

## Analysis of two teaching modes of material mechanics

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**Abstract:** In order to explore the application of the teaching mode combining the intelligent teaching tool "rain classroom" and offline teaching in the teaching of material mechanics, this paper takes the sophomore students majoring in civil engineering in the school of architectural engineering of Xinjiang University as the research object, compares and analyzes with the traditional offline teaching mode, and practices the auxiliary intelligent teaching of "rain classroom" in the teaching of material mechanics. By analyzing the final examination results, this paper reflects and summarizes the teaching effects of different modes. Students generally believe that the combined teaching of "rain classroom" and offline teaching is helpful to the study of material mechanics. Teachers believe that the data acquisition and analysis function of "rain classroom" is of great help to understand students' learning effect, monitor the teaching process, adjust teaching strategies and improve students' performance.

**Keywords:** Rain Classroom; Mechanics of Materials; Offline Teaching; Combined Teaching

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### Introduction

In 2021, will be coronavirus infection outbreak is still intermittent in the provinces, to cooperate with the national epidemic prevention and control, the Ministry of Education requires colleges and universities to postpone the autumn semester, in order to avoid the outbreak of home students delay learning, the Ministry of Education still advocates the use of the Internet and information education resources for all students, such as some students back to school, to return to teachers to participate in offline class and still due to the outbreak cannot return to home quarantine students learning needs, Teachers in our school generally adopt the combined teaching mode of "rain classroom" and offline teaching (hereinafter referred to as "combined teaching").

Despite the rapid development of big data, the continuous update of Internet technology has brought many new teaching methods and learning methods to the field of higher education. For example, MOOC, Dingding class, Tencent Conference, micro class, rain class, etc., the survey shows that although there are many rich online resources and many optional quality courses, the use of such online resources is not ideal, and a large number of online courses and high-quality resources is still few. In order to respond to the educational call of "no school suspension, teaching and no school suspension", the biggest problem faced by college education is how to effectively use this situation, mobilize students' learning enthusiasm and improve their independent learning ability under the epidemic prevention and control.

### 1. Analysis of "material mechanics" course teaching

After a large number of education scholars found that the traditional offline teaching mode (the following "offline mode"), mainly is to the teacher on the platform, although students sitting in the classroom, due to the contemporary college students 'self-control is generally weak, some students exist in the people in the classroom and god is not the phenomenon, according to the survey, the contemporary college students' mobile phone dependence rate of 92.6%, the phenomenon of playing mobile phone in class common <sup>[1]</sup>. Compared with high school classroom and teachers, college classroom environment freedom, relaxed atmosphere, teachers will not like high school teachers, to the students' behavior constraints, in the university, in most cases, the classroom are students in the personal drive for learning, and easily affected by the

surrounding learning environment, not only that, for "material mechanics" this kind to understanding and analysis of course teaching is also facing the following difficulties:

### **1.1 Less class hours, more content**

The author uses 387 pages of material and mechanical teaching materials, and the latest revision was reduced from 80 hours to 64 hours. For such closely associated with other disciplines, for students to lay a solid foundation curriculum, teachers need to combine the book content, according to the different difficulty chapters to carry out additional knowledge supplement and expansion, to consolidate the students basic concept, solve the problems of students in homework, teachers not only need to carry out the theory course, also specialized exercises and answering questions, etc., to make students better learn this course

### **1.2 Formulations are widely derived, and they are difficult to understand**

Because the material mechanics content more abstract research problem is relatively tedious, especially involved in the teaching material formula requires a large number of, tedious mathematical calculation, for relatively weak foundation, poor understanding ability of students learning, learning this course is very difficult, if only offline teaching teachers, easily lead to material mechanics class into mathematics class, if in the formula derivation process does not pay attention to the introduction of the establishment of engineering actual situation, will make students feel material mechanical content boring, knowledge.

### **1.3 Students' lack of interest in learning materials mechanics**

Mechanics of materials is a professional basic course, For students in the freshman stage of learning "theoretical mechanics" and "higher mathematics" course related knowledge is closely related, [2] is also related to the knowledge points in the University Physics course that students study at the same time, These courses are more difficult, before and after the chapters are closely related, relatively divorced from the realistic background, Courses that require high students' derivation comprehension, If the teacher is unaware of the seriousness of these phenomena, Students also do not actively participate in the classroom, Students will easily lose their interest in learning courses and the desire to explore the course, In a passive position.

## **2. Advantages of the combined teaching mode**

"Rain classroom" is tsinghua university and school online launched new wisdom teaching solutions, is the latest research results of the Ministry of Education online education research center, is committed to fast and free for all teaching process to provide data, intelligent information support, the teaching tools clever into the PowerPoint and WeChat, is the students' independent learning and teachers teaching communication bridge, implements the "before class preview-classroom teaching-review after class" the organic combination of [3]. The advantages of the combined teaching mode are reflected in the following aspects:

### **2.1 Reduce the stress of class hours**

Based on the combination of "rain classroom" and offline class mode, teachers can be high quality "micro", "moOCs" or "gold" and other resources through the rain classroom platform push to students to learn, and make full use of the rain classroom discussion area, students can will not understand the problem published, can let oneself "place to ask", also greatly alleviate the teachers and students because of less class, more content of learning and teaching pressure.

### **2.2 Assist in the study of experimental courses**

Material mechanics course not only contains the professional content of learning, the experimental class is also crucial, but due to the experimental class is less, many students may be under the premise of not accurately understand the experimental principle into the laboratory, an experimental class, effect, even some universities may exist lack of experimental equipment or equipment limited phenomenon, cannot guarantee that every student personally operate the experiment. In this case, teachers can through the "rain classroom" platform experiment video, with voice explanation, help students use before or after class free time to understand relevant knowledge, so in experimental class, students can more

quickly experiment, in the limited time to ensure that every student can practice, greatly deepened the students' memory of the experiment, also effectively improve the students' connection to experiment and textbook knowledge.

### **2.3 Active the classroom atmosphere**

There are many knowledge points of material mechanics, which have high requirements for students' understanding ability. When explaining the formula deduction in class and the subsequent example explanation, the classroom atmosphere is more dull because the content is more boring. Using the combined teaching mode, teachers can not only use the computer end to randomly call students to answer questions, causing a tense rolling roll call screen, so that students can raise their heads, the interactive mode of bullet screen can also improve the traditional students shy do not speak.

### **2.4 Flexible classroom form**

The combined teaching mode not only retains the traditional teaching method for teachers, but also provides the "Rain Classroom" platform for students with more functions, such as barrage area, discussion area, course broadcast, courseware marking and printing, making learning not only limited to teachers' platform teaching, but also to students sitting in the classroom. Flexible and diverse classes can also help teachers to understand the students' learning situation in a timely and comprehensive manner, and can timely adjust the classroom according to the feedback and rest, making the classroom more flexible and the course content more conducive to students' absorption. It can not only improve students' academic performance, but also integrate material mechanics into life.

### **2.5 Teaching mode comparison**

For offline teaching, students independent preview to students' discipline requirements is relatively high, a single preview mode will make students lose interest in preview, but combined with teaching mode of preview respectively includes: preview task, upload excellent teaching video, thinking and answer, diversity of preview mode to improve the students' interest, preview if questions in the process of the courseware can mark, to the teacher in class, the question and thinking inspired students to explore the "material mechanics". Class, the "rain classroom" online check-in function setting, greatly reduce the teacher before class roll check-in time, the introduction of students questions from the traditional teacher field questions to teachers from the "rain classroom" before class, but also to avoid the questions no answer, questions time long and invalid problems. To encourage students to participate more in the classroom, Students can ask questions when listening through the "Rain Classroom" online barrage, The emergence of the bullet screen not only solves the problem that students do not like to take the initiative to ask questions, It also increases the students' interest in learning, So that everyone's ideas can be displayed in real-time through the platform, It is more helpful for teachers to fully understand everyone's ideas in class; after class, Teachers can release knowledge summaries and homework tasks through the "rain classroom", Once the student completes the homework, Teachers can also correct homework anytime and anywhere, And to guide the errors arising in the homework, The advent of this feature, It also improves the time spent on teachers to correct their homework, Regional limitation; last, Students watch videos of the courses and publish their learning feelings through the platform, If the students do not understand it clearly in class, It can be effectively solved after class.

## **3. Questionnaire survey**

Questionnaire survey is a tool that can both correctly reflect the purpose of the respondent and accurately convey the ideas of the respondent, and it is widely used in various analyses. For feedback students in the combined teaching mode of "material mechanics" learning effect, convenient teachers use quantitative analysis results analysis of students' behavior, and to adjust different student behavior, the author of the research object in the form of questionnaire, research class a total of 64 people, recover effective questionnaire 64 points, the student participation rate of 100%. To facilitate the research, the results show the conclusion that more than 80% of the students can accept the combined teaching mode and suggest the combined teaching mode of check-in, the phenomenon of students do not come to the class; the students using the "rain classroom" slide synchronization and interaction in the classroom also effectively reduces the students playing mobile phones (games, watching videos and chat, etc.) in class. "Rain Classroom" has the functions of courseware "not understand" feedback,

classroom exercise response system, "bullet screen" class discussion, after-class review, data collection and analysis, etc. Students believe that the existence of these functions greatly increases the interest of the class; "watch playback" function helps some students solve the doubts in class by repeating the teaching content after class, or can provide certain opinions and suggestions to the teacher according to the broadcast.

Of course, Some students still think that they still participate in the projects with their mobile phones in class, not only has the demand for the network been greatly increased, it also subtly improves the dependence on the mobile phone. Messages and reminders that pop up in the background during class may also interrupt students' thinking, The relative freedom of barrage discussion may also increase the probability of disruptive behavior in some students. To address these problems, teachers should give full play to the dominance, cannot rely solely on improvement in teaching techniques, more should be made from the teaching content and teaching methods and other aspects of further exploration and attempt. For example, on the basis of traditional content teaching, introduce knowledge on frontiers and hotspots, make the content more characteristic of The Times, using modern applications such as PKPM, matlab, and ansys. Combining the teaching content with numerical simulation techniques, not only to improve students' learning enthusiasm and analysis and innovation ability [5], it can also cultivate students' early application ability.

## 4 Performance analysis

As the most primitive means of teaching evaluation, Still used by the majority of teachers to test the final teaching effect of [6]. To better study the effects of the two class models on student performance, this paper has selected four consecutive years of student final exam scores for research. In the 2018-2019 school year, In 2019-2020, the traditional offline teaching mode is adopted. The sample size was 42 individuals and 73 individuals, respectively, for Academic Year 2020-2021, in 2021-2022, the combined teaching mode is adopted. The sample size was 96 individuals and 64 individuals, respectively. The class content is the same thing, The content and form of the assessment are also the same. The full score is 100 points, According to the analysis. The passing rate of the final examination of material mechanics in the four academic years was 33.33%, 49.32%, 48.96% and 50%, respectively. A general upward trend, low scores below 30 points accounted for 21.43%, 15.07%, 14.58% and 12.50%, respectively. On a downward trend, Compared with the traditional offline teaching model, the combined teaching model reduces the number of low-level students. It is of great help for him to master the knowledge of material mechanics.

## 5. Conclusion

To better support COVID-19 epidemic prevention work, better adapt to the needs of college education and engineering construction, our hospital by combining "rain classroom" and offline teaching, not only expand the traditional offline teaching time and space, but also strengthen the "material mechanics" course before class, after class, class teaching and management, for the construction of our first-class undergraduate course, cultivate solid theoretical foundation, high innovation ability talent provides a new way. In making good use of the "rain classroom" provides the convenient function at the same time, the teacher also need to combine the classroom effect and the characteristics of modern college students, timely adopt various ways to adjust the classroom, such as the end of a class or the next class before the "rain" released appropriate amount of autonomous learning task, arouse students 'interest in the next class content, class guide each students with questions to read the teaching material, introduce new knowledge, group cooperation to solve practical problems, cultivate students' cooperation ability. Finally, teachers can also use the after-class time to upload some engineering examples on the "Rain Classroom" platform, accompanied by voice explanation, to explain the relevant knowledge points involved, so as to better strengthen the connection between theory and practice.

To sum up, compared with the traditional offline teaching mode, the combined teaching mode takes the Internet as the general background to help teachers to better understand the students' learning situation, which not only improves the teaching efficiency, but also activates the classroom atmosphere, and more arouses the enthusiasm of students for learning. With the decrease of the epidemic phenomenon in China, how to optimize the combined teaching mode and make good use of the technical means of "rain classroom" to realize the improvement of teaching quality still needs teachers to think

in-depth.

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