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A Study of Investigation and Research on Teaching and Learning of Online Courses

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Abstract

This article used a questionnaire survey for the college students on learning and teaching in epidemic situation. The result of the study shows that there were existing superficial understanding on Online learning, insufficient theoretical guidance for online teaching innovation and teaching support services still lag behind expectations. Based on the data of the questionnaire, putting forward a mixed online and offline teaching model hoping that the mode can stimulate students' interest in active learning, promote the interaction between teachers and students, enrich relevant research theories and to a certain extent improve students' ability to think independently and solve practical problems.

Keywords: online course, college students, Epidemic

1. Introduction

As the COVID-19 rages around the world, school education has faced unprecedented challenges. Despite the efforts of countries around the world, we are still at a critical stage of the global campaign of epidemic prevention and control. After the outbreak, China took the lead in putting forward the idea of "learning in home" through online platforms. In response, local education departments and primary and secondary schools have formulated online teaching programs, launched online learning guidelines, and released corresponding teaching guides, tools and tutorials. Major education platforms and internet companies have provided comprehensive technical support and services. More and more schools are conducting online teaching and learning .As indicated by the online teaching guidelines of schools, online or remote teaching during the epidemic has been mostly achieved through online platforms, mobile terminals and digital TV. There are several typical solutions, namely online courses, live teaching on the Internet, self-directed learning by students, and TV classroom in the air.

In the short term, the sudden epidemic has disrupted the original teaching plans of colleges and universities. Online teaching brings great pressure on teachers and students. They are both frustrated by the new way of learning and teaching. Nevertheless, in the long run, the large-scale and full coverage of online teaching practices has acted as a booster for the information of higher education, and the community has gradually established an awareness of the importance and urgency of online education. The wave of independent learning based on the new technological revolution is driving a shift from "teaching-oriented" to "learning-oriented". This study explores the practical effects of online teaching for college students, the main influencing factors, and ways to ensure that the quality of teaching in online and offline classrooms is substantially equivalent. This study aims to propose an effective online teaching model to enrich existing research.

2. Literature Review

Both online and traditional teaching are aimed at promoting students' all-round development, establishing correct views on learning, world, life and values, and thus giving them comprehensive qualities and abilities that will benefit them for a lifetime. With the advent of the knowledge-based economy, knowledge guides practice and synthesizes the knowledge and experience gained as people reshape the world. In addition to acquisition and construction, human beings gradually generate knowledge in learning. The social changes brought by information technology call for breaking the original static, preset and fixed teaching mode and advocating to stimulate learners' subjective initiative with dynamic generation, non-linearity and self-organization, so as to facilitate the reform of teaching modes. The development of the internet continues to reshape the way people

work and live, and the internet thinking behind it supports innovation in all industries rather than simply "internet + traditional teaching", online teaching represents the remodeling of traditional teaching content, reshaping of traditional teaching structure, reconstruction of traditional teaching process, innovation of traditional teaching methods, as well as the transformation of existing educational organization, service and teaching models with internet-based support services and innovative elements, thus constructing the new education ecology in the intelligent age.

Mode refers to the methods and forms used in words and deeds. It emphasizes both the "method applied" and the external form of the method, such as the tools and means adopted. Teaching method is the upper category of teaching mode. Teaching method is a set of teacher-student interaction activities conducted through teaching means and guided by teaching principles in order to achieve teaching objectives and teaching contents. Teaching method is the sum of the activities of interaction between teaching and learning taken by teachers and students to realize the teaching purpose and complete the teaching task. Being included in the teaching method, teaching mode is an integral part of the teaching method system, is the specific activities and behaviors that constitute teaching method. Therefore, the teaching mode is subordinate to the teaching method, and the latter's value is embodied by the implementation of the former. In this study, the teaching mode is taken as the sum of the dynamic teaching behavior sequence and systematic teaching activities adopted by the teaching subject to achieve teaching objectives and realize educational values. Under the guidance of teaching theory, teachers and students rationally apply teaching resources and carry out teaching activities based on the teaching environment, and finally achieve the educational goals. Teaching mode is characterized by dynamic interaction. The integration of internet thinking enriches the theoretical connotation of online education. Instead of the "online repetition" of traditional teaching mode, it remolds the teaching content with the internet thinking, reshapes the teaching structure, reconstructs the teaching process and innovates the teaching methods in online teaching, and relies on internet information technology to achieve teaching objectives and realize educational values.

In the past ten years, the total number of foreign publications on online education research has been generally stable, In 2012, as MOOC(massive open online course) became an educational buzzword, the research on online education reached the highest level, and then remained stable with a slow decline trend, indicating that scholars began to reflect on online education research, and then there was an increasing trend from 2019 to 2020, and with the outbreak of COVID-19 in 2020, online education research has reached a new wave of enthusiasm. Online teaching mode is influenced by a combination of fundamental elements within and a variety of external factors. Webster and Hackley (1997) classify the factors that affect online learning as technical characteristics, instructor characteristics, course characteristics and learner characteristics. Chen CM, Wu CH. (2015) used double factor experiment design on the brain wave detection, emotional perception, cognitive load measurement scale and learning performance test table to explore in the independent online learning situation, three kinds of commonly used video teaching style of sustained attention, mood, cognitive load and learning performance.

According to Hannafin (2003), six factors exert influence on online learning, namely learner and learning factors, teacher and teaching factors, field and task factors, organization and arrangement factors, community and communication factors, and evaluation factors. Through in-depth analysis and practice of online teaching activities, Wang (2013) put forward the model of four factors, i.e., cognitive factors, technical factors, teaching factors and environmental factors, for the success of online teaching. Cranfield (2021) revealed significant differences between the participating universities students' experiences. The most important differences were in the 'home learning environment', followed by 'engagement' and the perception of 'impact on learning skills'. Zhang et al. built the influencing factor model of LICE (learner, teacher, course, and environment). Other scholars have studies teaching mode in terms of diverse goals, the role of teachers and the experience of students. From the above, the main influencing factors of online teaching are teaching objectives, teaching environment, teachers, students, teaching resources, teaching activities, and teaching evaluation. Many other researchers have come up with many constructive teaching methods, Manzano León (2021) suggested that the online escape rooms can be active and effective learning strategies for university students. Wang, et al. (2012) used the Facebook group as a learning management.

3. Method

3.1 Participants

The participants of this research are 102 students from 3 classes with 27% boys and 73% girls. These three classes were selected as the survey subjects from all the classes in the college that had taken the lesson "College Students' Mental Health and Stress Management" on the principle of randomness. According to the recovery rate and efficiency rate of questionnaire, 102 valid questionnaires were finally obtained with 92.1% efficiency.

The school launched a blended teaching approach in 2015. All students in the school have a certain online learning experience, they can use the online teaching platform and learning technology for online learning, and have a certain online learning ability.

3.2 Research Content

From March to July 2020, we used the SPOC (small private online course) platform and some APPs to conduct the study of the "College Student Mental Health and Stress Management" course, including attendance, discussion completion, chapter test completion, participation in teaching activities and homework completion. The course *College Students' Mental Health and Stress Management* contains 12 chapters, mainly offered to students from a university of Inner Mongolia, which lasted for 16 weeks and 32 class hours. During the epidemic, a hybrid online and offline teaching model based on flipped classroom was adopted.

3.3 Research Method

Based on the existing results of some empirical studies on the quality of online learning for college students, combined with the new crown pneumonia epidemic and the situation of online learning, the research team designed a questionnaire for online learning to investigate students' views and behaviors on online classrooms and the similarities and differences between online classrooms and traditional classrooms. The questionnaire was divided into student classroom participation, online teacher-student interaction and so on. There are five dimensions of learning attitude, learning effect of online courses, and comparison between online courses and traditional classrooms. From June15 to 20, 2020, the research team used Questionnaire Star as an online survey platform to conduct a pre-survey. 102 undergraduates participated in the survey. Based on the results, the questionnaire items and expressions were revised and the Content validity were enhanced. In addition, the questionnaire also investigateed the gender, grade, and professional category of the respondents.

4. Result

4.1 Student's Participation

Table 1. Student participation

Question	Choices	Rate
Students'Online course preview	Take the initiative to browse online resources for pre-class preview and review	40.59%
	Never conduct online preview and review	11.88%
	Do not preview and review without teachers'assigning tasks	17.82%
	Occasionally look at the content that interesting	29.7%

Half of the students prefer online classes where the teacher was present, saying that live teaching gives them the feeling of being monitored in real time. About 1/3 of the students value the content of online classes and do not mind the absence of teachers. Less than 10% students value the courseware more than the teacher's presence. This shows that even in online classes, students want to see the teacher in real time and prefer face-to-face learning and communication. In terms of students' participation in online courses, only 26.7% of the students are frequently involved in online classroom communication and interaction, and the remaining 72.3% only participate occasionally, indicating the low level of students' participation in online classroom teaching. According to survey, only 50% of students stay focused throughout classes, and nearly 48% sometimes do things unrelated to class. Compared with traditional classroom teaching, the questionnaire suggests that students demonstrate weaker self-restraint and discipline in online class. According to the survey of students' online learning effect, 70.3% of them rate the teaching effect of online classes as mediocre, holding a position of neither aversion nor rejection. Only 22% recognize the effects and benefits of online classes, hinting at a low level of enthusiasm for them.

With respect to the teaching mode of online teachers, 80% of students prefer a combination of live broadcasting and relevant resources, and 18% prefer a combination of recorded broadcasting and teaching resources. This implies that students are more inclined to have teachers teach live and interact with them in real time, even though this is an online class.

As for the interaction between teachers and students in online classes, students mentioned in the survey that teachers frequently initiate classroom activities in online classes to increase interaction. However, according to the previous survey of students' participation in classroom interactions, they rarely participated in such activities, indicating a distinct difference in the attitudes and behaviors of teachers and students towards interaction in

online classrooms. 65.4% of the students prefer to combine online and offline teaching and focus on classroom teaching, 25.7% prefer complete classroom teaching, and 5% think online teaching is unnecessary. It can be seen that students are not rejecting online education altogether, but prefer to be more classroom-based.

4.2 Learning Process

On average, students take 3-7 hours of online classes every day. 73% of them do not speed up playing online class videos, and 17.8% play videos 1.25 times faster. This shows that some students are less patient with the online video resources uploaded by teachers, possibly because they find the video content less appealing.As shown in the survey on whether students take notes in online classes, 65% of students occasionally make notes, while only 32% always follow the teacher to take notes in class, indicating their low initiative and enthusiasm in online classes. Teachers are expected to strengthen their management of online courses and the demands on students. In the survey of students' preparation for online courses, 41% of them take the initiative to browse online resources for pre-class preview and review, only 12% never do online preview and review, nearly 30% occasionally browse content they are interested in, and 17.8% only preview and review at the request of the teacher. This reflects that students are less active in previewing and reviewing online classes, which may be attributed to their eyes and bodies being damaged due to the long time of attending classes through electronic devices. Also, teachers have failed to implement effective supervision over students' review and preview.38.6% of the students think that they can barely follow the online classes despite the somewhat faster pace, and 56.4% think such pace is reasonable. This shows that a considerable number of students have difficulties in understanding and digesting the content of online classes, possibly due to the huge differences between traditional and online teaching in terms of testing students' understanding and application of knowledge. In a traditional classroom, teachers can check students' learning results through various forms of activities at any time, while in an online classroom, teachers are unable to accurately monitor students' learning progress in time due to the limitation of network speed and equipment. Is it possible for online teaching to replace traditional classroom teaching? 40% of the students are not sure about this, and 35.6% holds that online teaching cannot replace traditional classroom teaching, reflecting their confidence in traditional classroom teaching mode.

4.3 Comparison between Online Courses and Traditional Classrooms

Table 2. Comparison between online courses and traditional classrooms

Question	Choices	Rate
What do you think are the advantages of online classes over traditional classroom teaching?	Excellent teachers	37.62%
	Strong online interaction	35.64%
	Rich resources	53.47%
	Flexible online learning	65.35%
	Other	25.74%

Table 3. Comparison between online courses and traditional classrooms

Question	Choices	Rate
Disadvantages of online teaching	Eyes uncomfortable staring at electronic products for a long time	78.22%
	Distracted easily	76.24%
	The network is prone to congestion	65.35%
	Inconvenient interaction between teachers and students	39.6%
	Poor learning environment	55.45%
	Other	8.91%

Table 4. Comparison between online courses and traditional classrooms

Question	Choices	Rate
Disadvantages of online classes	Individual students are not self-disciplined enough for teachers to supervise	71.29%
	Insufficient classroom interaction in online classes	32.67%
	Teachers cannot teach students of different abilities in accordance with their aptitude	54.46%
	Facing the screen for a long time may cause health problems	68.32%
	Easy to be disturbed by the external environment	66.34%

According to the survey about what advantages do online classes have over traditional classroom teaching? There are 65.3% of the students think online learning is more flexible, 53.5% think online courses are more diverse, 37.6% think online classes are equipped with better teachers, and 35.6% appreciate the large amount of interaction in online classes. The vast majority of students consider online classes superior to traditional classes in terms of flexibility and variety. Students complained online teachers forcing them to spend long hours glued to their gadgets, with 78.2% saying their eyes are tiring as a result. 76.2% admit that they tend to get distracted when studying online. 65.3% propose that network congestion during online courses is a major drawback of online teaching. 55.5% believe that online learning provides a poor learning environment. They have been mostly taught at home during the epidemic, which is a much worse learning environment than school classrooms. In general, the disadvantages cited by students include eye damage from electronic devices, lack of concentration, and network crowding. When asked about the main drawbacks of online classes, 71.3% of the students mention teachers' limited supervision of the class and students' low self-discipline. 68.3% held that excessive use of electronic screens is a health hazard, 66.3% think that online learning is easily disturbed by the external environment, and 54.5% believe that teachers fail to teach students according to their abilities. To sum up, students mainly complain about teachers' poor monitoring and management of online classes, which hints at students' low learning autonomy and enthusiasm. Factors affecting students' online class attendance include noisy environment (59.4%), unavailable textbooks and materials (57.4%), poor internet speed (55.4%), household chores (51.5%), and inconvenient learning equipment (40.6%). Therefore, the main factors that affect students' online class attendance are noisy environment, unavailability of paper textbooks and references, etc.

4.4 Learning Effect of Online Courses

How do students usually deal with the information they don't understand or miss in online classes? 64.4% of them watch online class replay with explanation, 56.4% repeatedly watch the teacher's courseware, 26.7% consolidate knowledge points by reading textbooks and other materials, and 24.7% inquire about their teachers or peers. It can be seen that students mostly pick up the knowledge points they do not understand by watching the online class replay, and only less than 1/4 of them ask their teachers or peers, suggesting a low level of initiative in online learning and passivity in the face of difficult questions. Despite the convenience brought by internet, it has made little contribution in enhancing the communication and exchange between teachers and students in online classes, implying the effectiveness and necessity of face-to-face communication and discussion in traditional classroom learning. With regard to the materials students use in online classes, 73.3% students use electronic textbooks, 65.4% use materials provided by teachers, and only 14.9% use paper textbooks, indicating that students prefer electronic textbooks rather than paper ones in online classes. While the school has already mailed printed textbooks to some grade levels, e-textbooks are still preferred. Online teaching has made a difference in students' habits of reading paper textbooks.

5. Discussion

Based on the results of the questionnaire, the current online teaching mode of " learning at home " has limitations, especially the superficial understanding of "internet + education", the insufficient theoretical guidance for online teaching innovation, and the guarantee to be optimized for the organization of online teaching. Many regions or schools suffer from "one-size-fits-all", monotonous teaching mode, overloading and poor results.

5.1 Superficial Understanding of "Internet + Education"

The online teaching mode largely fails to fully integrate the concept of "internet + education". Since most teachers only have a superficial understanding of "internet + education", their online teaching is nothing but a simple superposition of internet technology and teaching activities. In live classes, teachers "move" offline instruction directly to the internet, while in asynchronous online teaching, they put too much emphasis on "online time." In this sense, teachers are expected to re-examine the functional value of online education and combine internet thinking to drive innovation in online teaching mode.

5.2 Insufficient Theoretical Guidance for Online Teaching Innovation

According to the questionnaire, most students have not yet understood the essential rules of online teaching, highlighting the importance of further theoretical guidance of online education, especially information teaching design. In the context of "teachers' online teaching, students' home learning, and parents' cooperative guidance", teachers should, based on the characteristics of home learning by students, reshape the teaching content, reconstruct the teaching structure, re-engineer the teaching process, restructure the teaching evaluation and innovate the teaching mode with the internet thinking, so as to ensure the achievement of the educational objectives during the epidemic.

5.3 Guarantee of Conditions to be Optimized

Although generally complete, the online teaching of "learning in home" still needs to be optimized. Internet access is the basic requirement of online teaching; Teaching resources, platforms and tools are crucial support for teaching activities; Support services are the main guarantee for the sound development of online education. In some underdeveloped and remote poverty-stricken areas, the implementation of online education is hampered by poor network environment, limited teaching platforms and resources, and backward hardware conditions. The findings of this study were consistent with Cranfield (2021) who revealed significant differences between the participating universities students' experiences. The most important differences were in the 'home learning environment', followed by 'engagement' and the perception of 'impact on learning skills'. The differences in the 'home learning environment' can be attributed to the differing economic and digital development.

So far, there are few intelligent teaching platforms and tools based on "AI + big data", and teaching support services still lag behind expectations.

5.4 Policy Mechanisms to be Improved

Although most of schools in Chian have issued guidelines, there is no effective interaction between schools, teaching and research, technical support and scientific research departments. To implement online teaching programs, this is recommended to establish a linkage mechanism of "led by scientific research - implemented by schools - guided by teaching and research - cooperated by technical support". On the one hand, it will enable the sharing of problems and solutions and thus facilitate the rapid development of online teaching in schools. On the other hand, a joint steering group will be set up to address the concerns of schools and teachers, so as to ensure the sustainable and sound development of online education.

6. Conclusion and Suggestion

As indicated by the survey results, students show low initiative and enthusiasm for online learning, and teachers have poor supervision of online courses. Given other drawbacks of online classes, such as slow internet speeds and adverse learning environment, students prefer traditional classroom teaching. The first priority for the future is to make online classes promote traditional classroom teaching by effectively combining online and offline teaching mode, and to develop curricula and organizational forms suitable for online classrooms.

In traditional teaching model, teachers are the subjects of class and students are passive receivers of knowledge. In the hybrid online and offline teaching model based on flipped classroom, teachers become the leaders of class and students turn to the subjects. After the online preview before class, students go to offline class with questions. This changes them from passive to active, thus stimulating the classroom atmosphere and enhancing the interaction between teachers and students. In addition, through extensive practice in offline classes, teachers will understand students' mastery of knowledge so as to tailor the teaching content and implement the teaching process accordingly. According to the preliminary results of the teaching reform of *Database Principles* by adopting the hybrid online and offline teaching model based on flipped classroom, the model is better than traditional classes at stimulating students' enthusiasm and creating good interaction between teachers and students, deepening students' understanding, mastery, internalization and consolidation of knowledge (to get rid of rote memorization), and developing students' ability to learn and think independently and solve problems with what they have learned. Hence, the hybrid online and offline teaching model based on flipped classroom will continue to be applied to the teaching of *Database Principles* in the future, with a view to realizing the reform of the "flipped + online and offline" hybrid teaching model for all chapters of the course and achieving the teaching objectives.

Based on the above discussion and analysis, proposing a overall teaching process of the course that was divided into three stages.

Stage 1: Online self-directed learning before class. Teachers carefully record video clips of preview sessions and make sure they are no longer than 10 minutes long. Before classes begin, they post the class guide, PPT slides and video clips on the online teaching platform. Preview tasks for the next class are assigned in the previous class, and students are required to complete them in any learning mode in their spare time. To motivate students to study online before class and urge them to complete independent learning tasks on time, teachers inform students that the length of online learning before class will be included in the daily assessment.

Stage 2: Offline classroom teaching, including two parts. Firstly, the teacher spent about 10 minutes summarizing the knowledge covered in the lesson (i.e. what the students have learned on their own before class), so as to deepen students' impression and understanding of the self-study knowledge. 5-8 objective questions are set according to the knowledge points learned by students before class and sent to them through Rain Classroom,

so as to test their learning effect before class, and timely adjust the key and difficult points in class according to their answers. For knowledge points that students find difficult to understand in the self-study before class, teachers emphasize them repeatedly to ensure that all students understand and master them. Then it comes to applying your knowledge to practical problems, 5-10 subjective questions are set to encourage students to think independently and discuss with their peers. There is enough time for them to finish. Teachers check and explain the answers after every 2-3 questions to increase interaction with students. Practice has shown that asking questions in advance increases students' enthusiasm and initiative, and the class atmosphere is better. Also, self-study before class drastically reduces the amount of time teachers spend in class, giving students more time to internalize knowledge to improve understanding, mastery and application, while ensuring that teaching is completed on time.

Stage 3: After-school knowledge consolidation. In response to students' errant knowledge points in the class, teachers assign homework through the online Rain Class, which is expected to be uploaded within the prescribed time. Based on their feedback, teachers explain the common mistakes again in class to improve students' understanding and mastery of difficult and ambiguous knowledge. Experiments are also carefully designed to consolidate students' theoretical knowledge and cultivate their ability to think independently, innovate and solve problems.

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