 40% of students study online more freely, with greater autonomous choice, which is better than the traditional offline teaching mode. About 50% of students believe that online and offline combined teaching is better than single online teaching and believe that the online and offline combined teaching method

Table 3. A test between learning duration and test scores

Test result	Value	df	Progressive Sig. (two-sided)
Pearson Chi-Square	37.763a	6	.000
N in a valid case	3289	–	–

has more learning atmosphere and is conducive to their own learning. There are also about 10% of students who believe that the two modes have little impact on their own learning and they can complete their studies well [12]. Students put forward their own opinions on the online and offline combined teaching mode: The arrangement of online and offline classes should be more user-friendly. For example, when an offline class is arranged in the morning, the teacher will not arrange an online class on the same day, so that students don't need to carry laptops and other tools to complete the class, reducing the physical burden of students. During online classes, teachers should strengthen communication and interaction with students, pay attention to students' questions in the discussion area, give students timely responses, and pay attention to students' learning and homework completion.

5 Conclusion

For online learning, the time and counts of students logging into the online education platform vary, and they have a lot to do with the autonomy of the students themselves. In this case, through the data such as login counts, login time, and learning duration obtained through the background of the online education platform, based on the actual academic performance of students, it can be analyzed to determine whether the learning login time and learning duration meet the standards of online teaching, analyze the concentrated period of students' learning, and determine whether students use a one-time "courses cheating" method to complete online teaching. Teachers can analyze whether students are truly integrated into the classroom through the after-class discussion and the completion of task assignments in online courses and whether the acquisition of knowledge meets the requirements of teachers. Through the extraction of background data information, the problem data discussed by multiple students can be obtained and the problems raised by students at different stages can be recorded. Through data mining, it can be judged whether the questions raised by students match the current learning task. In addition to students' data, schools have access to teachers' data of giving lectures. Through the login clicks, learning completion and after-class assignments of the students in this class, it is possible to judge the teacher's dedication and attention to the class and mine and analyze which form of the class is the most popular among the students. Teachers can improve the future teaching design by analyzing the teaching mode of this class, so as to improve the learning efficiency of students. For courses with low completion of students, teachers should analyze the reasons, find out the reasons for the low learning efficiency of students, and draw corresponding solutions [13, 14].

In the combination of online and offline teaching, teachers should closely connect these two modes and rely on the Internet to complete teaching tasks. The online teaching

platform well supports the online teaching mode of classroom live broadcast and delivers functions such as student analysis, teaching management, resource delivery, video playback, synchronous and asynchronous interaction, etc. Students can adjust their learning progress in time according to their own learning situation. Teachers should be able to use these functions proficiently to present the lecture perfectly. For science courses and courses involving theorem proving and logical reasoning, teachers should mainly adopt offline teaching mode, use blackboard and other tools to display, and create an atmosphere of collective learning, so as to achieve better learning effect. At the same time, offline teaching helps students develop a systematic, scientific, and logical way of thinking, and group cooperation and discussion are conducive to cultivating students' ideas of unity and mutual assistance. It can be seen that the online and offline combined teaching mode eliminates the disadvantages of online teaching and offline traditional teaching and becomes a new teaching mode, which can better promote students' learning and development.

For teachers, schools should strengthen teachers' ability to use the Internet, improve teachers' informatization processing ability, and carry out special training for teachers on online teaching to cultivate teachers' use of live classes. At the same time, teachers should pay attention to the individual differences of students, adopt the principle of teaching students according to their aptitude, and seriously answer the questions left by them online and offline for students with different personalities and different classes. Teachers shouldn't measure students by grades, instead, they must understand and evaluate in many ways.

For students, both online and offline courses should be taken seriously and should not be neglected. Students should become the main body of learning and know the key points and difficulties well of this class in advance. In offline classes, they should pay more attention to the connection between knowledge points, deepen the understanding and application of knowledge points, improve the ability of autonomous learning, and make corresponding preparations according to their own level, so as to improve the enthusiasm of learning and ensure the quality of teachers' teaching.

The online and offline combined teaching mode will become mainstream teaching in the future. The epidemic situation is slowly improving, but both teachers and students must accept this "new mode" after the change in teaching methods. The online education platform will not die down like a wave. Teachers must seize this opportunity to comply with the requirements of the times, create more new conditions that are beneficial to teachers and students, improve the quality of classroom teaching, constantly update learning resources, and continue to carry forward the advantages of the "Internet + traditional curriculum" mode.

Authors' Contributions. Wenxi Liao wrote the paper, Yangli Liu and Yang Lei analyzed the data, and Song Luo participated in the data survey.

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