Inteligencia Artificial 23(66), 51-65
doi: 10.4114/intartif.vol23iss66pp51-65

INTELIGENCIA ARTIFICIAL

http://jounal.iberamia.org/

Student-centred webcast + home-based learning model and investigation during the COVID-19 epidemic

Mingyong Li[1], Ziye An[1], Miaomiao Ren[2,*]
[1] College of Computer and Information Science, Chongqing Normal University, Chongqing, 401331, China
[2] College of Computer Science and Engineering, Chongqing Three Gorges University, Chongqing, 404020, China.
[*] Corresponding Author: Miaomiao Ren 20181010@sanxiau.edu.cn

Abstract. With the rapid development of Internet technology, traditional online learning can no longer meet the adaptive learning needs of students. Through big data and learning analysis technology, artificial intelligence technology based on learning has gradually become a new research hotspot. How to further use these big data resources for adaptive learning and push to improve the quality of student training has become an important issue in the current research field. To support students' learning during the COVID-19 epidemic, schools have shifted completely from offline to online teaching. Students study online at home, so the family plays a vital role as a special classroom. Based on the analysis of factors affecting home-based learning, this paper compares live broadcast platforms and constructs a student-centered webcast + home-based learning model under the epidemic situation. Through the implementation effect investigation, the evaluation effect is good. It is hoped that this model can provide reference for teachers and students under the new situation and solve some problems of current online teaching.

Key words: COVID-19, Student-centred online teaching, Home learning, Learning model

1 Introduction

The coronavirus outbreak has delayed the opening of schools, education departments and schools across the country switch to online teaching activities [10]. The school's traditional classroom teaching has been transformed into web-based home learning, and the family plays a vital role as a particular classroom. Online teaching should focus on students' learning [11]. Therefore, while paying attention to teachers' online guidance, they also need to pay attention to students' home study, to achieve the best goals of teaching and learning online. On this basis, we analyze the influencing factors of home learning, compare each live broadcast platform, and construct a student-centred webcast + home learning model under the epidemic. The coronavirus outbreak has delayed the opening of schools, forcing education departments and schools across the country to switch to online teaching activities.

2 Related Work

Online learning behavior is one of the core research topics in the field of online education. Online learning behavior refers to various behaviors related to learning that occur in e-learning environment. At present, the environment of online learning behavior has evolved from e-learning environment and network learning environment to intelligent learning environment. Intelligent learning environment is student-centered and consists of intelligent hardware resources, learning tools, learning resources, teachers and students, etc. Intelligent learning space can support students to interact with learning resources or learning system at any time and any place, and can also provide

ISSN: 1137-3601 (print), 1988-3064(on-line)

personalized learning guidance and suggestions for students [1].

With the development of online courses and learning analysis technology, scholars begin to study online learning behavior with learning analysis tools to provide a basis for teaching intervention or optimization. For example, khan academy uses the learning analysis tool [2] to analyze the learning behavior of group or individual students and visually present the analysis results, so as to better optimize the learning process of students.

Course Signals System at purdue university uses a specific algorithm of academic success (SSA) [3], by analyzing the data of students' academic performance, interaction frequency, and scores obtained from course learning, the system gives reminders of students' academic status, and teachers give timely intervention to students to promote students to take self-optimization measures.

The student success system [4] of Desire2Learn institution in the United States accurately identifies students with academic risks by collecting and analyzing the data of students' attendance and course participation, and provides them with reports on learning status, learning warning, learning intervention and their corresponding intervention measures.

Through the Blackboard course management system, the university of Maryland (UMBC) [5] can detect and visualize students' learning time data, resource use data and comparison data with learning partners to help students understand their own learning and that of their peers, so as to promote self-reflection and adjust their learning.

EAdvisor TM [6], an online interactive tool developed by Arizona state university, uses student data to monitor students' progress in degree courses and provides necessary services and interventions to better meet students' needs or support their learning success.

In addition, some researchers monitor students' behavior data based on learning analysis technology, construct learning behavior intervention model or system, and apply it to learning practice to provide students with learning intervention or early warning. For example, the classroom teaching evaluation system based on face recognition technology is used to track and analyze students' participation in classroom learning, so as to provide personalized guidance and behavior correction services for students [7]. The learning behavior intervention model based on the learning behavior data of students can effectively identify the students in the state of learning crisis, which is conducive to timely issuing early warning signals and providing personalized intervention [8]. The adaptive online learning analysis model can accurately feedback the learning effect of students, recommend appropriate learning paths and learning resources for students, and provide personalized intervention [9]. The intelligent monitoring system model of network learning behavior can effectively monitor the learning behavior of remote students.

Wang Yuan [26] and others analyzed the adaptability of "teaching" and "learning", teachers, students, and teachers' platforms from the perspective of online teaching organization, implementation, and effect research. From the standpoint of updating educational concepts, teaching reform, teaching resources, and teaching design, Educational technology thinking provide a reference for online education and teaching research. However, the study of Wang Yuan and others only provides some ideas for teaching researchers in online teaching in a broad sense from their own practical experience. Taking the course of "Inorganic Chemistry and Chemical Analysis" as an example, Ma Xiaofei [25] and others adjusted the previous mixed teaching mode of "online and offline integration" to provide a "completely online" remote mixed teaching case to obtain real-time and efficient Teaching effect. This article is to refine the research direction into "completely online" teaching and provide practical instances for everyone. Song Lingqing [4] and others combed the factors of teachers' online teaching and students' home learning. Based on the interrelationships between these factors, they proposed a "teacher-parent-student" community framework model that promotes the quality of student learning. It analyzed the development stages and guidance strategies. On this basis, an explicit online teaching + home learning model based on the virtual community of the class is constructed. Although this article proposes a "teacher-parent-student" community online live teaching framework model, the report emphasizes more on the help provided by teachers, parents and other groups for students' home learning, and the guide description for students' home learning is more abbreviated. Based on this analysis, we make more detailed guidance for learners' home learning.

3 Influencing factors of home study in epidemic situation

From school learning to home learning, teaching organization and teaching relationship have

undergone significant changes. we need to consider the construction of home environment, equipment ownership, the study plan under a reasonable schedule and parents' constraints and other factors. On this basis, a self-made questionnaire was designed and sent to students in various sections in the form of an electronic survey, and 1100 valid questionnaires were recovered. According to the questionnaire data, the following analysis results are obtained:

3.1 Environment

Whether or not there is an independent learning space is the primary influencing factor for home study [12]. The survey shows that 54.64% of students have an independent learning environment

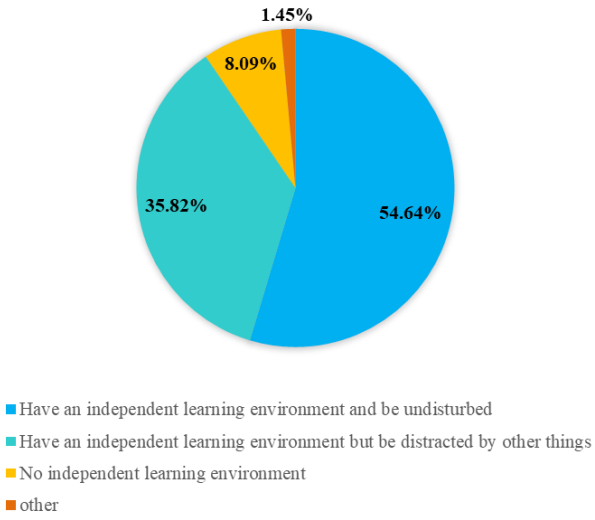

Figure 1. Home learning environment.

are not disturbed, while 35.82% of students have independent learning space but are easily disturbed by other things. For learners, according to their family situation, it is best to choose a study room. If there is no particular study room, you can choose a quiet and tidy place suitable for studying. It is best to be free from external interference and have a calm learning atmosphere. The learning environment is the beginning of formal learning.

3.2 Equipment

The electronic equipment owned by each region and family is different and electronic equipment suitable for watching webcast should be selected based on the family's conditions. With the advent of the "Internet plus" and "5G era", almost every home has a computer.

For college students who live at home, most of them have laptops, while those who don't have cell phones and other equipment, so they can use the existing equipment to study. Primary and middle school students at home can choose computers, tablets, mobile phones, and other devices to study. The survey shows that 88.55% of students choose to study by mobile phone, 57.55% by computer and 27.55% by tablet. Besides, we should also pay attention to the stability of webcast. Only by watching the streaming courses can we not affect our study mood. According to the survey, 82.27% of students have WIFI at home, and 43.73% have excellent and smooth network signals at home. Therefore, it is best to install broadband to use a wireless network, which is much faster than mobile phone traffic. As shown in Figures 2, 3, and 4.

3.3 Daily schedule

52.55% of the students had a fixed schedule, while the rest did not (see figure 5). Home learning natural lack of enthusiasm, more difficult to enter the state of learning, must have a reasonable life and work schedule and make the corresponding curriculum learning table, supervise themselves learning, but also to adequately protect the eyesight, do work and rest [13]. For college students with a specific self-learning ability, they can make themselves daily schedule based on the school's curriculum to form an

external driving force to monitor themselves.

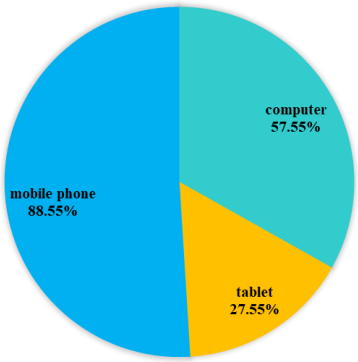

Figure 2. Usage of electronic equipment.

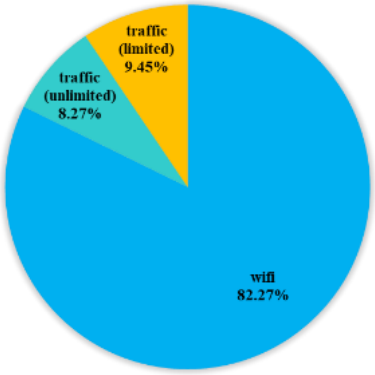

Figure 3. Network usage.

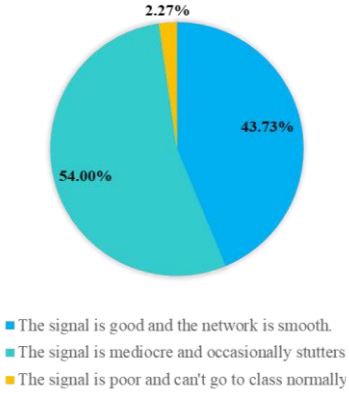

Figure 4. Signal situation.

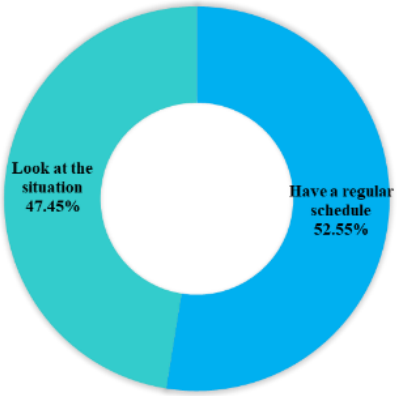

Figure 5. Regular schedule.

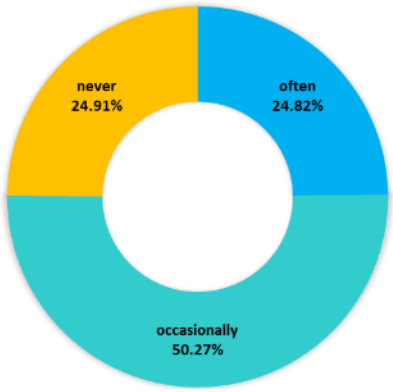

Figure 6. Parents' supervision of learning.

3.4 Parents

Parents should actively cooperate with the arrangement of the school and play the role of supervision, reminder, suggestion and feedback. The survey shows that 24.82% of parents often urge students ,and 50.27% of parents occasionally urge students. Besides, parents should also cooperate with the school to complete the daily learning video shooting, assist the teacher in supervise the learning and regularly shoot short videos to report the regular learning status to the school. They must also set an example for their children.

3.5 Teacher

Teachers are generally divided into three levels: young teachers who have just entered the profession, backbone teachers who have improved their development and teachers who are in a period of burnout [14]. For young teachers who have just entered the profession, they are enthusiastic and proficient in using modern network technology but lack of systematic knowledge of subjects. They should learn more about the subject knowledge and consult the subject leaders on the Internet. The backbone teachers of development and improvement are essential forces in special period. They have the potential to use technology to carry out teaching, so they should give full play to their enthusiasm to improve teaching effect. Teachers in the period of burnout are familiar with the subject knowledge, but they are not suitable for the new teaching methods and new technologies. Schools can adequately do the technical training

before the start of school, to make full preparation for successful teaching.

3.6 School

Schools, teachers and students are not prepared for the sudden outbreak. Schools should conduct pre-job training on teachers' relevant live broadcasting technologies [15]. Initially, the students' autonomy is weak and have not yet adapted to the network teaching method. Therefore, the school should formulate strict attendance system to mobilize the students' autonomy.

According to the analysis of the questionnaire results, students should build a family learning space centred on learning, a quiet and clean environment, functional network status, large-screen e-learning equipment and make a schedule suitable for themselves. Parents cooperate with school arrangement and supervise students appropriately. The school should train teachers on live broadcast technology, make them thoroughly familiar with the live broadcast platform, and specify strict attendance checking system to supervise students' learning and teachers' teaching.

4 Comparison analysis of live broadcast platforms

Before teaching, we should compare and analyze the major network platforms and choose the platform suitable for our own teaching, which has a good guarantee for the teaching process [16].

QQ group live broadcast is divided into two types: QQ video call and QQ classroom. The teacher side of QQ video phone can open the camera, share the screen and demonstrate the whiteboard. The student side can turn on the microphone to talk at any time. In the QQ classroom, the teacher can open the camera, share the screen, demonstrate the PPT and whiteboard. There are three modes of interaction: free mode: members speak freely; Host mode: the host can talk with the members openly; Microphone order mode: members queue up to speak. Tencent Class: the teacher side can open the camera, share the screen and present the PPT. Students can clock in, send text or voice speech. Course playback can also be generated automatically. Tencent Meeting: Teachers can open the camera, share the screen, demonstrate PPT and online blackboard writing. Students can speak through text, voice and video [17]. Ding Talk: Teachers can turn on the camera and share the screen. Students can speak by voice, video and watch course playback.

Table 1 is the comparative analysis of each live broadcast platform, and four selection criteria are listed based on full consideration of the advantages of each platform:

1.Whether the screen can be shared. Try to restore the real classroom status through the real-time classroom sharing on the screen, so that students have a real sense of scene and learning atmosphere [18].

2.Whether it is possible to interact with each other. Most of the platforms can be realized in text and voice communication, but video communication can be rarely achieved. The face-to-face proximity of video is very essential [19]. In the course of the course, teachers can ask students questions at any time in order to achieve the purpose of supervising students' learning.

3. Whether it has an online blackboard function. The online blackboard writing function can be used by teachers to restore the real classroom, especially for the detailed steps explanation of the subject.

4. Whether there is a course playback function. If you have questions about the course content, you can watch the playback record to help students review and consolidate the knowledge [20].

5 The design of student-centred webcast + home learning model

The model in Figure 7 consists of two parts: the teacher's live webcast teaching and the student's home study, the core of which is student-centred problem-based learning. The following will elaborate on the student-centred network teaching and home-based learning model from the six links mentioned above.

5.1 Preparation before the class link

5.1.1 Teacher behaviour

To ensure the smooth progress of teaching before class, teachers should make a good preparation for teaching. First of all, it is particularly important to choose a stable live broadcasting platform. After determining the platform, teachers should be familiar with the use of software in advance. Qualified teachers can also be equipped with a microphone, HD camera, and other equipment to prepare for formal teaching [15]. Secondly, the course content of home-based learning should be based on the principle of

Table 1: A comparative analysis of each live broadcast platform.

platform / function		QQ group		Tencent class	Tencent meeting	Ding Talk
		QQ video	QQ class			
clock in		√	√	√	×	√
Teaching method	share the screen	√	√	√	√	√
	Camera	√	√	√	√	√
	Online blackboard	×	×	×	√	×
	PPT presentation	√	√	√	√	√
Interactive	Text discussion	√	√	√	√	√
	Voice speech	√	√	√	√	√
	Video speech	×	×	√	√	√
playback		×	×	√	×	√
stability		√	√	√	√	√

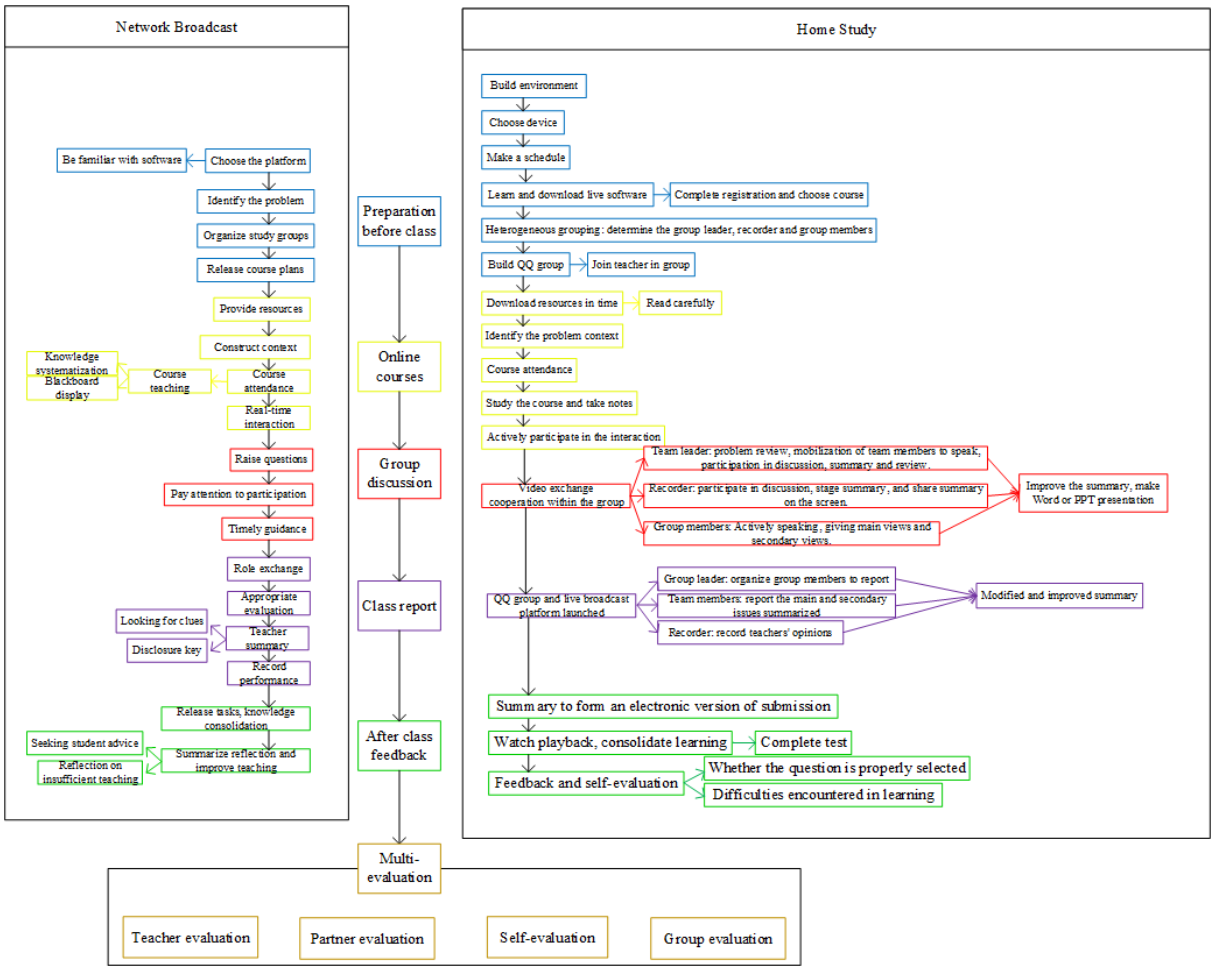

Figure 7. Student-centred webcast teaching + home study model.

"five education integration" [21] to select the knowledge suitable for students and find out the problems to be discussed. The focus of this lesson is to identify the problems. The key to the success of question

selection is whether there is scientific knowledge behind the question, and whether students can acquire problem-solving skills and develop the ability of independent learning in the inquiry of this question [22,23,24]. After the problem is determined, students in the class are assigned according to the principle of heterogeneity, to ensure that each group can solve the problem cooperatively and avoid affecting the outcome of the problem discussion due to the insufficient ability of individual students. The number of groups should be determined according to the class capacity, preferably composed of 4-6 people [23]. Finally, the teacher releases the course plan for the semester within the student group, and informs the required software and equipment, etc.

5.1.2 Student behaviour

Build your own study space before the class, preferably with a study room or a quiet room, with their favourite tablecloth, stationery and so on, to create a learning atmosphere, but also by the equipment with electronic equipment is choosing the most suitable for their own learning, and live in accordance with the requirements for teachers to download software, complete registration and add the corresponding courses. After the preparation measures are completed, you can refer to the daily work and rest schedule and make your own class schedule and life schedule to urge yourself to study. Then, the group leader and recorder (also known as text record) are defined for the group determined by teachers. The group leader is the leader and the core of each group. Students with charisma and strong learning ability can be selected. The recorder is responsible for summarizing and recording the speeches of the members. Finally, it can be considered that the files in the QQ group have the function of cloud saving. Each group should establish their own QQ group chat and pull the teacher into their own group, so that the teacher can supervise it.

5.2 Online courses link

5.2.1 Teacher behaviour

The online live course moves the traditional classroom to the virtual space [16,21]. Teachers can carry out teaching with the help of various media devices and immerse knowledge in the real situation. The "raise your hand and ask questions" link in the traditional classroom is truly reflected with the help of the met-arrangement function of the platform, and the abstract knowledge is presented to students in a concrete way, to fully mobilize students' various senses, enhance students' sense of experience, eliminate the de-contextualization factors in the traditional classroom, and further improve students' ability to solve problems. Before formal teaching, it is necessary to provide students with a series of course materials, including courseware, literature, e-books, lecture and other modern media resources, to stimulate students' learning enthusiasm, enable students to learn something, and make material preparations for the smooth development of teaching activities [25]. During the formal teaching, the course attendance should be carried out first. With the help of the platform's check-in function, every student can be ensured to attend the course. Teachers' course teaching is to sort out the logical relationship between fragmented knowledge, help students to build the overall framework of knowledge, and make use of tablet computers and other devices to visualize blackboard writing in the process of explanation. Among them, the most important thing is to observe the speech in the bullet screen area in real-time during the teaching process and answer the difficult questions in time after students' comments. Students can send text, voice or start video communication. Questions can also be asked at any time during the course to keep students alert and encourage them to learn. By means of bullet screen and questioning, teachers can grasp students' knowledge and learning status in real-time.

5.2.2 Student behaviour

Download the resources posted by the teacher before the course, and read the ones that help you. At the beginning of the course, we should sign in. After entering the class, we should understand the problem in the situation given by the teacher, find out the knowledge needed to solve the problem, take notes in class, ask questions in the process of the teacher's explanation, and give feedbacks to the questions raised by the teacher.

5.3 Group discussion link

5.3.1 Teacher behaviour

In terms of the selection of discussion topics, students have difficulty in discussing difficult questions, and too simple questions are not worth their time. Therefore, the moderately difficult issues in the course content are taken as discussion topics. In the process of student discussion, students should join the discussion group to observe whether their discussion is one-sided and whether their grasp of knowledge is accurate, and make appropriate guidance to prevent the formation of wrong ideas and affect the solution of problems [12].

5.3.2 Student behaviour

Use the video-sharing function in the online platform to communicate face to face to achieve internal cooperation. Firstly, the group leader reviews the problem and mobilizes team members to speak. Secondly, other team members took an active part in the discussion and expressed their views in the form of main and secondary views. During the discussion, the recorder made periodic summaries and records. Finally, the recording content will be shared and displayed, and the group leader will review and perfect the summary and make it into word or PPT.

5.4 Class report link

5.4.1 Teacher behaviour

When each group presents and reports, the teacher and other students become the audience, and the group reporter becomes the anchor and the teacher changes roles, so that students can experience as the host. During the reporting process, teachers should make appropriate evaluations and keep a good record of students' performance. After the students finish the report, the teacher makes a summary to help the students find clues to solve the problem and dig out the critical information. The teacher's role is mainly to supplement the students' explanation.

5.4.2 Student behaviour

Use QQ group to distribute electronic documents or PPT and summarize the contents of students, and display the report on the live broadcast platform. The team leader arranges the team members to report, and the reporter sorts out the team's results to discuss in order of the primary and secondary viewpoints. The process of analyzing problems not only exercises the communication skills, but also improves the critical thinking. Keep records of students' and teachers' evaluations, and make the final improvement work after class.

5.5 After class feedback link

5.5.1 Teacher behaviour

To prevent students from only paying attention to the live broadcast and ignoring the learning of knowledge, in order to achieve the systematization of fragmented knowledge, unit tests and chapter tests should be included in the release of course tasks. After students submit their homework, the platform will automatically generate learning result data, which dramatically saves time and facilitates teachers to make a scientific and accurate value judgment on students' knowledge mastery, to further improve and perfect teaching. Finally, students' opinions on the live broadcast process and content knowledge should be reflected on the deficiencies in the teaching implementation process, and the teaching should be revised and improved.

5.5.2 Student behaviour

Submit the final discussion summary as an electronic document. For problems that still exist after the course, you can watch the replay video or communicate with the teacher online to consolidate what you have learned and complete the test tasks in time. Based on the evaluation given by teachers on the platform, the author analyzes himself and finds out the weak links of knowledge. Give feedback to teachers on the issues in live broadcasting teaching, such as whether the problem selection is appropriate, the problems in the live broadcasting process and the difficulties encountered in learning, etc., and make

a good self-evaluation.

5.6 Multi-evaluation link

The system of multiple evaluations combines quantitative evaluation and qualitative evaluation, which requires teachers to treat students with the perspective of play and not only focus on results.

5.6.1 The teacher evaluation

Teachers' evaluation of students' learning process can refer to the display of data on the platform, including attendance times, number of speeches and discussions, number of activities and chapter test scores, etc. Teachers can also refer to the course performance records in the teacher's course.

5.6.2 Parents evaluation

In the process of home-based learning, parents are the main companions. They can observe the students' learning trend at any time and make evaluation according to the observation table provided by teachers.

5.6.3 Team evaluation

The performance of the group members in-class discussion was evaluated qualitatively according to the evaluation form provided by the teacher.

5.6.4 Self-assessment

The classroom participation, group collaboration and task completion in home-based learning can be recognized, and can be evaluated according to the observation table provided by teachers.

6 Investigation and research on the effect of the proposed model

To further understand the implementation effect of the student-centred webcast teaching + home study model, we used a self-made questionnaire to investigate the students of each segment. The content mainly involves: the adaptation of the live broadcast platform, teacher classroom implementation, student adaptability and other aspects. One month after the course, a survey was conducted. The questionnaire was distributed in the form of an electronic questionnaire, including 1100 valid questionnaires.

6.1 Adaptation of live broadcast platform

At the initial stage of live broadcasting, there were too many people, which led to more enormous pressure on the system [26]. During the live broadcasting, there were some phenomena such as jam, and the overall viewing effect was not smooth. After the teacher's continuous exploration, it is found that the use of live broadcast software under the big platform can better guarantee the stability. The primary platform tools are Ding Talk, QQ live, Tencent classroom, Tencent conference and so on. The distribution is shown in figure 8.

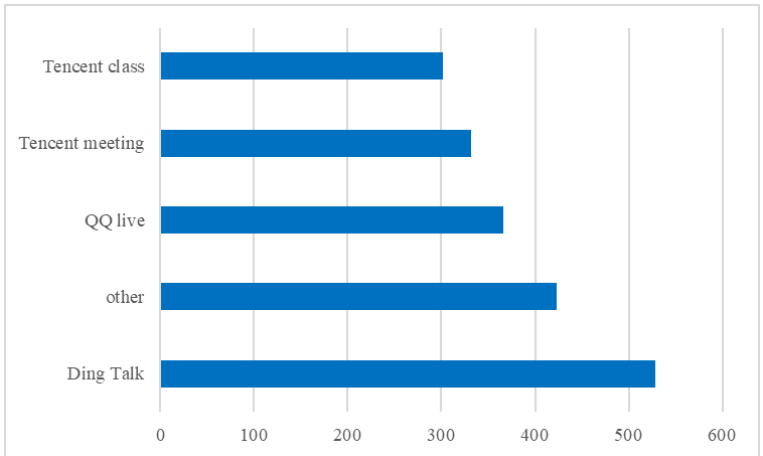

Figure 8. Selection of live broadcast platform.

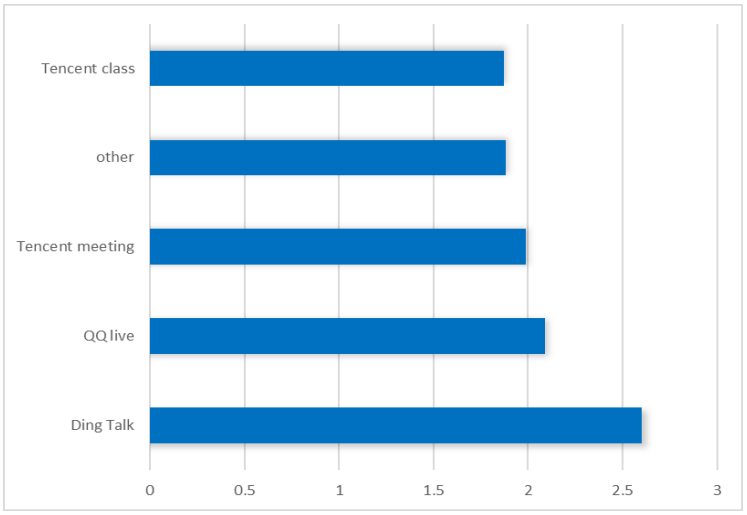

Figure 9. Students' evaluation of various live broadcast platforms.

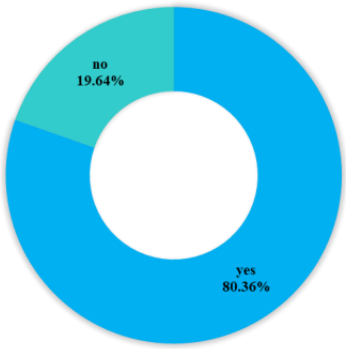

Figure 10. Attendance before class starts.

The evaluation results of students on the live broadcast platform show that Ding Talk's evaluation is significantly better than other live broadcast platforms such as QQ Live, Tencent Meeting and Tencent Classroom Platform, as shown in Figure 9.

6.2 Classroom implementation of Teachers

The result of the survey on whether teachers have pre-class check-in shows that 80.36% of teachers have pre-class attendance, as shown in figure 10.

According to the results of whether teachers provide learning resources before class (as shown in Figure 11), 95% of teachers can timely release curriculum resources, which are courseware, literature resources, e-books and other materials. The results of the survey on the materials promoting students' learning show that 40.55% of the students think the materials are helpful, while 55% think the materials are beneficial.

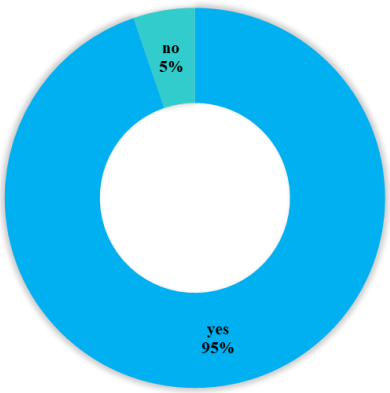

Figure 11. The release of course resources.

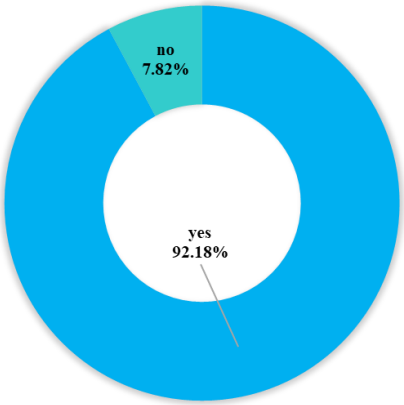

Figure 12. Whether the teaching has a definite goal and clear thinking.

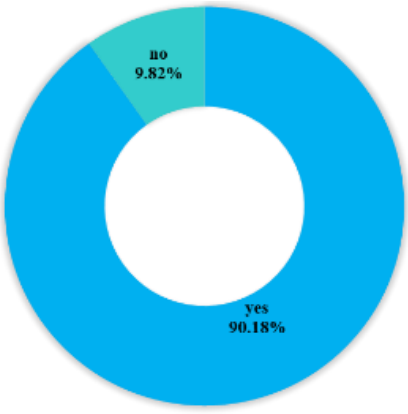

Figure 13. Teachers' attention to speech.

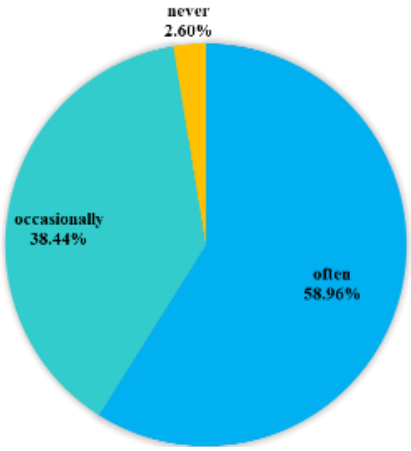

Figure 14. Questioning students.

The results show that 92.18% of teachers have bright goals and clear ideas for live teaching, as shown in Figure 12.

According to the results of classroom interaction, 90.18% of teachers pay attention to the speech in the bullet screen area in time, 58.96% ask students frequently and 38.44% occasionally, as shown in Fig13 and Fig 14.

6.3 Adaptation of student

There are vast differences in the motivation of home study, 48.27% of the students learn because they have classes, 6.91% of the students learn because they have homework and only 43.64% of them learn actively, as shown in Figure 15. Most of the students lack enough learning consciousness and self-discipline.

In terms of course participation, 49.09% of the students take the initiative to participate (as shown in figure 16), of which 81.18% chooses text participation, 40.36% chooses voice speech, and only 9.18% of the students chooses to turn on the camera to participate. In the classroom reporting, 49.82% of the students choose to apply actively as the reporter. At the end of the course, 55.09% student selected to watch the playback, as shown in figure 17.

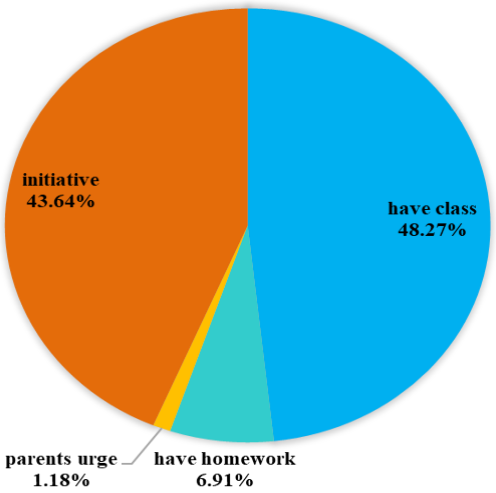

Figure 15. Distribution of daily learning motivation.

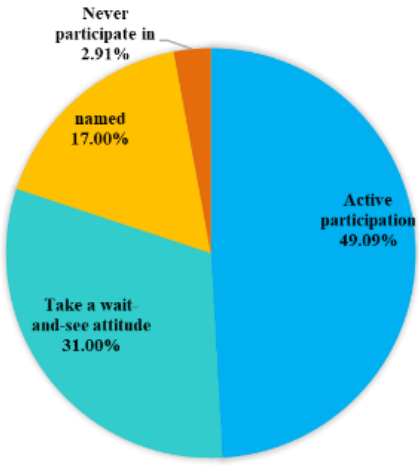

Figure 16. Students' participation in class.

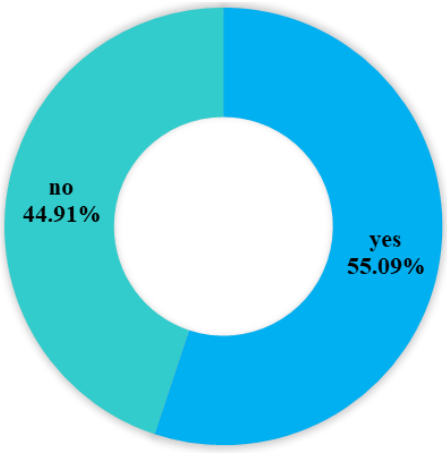

Figure 17. Watching the course playback.

6.4 Other problems

A survey of students' attitude towards live learning shows that 71.36% of students think that special methods should be adopted in special periods and 15.09% students think that this method is more suitable for themselves, as shown in Figure 18. The advantage of home-based learning is that it can overcome the limitation of time and space, the place of learning is not restricted and watch the playback of difficult knowledge, etc. As shown in figure 19. The deficiency of home-based learning lies in the lack of self-discipline of home-based online learning courses, the lack of face-to-face proximity and the impact of network speed. As shown in Figure 20.

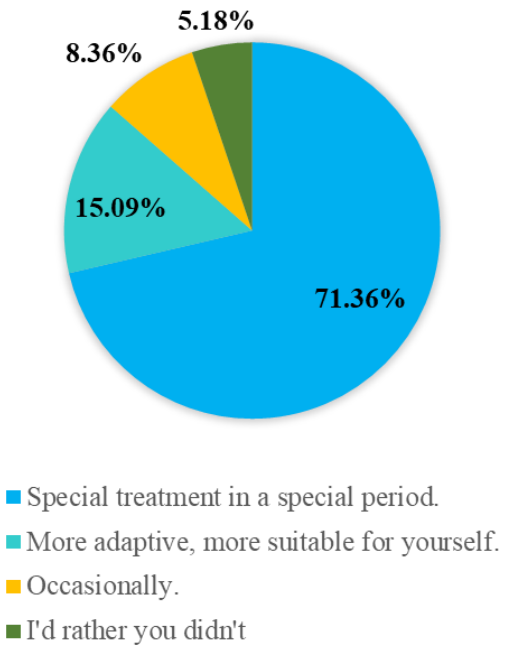

Figure 18. Students' attitude towards live broadcast learning at home.

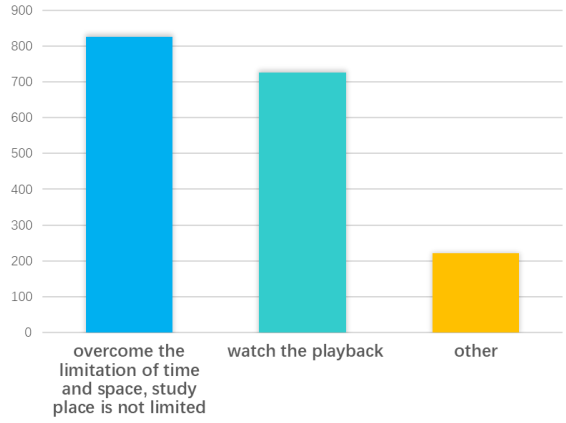

Figure 19. Advantages of home study.

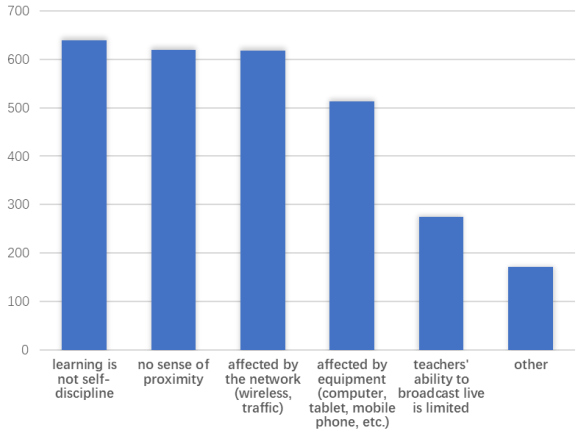

Figure 20. Deficiency of home study.

On the basis of research, it is found that teachers should choose the live broadcast platform under the large platform for teaching, such as the platform with proper overall evaluation. Students need to sign in before teaching, and provide all kinds of learning resources that are helpful for students' independent learning. When teaching, students should have clear ideas and clear goals, and pay attention to students' speeches and timely feedback or questions. Students should develop independent learning ability, learn to conduct personalized learning at their own pace, and complete real learning with complex realistic tasks as the goal.

5 Conclusion

Facing the normalized online learning in special periods, students as the main body of learning, the status and effect of home-based learning needs the attention of schools, teachers and parents, so that the misfortune of the epidemic can become a bridge to happiness. We have built a student-centred network live broadcast + home study model under the epidemic situation. Through the investigation and research of the implementation effect, the evaluation effect is good. It is hoped that this model can provide a reference for teachers and students in the new situation and promote the solution of some problems faced

by home-based online teaching. At the same time, it plays a great role in training students' self-discipline, promoting teaching innovation reform, wide application of learning resources and construction of the smart campus, which is worth innovation and development in the future.

The analysis of this paper finds that students in online learning have poor learning status, lack of self-discipline consciousness, and need teachers' supervision to a certain extent. There are also some problems in the interaction between teachers and students. Teachers can only teach unilaterally and cannot grasp the online learning status of students in real time. Therefore, the focus of future research can be to use artificial intelligence technology to judge learners' emotions and learning state in real-time in online learning, so as to evaluate the overall state of the +4000.online classroom.

Acknowledgements

The work reported in this paper is partially supported by science and technology project of Chongqing Education Commission of China (No: KJ1600332,KJQN201900520), humanities and social sciences project of Chongqing Education Commission (No:19SKGH035), graduate education reform project of Chongqing Education Commission(No: yjg193093) and Chongqing Education Science Planning Project (2017-GX-116).

References

[1] Zhang Jinliang ,Wei Lipeng and Liu Bin. Research on Learning Behavior Optimization based on Learning Analysis in Intelligent Environment. journal of distance education, 2020 (2):69-79.

[2] Zhang Zhenhong, Liu Wen, Han Zhi. Learning Dashboard: A Novel Learning Support Tool in the Big Data Era. Modern Distance Education Research, 2014(3):100-107.

[3] Arnold K E, Pistilli M D. Course signals at Purdue: Using learning analytics to increase student success[C].Vancouver , BC , Canada: International Conference on Learning Analytics & Knowledge, 2012:125-132.

[4] Essa A, Ayad H. Improving student success using predictive models and data visualizations. Research in Learning Technology, 2012(20):58-70.

[5] UMBC. “ Check My Activity ” Reports for students now available inside blackboard[EB/OL]. [2019-10-09]. http://www.umbc.edu/blogs/oit-news/reports/.

[6] Arizona State University. How does eAdvisor TM benefit me [EB/OL]. [2019-10-09].https: //eadvisor.asu.edu/.

[7] HAN Li, LI Yang, ZHOU Zijia, SONG Peixuan. Teaching Effect Analysis Based on the Facial Expression Recognition in Classroom. Modern Distance Education Research, 2017(4): 97-103.

[8] ZHAO Huiqiong, JIANG Qiang,ZHAO Wei,LI Yongfan,ZHAO Yan. Empirical Research of Predictive Factors and Intervention Countermeasures of Online Learning Performance on Big Data-based Learning Analytics. E-education Research. 2017(1):64-71.

[9] Jiang Qiang, Zhao Wei, Wang Pengjiao, Wang Liping. Realization of Individual Adaptive Online Learning Analysis Model Based Big Data. China Educational Technology, 2015 (1):85-92.

[10] The Ministry of Education. The Ministry of Education the Ministry of Industry and Information Technology issued a notice to deploy the relevant work of "Classes Suspended but Learning Continue" during the extension of the start of primary and secondary schools [EB/OL]. http://www.moe.gov.cn/jyb_xwfb/gzdt_gzdt/s5987/202002/t20200212_420385.html, 2020-02-12.

[11] Wu Yan, Online Teaching is more suitable for "Learning" , China Educational Technology, 2020. (4): 6-7.

[12] Lv Haixia, Wang Yuan, Liu Wenbin, Lv Yi, Yan Hong. Challenge and Strategy for PBL Teaching Activities during Prevention and Control of New Coronavirus Pneumonia. Medical

Education Research and Practice,2020.(03):1-8.

[13] Dai Rong. Several issues that need attention in home study [N]. Jiangsu Education News,2020-02-26(003).

[14] Song Lingqing, Xu Lin, Li Yaxuan. Precision 0nline Teaching + Home Study Model: a Feasible Way to Improve the Quality of Study for Students during Epidemic. China Educational Technology,2020(03):114-122.

[15] Wang Yunwu, Wang Yuru, Li Yanxin, Li Dan. Countermeasures and suggestions for improving the quality of online education during epidemic prevention and control . China Medical Education Technology, 2020, 34 (02): 119-124 + 128.

[16] Yang haijun, Zhang Huiping, Cheng Yang. An Analysis of College Online Teaching during the New Coronary Pneumonia Epidemic.China Journal of Multimedia & Network Teaching, 2020(04):194-196.

[17] "Home" strong office 7 mainstream online video conference APP horizontal test [N]. Computer News,2020-02-17(022).

[18] Yang Shanshan, Long Qiuju. A study on the "Online and Offline" blended teaching model of college English based on live online courses. Journal of Baise University, 2019,32(06):135-140.

[19] Nei Zhaoyu. Live video teaching: the new situation of "Internet + education". Software Guide(Journal of Educationl Technology), 01918(09):80-81,86.

[20] Zhang Rui, Zhang Xiaolan. Research on the Flipping Teaching Mode Supported by "Webcast" . Computer Knowledge and Technology,2018,14(30):208-211.

[21] Li Zhengtao, Wen Juan. The "Integrated Education" and the Construction of a "Educational New System" in the New Era. China Educational Technology, 2020(03):7-16.

[22] Yuan Zhiqiang, MARINA MILNER-BOLOTIN. A Study of a TPACK-Based Subject-Specific Educational Technology Course and Its Implications--The Case of "Teaching Mathematics and Science through Technology" Course at The University of British Columbia Journal of Mathematics Education. Journal of Mathematics Education, 2020,29(01):23-28.

[23] Jiang Meiling. Problem-based learning: a teaching model that can be used for reference, 2003,32(3):62-66.

[24] Li Huangmo. Application of PBL teaching model to improve students' problem-solving ability . Technology Wind,2020(08):38.

[25] Ma Xiaofei, Ma Yalu, Tian Yun, Qin Xue, Gao Huaji, Liu Huaji, Lu Fanli. Practice and Thinking of "Full Online" Remote Hybrid Teaching under Novel Coronavirus Pneumonia Epidemic. University Chemistry,2020,(04):1-4.

[26] Wang Yuan, Jia Yue, Qu Meichen, Chen Yangjing, Zhang Wangmin, Liu Renjie, Chen Xue, Zhang Ming, Lu Yi. Practice and thinking of online teaching in the form of "watch the screen as making face-to-face communication",2020,34(02):138-142.