Challenges and Opportunities in Remote Learning: A Study on Collaboration and Flexibility in Chinese Middle Schools

Jieming Li, Fazilah Razali
Curriculum and Instruction, Universiti Putra Malaysia, Selangor, Malaysia, 43400
Corresponding Author Email: fazilahrazali@upm.edu.my

Abstract
After the COVID-19 pandemic, it will be even more important to provide scientific guidance to students by further leveraging the advantages of remote learning, especially in terms of collaboration and flexibility. This study employs a quantitative research method, analyzing the experiences of middle school students in Tianjin, China. A questionnaire featuring Likert scales and closed-ended questions was used to ensure consistent and measurable responses. The data was then evaluated using descriptive statistics and t-tests. The results show that students show high flexibility and willingness to collaborate in remote learning, and they generally appreciate the flexibility of remote learning in terms of time management, teacher contact, and learning content. but they have difficulties in task coordination, expressing opinions, and maintaining enthusiasm for group work. In addition, students need better guidance in collaborative learning to improve these interactions. Future research should focus on how to improve communication skills and improve task allocation to guide students to reasonably use the advantages of collaboration in remote learning, to help educators solve the problems found in this study and to improve the learning outcomes of remote education.
Keywords: Flexibility, Collaboration, Remote Learning.

Introduction
    The rise of remote learning is not only the inevitable product of contemporary development, for example, during the COVID-19 epidemic, it was expressed as "emergency distance teaching" (Bozkurt & Sharma, 2020; Hodges et al., 2020), it is also an important part of the future primary and secondary education curriculum. However, current remote education curricula overly emphasize students' autonomous learning abilities (Zhang, 2020) while neglecting the cultivation of collaborative skills under teacher guidance. Additionally, the implementation of flexible curricula receives limited attention at the middle school level in China, predominantly manifesting at the higher education level, with very few studies examining the implementation of remote learning at the basic education stage. Furthermore, at the research level, most studies have merely introduced and analyzed the concept of

guided remote learning design models(Flynn, 2020). In practice, implementation explorations have been limited to higher education and adult education contexts.

The Collaborative Innovation Center for Balanced Development of Information Technology and Basic Education, jointly established by Central China Normal University and the Zhongguancun Internet Education Innovation Center, organized a nationwide remote learning survey (2020). The aimed to comprehensively understand the current status and issues of remote learning among primary and middle school students. This study shows that regarding the difficulties and problems faced in remote learning, primary and middle school teachers identified insufficient teacher-student interaction as the most severe issue (39.78%). Chen and Wang(2013) through a meta-analysis of 47 quasi-experimental and experimental studies, also found no significant difference in student learning outcomes between remote and face-to-face teaching, regardless of the instructional medium. Therefore, it is evident that changing the teaching and learning methods of remote learning in primary and middle schools is the key to addressing the issues encountered in the implementation of remote education.

The importance of this study lies in its ability to support research on how Chinese middle school students feel during the remote learning process. This study can enrich the body of knowledge on the effectiveness of different educational methods in improving student learning outcomes. Because at present, especially after the epidemic, remote teaching has played an irreplaceable role in enabling education to continue. However, despite some achievements and developments in remote teaching, remote education at the middle school level still faces some challenges and there is also a certain gap compared with remote education in colleges and universities(Wang, 2023). Therefore, this study draws up the following research objectives:

1)To determine the level of the collaboration among students in remote learning in Tianjin, China.

2)To determine the level of the flexibility in remote learning in Tianjin, China.

3)To determine the feedback effect of middle school students in Tianjin, China in the process of remote learning.

Literature Review
Remote Education in China's Middle Schools
Researcher Wang (2021), analyzed the limitations and restrictive factors of the development of remote education in my country's middle schools in his master's thesis "Limitations and Countermeasures of the Development of Remote Education in middle schools"(Zhang, 2021). Based on the analysis of the influencing factors and optimization paths of remote teaching in middle schools, Aiping (2023), emphasized that remote teaching has broken the traditional model and increased the channels for acquiring knowledge and the transformation of learning methods. Schools, teachers, and parents need to pay attention to remote teaching, and teachers should continuously improve strategies to ensure the effectiveness of teaching and promote the all-round development of students. Zhang Yanjie (2020) also further emphasized that student-centered design and diversified evaluation are key in remote teaching. Scholar Lu Lichuan (2020) also conducted research and analysis on

the current status and countermeasures of the development of K12 remote education in my country. He believes that the government, enterprises, and users should work together to solve a series of problems such as the virtuality of remote education, poor classroom interaction, and inadequate teaching content(Paul et al., 2021). Guohao (2020), explored the problems and countermeasures of remote education under the background of the epidemic. He found that the main problems of remote education under the background of the epidemic are "Internet coverage", "outdated and boring teacher courseware", and "students and parents' seriousness in remote teaching". To solve these problems, it is necessary to improve network management, optimize the teaching of remote curricula, and advocate the active cooperation of parents and students (Li et al., 2021). Regarding the school as the main body, Jiayu (2020), summarized the "simultaneous remote" and "asynchronous remote" curriculum paradigms through cases, and put forward suggestions such as changing teaching strategies, restructuring curriculum resources, and building innovative learning spaces to help improve the school's ability to cope with future education. Yang Hong (2019) took K12 as an example to study and analyze the problems and countermeasures of remote education supervision in Chongqing, and put forward suggestions on strengthening the construction of the supervision team, improving the incentive mechanism of the supervision team, and improving the remote education supervision system (Xu & Jin, 2022).

Jiayuan (2024), claimed that remote education research needs to strengthen cooperation, and the current hot spots are "metaverse" and "education equity". Researchers should dynamically adjust their directions, seize scientific and technological opportunities, and promote high-quality development.

In summary, through the review of the literature, it is found that the research on remote education in middle schools in China is relatively comprehensive. However, through the literature method, it can be found that compared with the stage of higher education, there are fewer research documents on remote education in middle schools. In addition, under the new historical conditions and the background of the COVID-19 pandemic, the research on remote education is not very rich. Therefore, this article has a relatively important significance and characteristics of the times.

Remote Education in Middle Schools in Other Countries
Since 2021, the COVID-19 pandemic that has been raging in many foreign countries has seriously affected the education systems of many countries. Foreign college and high school students have also had to carry out learning activities through remote education. After the outbreak of the epidemic, foreign scholars' research on remote education channels mainly focused on college student education, and there was less research on middle schools. Osamudiamen (2021), and other scholars conducted a detailed questionnaire survey on 703 students and 60 college teachers in Nigeria, and put forward some suggestions for the development of remote education curricula for Nigerian college teachers and students. Flynn (2020), studied the problem of remote education teaching toolkits for middle school teachers, and proposed an ED toolkit model to help middle school teachers and students carry out remote education activities (Tang, 2022). In summary, the research on remote education by foreign scholars has provided a foundation for the research and development of remote education in my country, and also provided rich ideas for the research of this article.

Methodology

The location for this study was Tianjin, a city in China. First of all, this city has a high level of economic development, and there are already mature remote education platforms for auxiliary teaching in primary and middle schools, which meets the basic requirements of the research. Secondly, the government also has a positive attitude towards the promotion of remote education and the use of remote education resources by teachers and students.According to the official data released by the Tianjin Municipal Education Commission in the Tianjin Education Statistical Bulletin for the 2023 academic year (2024) , the number of students in middle schools in Tianjin is 603,223. According to the sample size table of Krejcie and Morgan, this study will adopt a random sampling method to select 390 people from the total population as the sample size of the study.In this study, students in middle schools (grades 1-3 in junior high school and grades 1-3 in senior high school) were investigated by online survey. 410 questionnaires were received and 404 were valid.

Due to the epidemic situation, remote education has been widely used in Tianjin. Although the proportion of distance teaching in the classroom gradually decreases with the gradual restoration of offline teaching methods, middle school students have all had the experience of remote learning, so simple random sampling can meet the needs of investigation. Because the content of the questionnaire is more relevant to students' learning process, the time of data collection is in the middle of the semester rather than at the end of the semester. The data is collected by China's questionnaire collection software, and students can access it through WeChat, which is more convenient.All questions in the questionnaire of this study are closed-ended and consist of various rating scales and checkbox questions. By setting such questions, participants can quickly answer all questions. The questionnaire consists of two parts, A and B. Part A mainly contains basic demographic information of the participants, such as gender, age, etc. Part B is the main part of the questionnaire, which consists of three parts: a part about the experience of cooperation between students, a part about the flexibility of remote learning, and a part about students' feelings during remote learning. The questionnaire on cooperation comes from Aqalah (2018), and includes two sections and a total of 6 questions. This study on flexible learning was guided by Bergamin et al (2012), concept that flexible learning is aligned with students' ability to understand the what, when, and how of learning. Participants' opinions on each flexibility were expressed on a 5-point Likert scale, （1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; and 5 = strongly agree). The questionnaire had three dimensions: flexibility in time management, flexibility in contact with teachers, and flexibility in content.The data about remote learning is from Adnan & Anwar (2020) with 14 questions for the general attitudes of the students related to remote learning.

After 404 questionnaires were collected by questionnaire software, they were manually entered into the form, and descriptive analysis and t-test analysis were carried out in spss software.

Results

1) Students are highly satisfied with the course time management, teacher contact and flexibility of content in remote learning.
2) Students have different views on different aspects of collaboration with others in remote learning. Although some aspects, such as the quality of work and helping to

understand, are highly recognized, students' satisfaction with learning materials is low.

3) Although students generally think that they have good conditions in terms of Internet access and computer use ability, they are less satisfied with remote learning motivation and assignments completion.
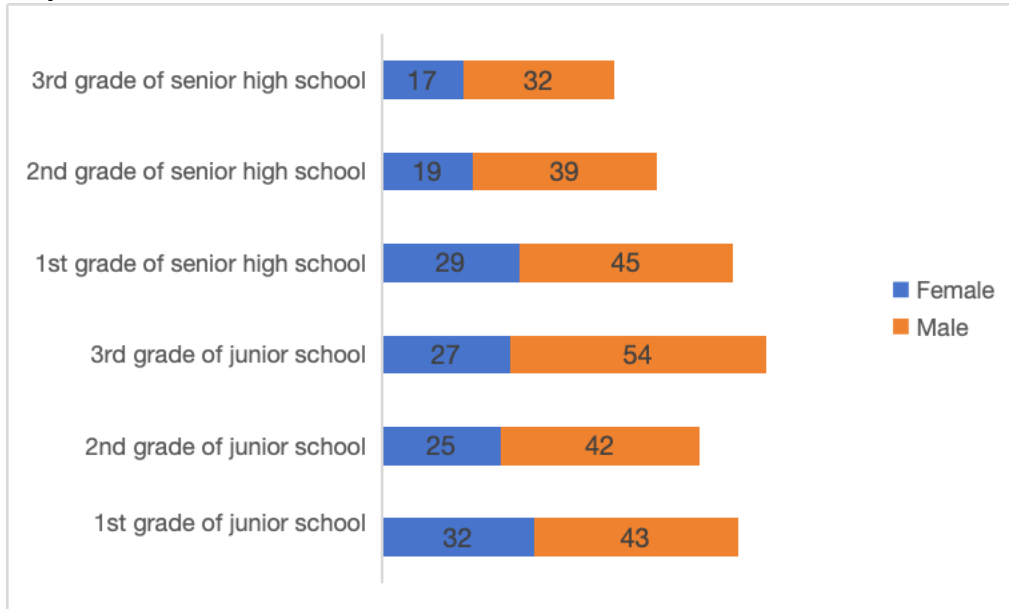
Data Analysis

Figure 1: Grade and gender distribution of students who participated in the study and completed the questionnaire.

Figure 1 shows the sample, including the age and gender distribution of the students who participated in this questionnaire survey. It can be seen that the number of participants in this questionnaire survey is more than that of women, and at the age level, the number of participants in third grade of Junior school is the largest in all age groups.

Table 1
Descriptive Analysis of the Flexibility situation in the Questionnaire.

	Mean	Median	Mode	Std. Deviation	Variance
3.1Flexibility of Time Management can decide when to teach	3.35	3	3	1.220	1.489
3.2flexibility of time management can define the learning pace	3.15	3	3	1.230	1.513
3.3flexibility of time management can repeat the subject matter at will	3.29	3	3	1.143	1.307
3.4flexibility of time management can arrange the learning time	3.37	3	4	1.243	1.545
4.1flexibility of teacher contact can contact the teachers at any time	3.34	3	3	1.160	1.345
4.2flexibility of teacher contact can use different ways of contacting their teachers	3.23	3	3	1.262	1.592
5.1flexibility of content can focus the topics of the class	3.35	3	3	1.129	1.276
5.2 flexibility of content can prioritize topics in teaching	3.36	3	4	1.171	1.372
5.3flexibility of content can choose different learning forms, which includes on?campus study, online study, and self-study	3.44	3	3	1.170	1.368
5.4 flexibility of content can study topics of special interest	3.30	3	4	1.177	1.385

According to the various aspects of "flexibility" in the table, it can be seen that students are highly satisfied with "flexibility of time management", "flexibility of teacher contact", "flexibility of content", etc. Most of the means in the table are close to or exceed 3, indicating that students generally agree on the importance of these aspects.

The survey data show that the mean of "flexibility of time management" is between 3.15 and 3.37, with the lowest being "defining the learning pace" (M=3.15) and the highest being "arranging the learning time" (M=3.37), indicating that students have a relatively consistent view on the importance of flexibility in time management. And the median and mode are mostly 3 or 4, showing that most students have a high degree of recognition of these issues. The standard deviation and variance are relatively concentrated, indicating that students' views on these issues are relatively concentrated and there are not many differences.

The survey data show that the means of the two questions in "flexibility of teacher contact" are 3.34 and 3.23 respectively, and the median and mode are both 3 or 4. The standard deviation is slightly higher than the flexibility of time management, but it is still within a

reasonable range overall, showing that most students recognize the flexibility of teacher contact.

The survey data shows that the mean values of the four questions about "content flexibility" range from 3.30 to 3.44, with the lowest being "studying topics of special interest" (M=3.30) and the highest being "choosing different learning forms" (M=3.44). The median and mode are both 3 or 4, indicating that students have a relatively consistent recognition of the importance of content flexibility. The standard deviation and variance also show that students' opinions in this regard are relatively concentrated.

Table 2

Descriptive Analysis of the Collaboration situation in the Questionnaire

	Mean	Median	Mode	Std. Deviation	Variance
6. When I work in a group, I do better quality work.	3.41	3	3	1.224	1.498
8. I enjoy the material more when I work with other students	2.16	1	1	1.526	2.329
9. My group members help explain things that I do not understand.	3.25	3	3	1.172	1.374
10. When I work in a group, I am able to share my ideas.	3.21	3	3	1.124	1.263
11. The material is easier to understand, when I work with other students.	3.42	3	3	1.143	1.306
12. My work is better organized when I am in a group.	3.23	3	3	1.269	1.609
13. My group members like to help me learn the material.	3.39	3	3	1.179	1.390
14. The workload is usually less when I work with other students.	1.13	1	1	.655	.429
17. I learn to work with students who are different from me.	3.15	3	3	1.206	1.455
18. I have to work with students who are not as smart as I am.	3.17	3	3	1.222	1.494
19. When I work in a group, there are opportunities to express your opinions.	3.26	3	3	1.242	1.543
20. When I work with other students, the workload is divided equally.	3.37	3	3	1.138	1.296
21. I help my group members with what I am good at.	3.57	4	5	1.317	1.735
22. The material is more interesting when I work with other students.	3.43	3	3	1.231	1.516
23. When I work in a group, my work habits improve.	3.23	3	3	1.199	1.438
24. I learn more information when I work with other students.	3.36	3	3	1.190	1.416
25. It takes less time to complete the assignment when I work with others.	3.35	4	4	1.194	1.425
26. I also learn when I teach the material to my group members.	3.44	3	3	1.133	1.284

recode Q7: The work takes longer to complete when I work with other students.	2.61	3	3	1.183	1.399
recode Q15: I find it hard to express my thoughts when I work in a group.	2.35	2	2	1.201	1.443
recode Q16: I do not think a group grade is fair.	3.48	3.50	3	1.085	1.178

Overall, students generally believe that group work plays a positive role in promoting understanding, sharing knowledge, improving organization, and distributing workload. It can also make learning materials more interesting and improve learning outcomes and work habits. However, students generally do not think that group work can reduce workload, but most believe that it can shorten the time to complete tasks. These results show that students generally recognize group work, especially in terms of improving learning outcomes and work habits, but also reflect some dissatisfaction with their workload distribution.

In terms of interaction between students, "Group members can help explain what the student don't understand" (Question 9, M=3.25) was highly recognized. The data showed that the median and mode were both 3, indicating that most students recognized this view, and students' opinions on this were relatively concentrated (SD=1.172). In addition, students generally believed that "Being able to share your thoughts in a group." (Question 10, M=3.21), with a median and mode of 3, showing a high degree of recognition and relatively consistent opinions (SD=1.124). Similarly, "Better organized when working in groups" (Question 12, M=3.23), the median and mode are both 3, indicating that students have a high degree of recognition of this view and their opinions are relatively concentrated (SD=1.269). Further analysis, "I enjoy helping group members learn" (Question 21, M=3.57) also shows a high degree of recognition, with a median of 4 and a mode of 5. Although the opinions are slightly scattered (SD=1.317), most students agree with it overall. On the other hand, "The material is more interesting when I work with other students." (Question 22, M=3.43), the median and mode are both 3, indicating that students think that group work makes learning materials more interesting, and their opinions are relatively concentrated (SD=1.231).

Regarding workload and time management, "Less work in groups" (Question 14, M=1.13), most students do not agree with this view, the median and mode are both 1, and the opinions are very concentrated (SD=0.655). On the contrary, "When I work with other students, the workload is usually more evenly distributed." (Question 20, M=3.37), the median and mode are both 3, indicating that students believe that group cooperation is fair in distributing workload, and their opinions are relatively concentrated (SD=1.138). At the same time, "When working with other students, the task is completed in a shorter time." (Question 25, M=3.35), the median and mode are both 4, indicating that students believe that group cooperation can shorten the time to complete the task, and their opinions are relatively concentrated (SD=1.194).

In terms of learning effect, "I learn more information when I work with other students." (Question 24, M=3.36), the median and mode are both 3, indicating that most students believe that group cooperation can improve learning effects, and their opinions are relatively

concentrated (SD=1.190). In addition, "When I work in a group, my work habits improve" (Question 23, M=3.23), the median and mode are both 3, indicating that students believe that group cooperation helps improve work habits, and their opinions are relatively concentrated (SD=1.199).

Table 3
Descriptive Analysis of the Remote Learning situation in the Questionnaire.

	Mean	Median	Mode	Std. Deviation	Variance
27. Do you have proper Internet access at home?	4.91	5	5	.494	.244
28. I am pretty good at using the computer.	4.10	4	4	.882	.778
29. I am comfortable communicating electronically.	3.38	4	4	1.153	1.328
31. I believe that learning on the Internet outside of class is more motivating than a regular course.	2.73	3	1	1.515	2.296
32. I believe a complete course can be given by the Internet without difficulty.	3.38	3	3	1.139	1.297
33. I can discuss with other students during Internet activities outside of class.	3.28	3	3	1.235	1.524
34. I can work in a group during Internet activities outside of class.	3.20	3	3	1.227	1.506
36. I am able to manage my study time effectively online and easily complete assignments on time.	3.09	3	3	1.203	1.446
recode_Q30. Learning is not the same in class and at home on the Internet.	2.37	2	1	1.224	1.498
recode_Q35. I feel that face-to-face contact with my instructor is not that necessary for learning to occur.	2.89	3	3	1.231	1.515

This table shows students' satisfaction with different aspects of online learning and Internet activities. Most of the mean values are between 3 and 4, indicating that students have different views on these aspects.

The survey data shows that in terms of "Internet access and computer use", "Do you have proper Internet access at home?" (M=4.91) (Question 27), the median and mode are both 5, indicating that almost all students agree with this. It shows that students have almost no

difficulties in participating in distance learning normally. And "I am pretty good at using the computer" (M=4.10) (Question 28), the median and mode are both 4, showing that students themselves have high confidence in the computer-related skills required for distance learning. At the same time, the variance and standard deviation of the answer data of these two questions in the survey data are small, indicating that the opinions are relatively concentrated. It shows that the students participating in the questionnaire have almost no problems in Internet access and computer skills use, and can meet the basic requirements of distance learning.

In terms of electronic communication and online learning motivation, "I am comfortable communicating electronically." (M=3.38) (Question 29), the median and mode are both 4, indicating that most students feel comfortable with electronic communication in distance learning. Students have a wide range of opinions on "I believe that learning on the Internet outside of class is more motivating than a regular course" (M=2.73, SD=1.515) (Question 31), with a median and mode of 3, indicating that most students have a neutral attitude. Therefore, students do not agree with the learning experience of remote learning completely replacing offline teaching.

The survey data shows that in terms of "remote learning courses and student interaction", students believe "I believe a complete course can be given by the Internet without difficulty." (M=3.38) (Question 32), with a median and mode of 3, indicating that most students have a neutral attitude towards this view. In addition, students are relatively high in "I can discuss with other students during Internet activities outside of class." (M=3.28) (Question 33), with a median and mode of 3, indicating that students have a neutral attitude towards this view. The standard deviations of this question are 1.139 and 1.235, and the variances are 1.297 and 1.524, respectively, showing a relatively concentrated but somewhat divergent view. Therefore, the degree to which students participate in discussion and collaboration during distance learning varies from person to person, and the results will also vary.

Table 4 and 5
Student's Grade Differences on their Ability to Discuss with other Students During Internet Activities Outside of Class.

variable	n	Mean	SD	t	p
grade					
Junior school	224	2.82	1.150	-8.996	<.001
senior high school	180	3.84	1.104		

33. I can discuss with other students during Internet activities outside of class.

	t-test for Equality of Means	
	95% Confidence Interval of the Difference	
	Lower	Upper
Equal variances assumed	-1.240	-.795
Equal variances not assumed	-1.239	-.796

The t-test results show that there is a significant difference in the mean scores between Grade 1(Junior school) and Grade 2(senior high school) students regarding their ability to discuss with other students during Internet activities outside of class (t(402) = -8.996, p <

0.001). Grade 2(senior high school) students (Mean = 3.84, SD = 1.104) reported significantly higher scores compared to Grade 1(Junior school) students (Mean = 2.82, SD = 1.150). The mean difference of -1.017 indicates that Grade 2(senior high school) students perceive a greater ability to discuss with others during Internet activities outside of class than Grade 1(Junior school) students.

The significant p-value (<0.001) and the confidence interval that does not include zero [-1.240, -0.795] further support this conclusion. Therefore, it can be concluded that Grade 2(senior high school) students are significantly more likely to discuss with other students during Internet activities outside of class compared to Grade 1(Junior school) students.

The survey data shows that in terms of "collaboration and time management in online distance learning", students "I can work in a group during Internet activities outside of class." (M=3.20) (Question 34), the median and mode are both 3, indicating a neutral attitude. "I am able to manage my study time effectively online and easily complete assignments on time." (M=3.09) (Question 36), the median and mode are both 3, indicating that most students have a neutral attitude towards this. The standard deviations of this part are 1.227 and 1.203, and the variances are 1.506 and 1.446, showing a relatively concentrated but divergent attitude. There are differences in students' opinions on the completion effect of homework, indicating that not all students are adapted to the teaching feedback method or content arrangement of online learning.

Table 6
Student's Grade Differences on their ability to manage their study time and complete assignments online.

variable	n	Mean	SD	t	p
grade					
Junior school	224	2.61	1.070	-10.119	<.001
senior high school	180	3.69	1.068		

As depicted from the analysis, there was a significant difference in the mean scores for managing study time effectively online and completing assignments on time between Grade 1(Junior school) and Grade 2(senior high school) students, t(402) = -10.119, p < 0.001. The mean score for Grade 2(senior high school) students (M = 3.69, SD = 1.068) was significantly higher than the mean score for Grade 1(Junior school) students (M = 2.61, SD = 1.070). This indicates that Grade 2(senior high school) students report being better able to manage their study time and complete assignments online compared to Grade 1(Junior school) students. The effect size (Cohen's d = -1.013) suggests a large practical significance of this difference.

Recommendations
Optimize Online Platform Functions and Improve the Learning Experience of Middle School Students
Remote learning platforms need to focus on how to optimize the platform interface design and strengthen its adaptive function. Due to the different learning styles and individual characteristics of middle school students, remote learning requires the platform to provide personalized learning paths, generate personalized knowledge maps, accurately customize

personalized learning processes according to the learning situation of middle school students, and provide course questions and answers, AI lectures/topics and other functions through intelligent learning partners to improve learning experience and efficiency (Li & Wang, 2018). The design of the teaching platform includes the design of the learning navigation interface and the course interface, which runs through the learning process of previewing, learning, reviewing, practicing, checking, reflecting, and answering questions.

Enhance Teachers' Information Literacy and Innovate Remote Teaching Models

Enhance teachers' information literacy. Teachers' information literacy is the prerequisite for the smooth progress of distance teaching activities. To ensure the orderly development of distance learning, schools should carry out remote teaching platform training. Teachers first need to be familiar with the basic operations of the teaching platform (Chen, Wen, & Luo, 2021); secondly, explore the deep integration of information technology and teaching, and improve the ability to control distance learning; finally, carry out "normalized" online teaching, relying on the big data function of the online platform, deeply mine educational data, adjust teaching behavior in time, improve the utilization rate of teaching materials, and help students conduct remote learning more efficiently.

Innovate remote teaching mode. Make full preparations before class, carry out flipped classrooms, form learning communities, etc. through situational, exploratory, and collaborative teaching, so that remote learning becomes vivid and active, and enhances the attractiveness of remote learning. Remote learning can adopt a multi-teacher collaborative interactive mode. Based on the insight into the needs of middle school students, the main teacher is equipped with a tutor. The tutor can monitor the online learning situation and make timely and effective interventions in the remote learning of middle school students.

Strengthen the Quality of Courses and Help Students Achieve Deep Learning

Design structured teaching content. Remote learning curricula are not a direct copy of the textbook content. They adopt a structured design approach to achieve a leap from flat to three-dimensional on the basis of overall grasp of the learninig materials. Taking the large unit as the leader, sort out the relationship between the sub-topics of the unit, focus on the understanding of the core concepts, break down the content into multiple modules of 5-15 minutes, intersperse videos, questions, discussions, tests and other resources between the modules, and cast the "vertical line" of the course structure to improve the utilization rate of textbooks in distance learning, so that learning can reach the depth and promote the effective achievement of deep learning.

Design diversified interactive teaching activities. At present, most remote learning is mainly based on teacher lectures. Appropriate course types should be selected according to the characteristics of the teaching content, and some technical means should be adopted to improve the interactivity of online classes, such as online answering, online games, online discussions, online voting, real-time barrage, etc., to increase students' learning involvement, guide students to actively participate in classroom discussions, and combine the needs of middle school students to guide and organize middle school students to establish study groups, case groups and learning communities, etc., to enhance interactive feedback in teaching

Give Full Play to the Synergy Between Home and School and Guide Parents to Participate Deeply

Establish a normalized interactive communication mechanism between home and school. Parents' collaborative participation in teaching has become an important breakthrough in deepening the reform of basic education curriculum (Li & Long, 2023). Through the channel of communication and interaction between home and school, parents are encouraged to provide guidance, supervision and tutoring for middle school students' remote learning. Parents should maintain effective communication with online teachers, observe and understand their children's learning performance and growth as much as possible, and discuss effective solutions with the assistance of teachers from the aspects of learning behavior, learning attitude or learning habits for problems such as children's inability to complete homework on time during remote learning.

Improve parents' ability to participate in remote teaching. Schools should organize special training on parents' "home-school co-education" capabilities to stimulate parents' enthusiasm for home-school co-education, especially to clarify what parents need to do and how to do it in the process of participating in their children's remote teaching. At the same time, parents adjust their role positioning, as close collaborators of teachers in remote teaching activities, provide high-quality accompanying services during remote learning, and scientifically guide children's growth.

Conclusion

During the epidemic period, remote learning filled the gap of traditional methods with its moderate flexibility and advantages in collaborative activities, and promoted students' active learning, but problems such as distraction and task allocation in collaboration still existed in middle schools. This study investigates the flexibility and collaboration level of middle school students in China, and evaluates their satisfaction with this learning mode. The results show that middle school students in China generally pay attention to the importance of flexibility and collaboration in remote learning, and their satisfaction in these aspects is very high. However, there are obvious challenges for middle school students in China to enjoy the learning materials, keep the motivation of remote learning, and complete the curriculum tasks within the specified time. Although students have a positive attitude towards flexibility and collaboration, they still have difficulties in participating in collaborative activities and motives among students, which affects their overall learning experience. Parents, teachers and students need to work together to solve these problems. At the same time, relevant departments also need to develop more fascinating learning materials, strengthen incentive strategies and ensure more effective curriculum delivery, so as to improve the satisfaction and overall effect of remote learning. In particular, schools and teachers should cooperate with science to guide students in collaborative learning and help them make effective use of the advantages of collaborative learning, so as to better help students coordinate their tasks and promote meaningful discussions, thus solving learning challenges and ultimately achieving the goal of improving learning results.

References

Adnan, M., & Anwar, K. (2020). Online learning amid the CoVlD-19pandemic: Students' perspectives. Journal ofPedagogical Sociology andPsychology,2(1),45-51.

Arshad, A. (2018). Use of Twitter, online forum and blog for collaborative learning among ESL undergraduates learners. Masters thesis, Universiti Putra Malaysia.

Bergamin, P. B., Ziska, S., Werlen, E., & Siegenthaler, E. (2012). The relationship between flexible and self-regulated learning in open and distance universities. International Review of Research in Open and Distributed Learning, 13(2), 101-123.

Chunjin, C., & Hong, W. (2013). The impact of blended learning and online learning on students' learning outcomes: a meta-analysis of 47 experiments and quasi-experiments. Open Education Research (02), 69-78.

Chen, J., Liu, H., & Liu, Y. (2024). Analysis of the current status, hotspots, and trends in online education research in China from 2013 to 2023. Heilongjiang Science, (07), 56-59.

Chen, Y., Wen, X., & Luo, Y. (2021). A study on the current situation of university live teaching from the perspective of learning experience. *Journal of Gannan Normal University*, 42(6), 114-119.

Ebohon, O. (2021). Factors influencing students' behavior and attitude towards online education during COVID-19. *Sustainability, 13*(13), 16-17.

Li, H., & Wang, W. (2018). Intelligent adaptive learning models supported by artificial intelligence. *China Educational Technology*, (12), 88-95+112.

Li, S., & Long, B. (2023). Issues and solutions of home-school co-education: Based on the perspective of the third space. *Contemporary Education Science*, (5), 31-39.

Li, X. R., Liang, H. W., Feng, J. Y., Xiao, J. P., & Peng, W. F. (2021). Design of personalized learning resource recommendation system in online education platform. *Computer Technology and Development, 31*(02), 143-149.

Lu, L. (2021). Study on the effectiveness of online education in ethnic areas based on balanced educational development: A case study of middle schools in Aba Prefecture. *Modern Business Trade Industry, 42*(30), 21-23.

Flynn, P., Hatan, M., Salman, A., Gelidan, A. G. (2021). Perceptions of Saudi Plastic Surgery Residents and Attendings of Online Education during the COVID-19 Pandemic[J]. Plastic and Reconstructive Surgery - Global Open,2021,9(6):78-79

Tang, X. J. (2022). Research on the evaluation system of students' knowledge review literacy on online education platforms. *Microcomputer Applications, 38*(02), 39-41.

Aiping, W., & Nan, L., (2023). Analysis of influencing factors and optimization paths of middle school online teaching under the background of "Internet +". Chinese Journal of Multimedia and Network Teaching (Later Issue) (12), 37-39.

Jiayu, W., Sheng, C., Zhiqin, Z., & Lei, C. (2020). Implementation paradigm and practical exploration of "complete cloud" middle school online courses. Teaching and Management (16), 25-28.

Wang, D. (2021). Diagnosing the "Double Reduction" policy and building an online education information security system. *Modern Distance Education Research, 33*(05), 3-13+25.

Xu, M., & Jin, B. N. (2022). Difficulties and countermeasures in the development of online education in China under the epidemic situation. *Journal of Anhui Open University, 2022*(01), 22-25.

Yang, H. (2019). From online courses to smart classrooms: Research on the development process and connotation of online education. *Journal of Hubei Open Vocational College, 34*(16), 160-162.

Zhang, G. (2021). Research on the comprehensive quality evaluation of middle school students in the context of online education. *Teaching and Management, 2021*(27), 122-124.

Zhang, Y., & Zhou, Y. (2020). How online teaching moves toward a new normal in the post-pandemic era: A micro-perspective based on the integration of concepts and technology. China Education Policy Review, (00), 96-112.