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# Application of Micro-lecture For Engineering Mechanics Experimental Teaching

**Ziping Wang[1*], Ying Luo[1] and Yilin Qu[1]**
[1]Faculty of Civil Engineering and Mechanics, Jiangsu University, Zhenjiang, 212013.
*Corresponding author email id: wzp@mail.ujs.edu.cn

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***Abstract* — As a new teaching model, Micro-lecture is gradually used in the various areas of teaching. Students learn by watching Micro-lecture video by oneself, and they can communicate in the comment area to solve the problem. The teaching from the classroom observation to life can be changed and the efficiency of teachers and students can be improved. The Micro-lecture introduced for engineering mechanics experimental teaching is recommended in this paper. The Micro-lecture teaching platform of the engineering mechanics experimental is proposed. Combining the teaching experience of many years, the way of classroom teaching continuously is improved. Through the practice teaching of Micro-lecture, the engineering mechanics experiment grade of undergraduate has improved significantly, the service efficiency of mechanical equipment and degree of familiarity has improved sharply. It provides some guidance for the quality improvement of engineering mechanics experiment teaching.**

***Keywords* — Micro-Lecture, Engineering Mechanics, Experimental Teaching, Online Education, Innovative Thoughts.**

## I. INTRODUCTION

The current rapid development of network technology and the increasing popularity of mobile terminals are in imperceptible influence people's life style. Dissemination of information gathered speed which prompted us to accelerate the pace and keep pace with the times. As a result, the traditional media way has a lot of limitations (Anna, 2013). "Micro-era" has come quietly instead of the traditional media, such as "WeChat, blogging, Micro-fiction, Micro-film" and so on. It has caused a revolutionary impact to the traditional internet. Meanwhile, the "Micro-lecture" as a new teaching model through a long time research and induce the increasing popularization (Iksan, 2014). There exists common application of course at Tsinghua University, Tongji University currently and other national famous universities of various disciplines. From the implement situation of class, the traditional teaching mode has been broken and it's improved the teaching conditions. It has obtained the teachers and the student's consistent high praise. Lesson will be a form of teaching in classroom observation to life based on teaching design thinking, the main video presentation. It is widely used in various teaching field for the performance of "dapper, prominent theme, interactive" and so on (Liu and Hou, 2016). Due to the influence of traditional teaching ideas, teaching conditions and other factors, there are still such a variety of defects as more difficulty theoretical mechanics experiment, complex laboratory equipment (Bernhard, 2000). Teachers only have class time to explain in detail. And students have not been exposed before when faced with complex equipment operation. Students are limited by the number of equipment, it's difficult to ensure that all the students are fully grasp knowledge, but imposed on its unique teaching form can compensate for these shortcomings. It is necessary to introduce the teaching course method of engineering mechanics experiment.

Engineering mechanics experiment often need the help of equipment to complete the teaching. But the equipment is too limited to meet the needs of every student. Mostly confirmatory experiments and the single teaching equipment are difficult to meet the needs of personalized learning. Less innovative and experimental test, lack of practical skills make lots of students in the form of group cooperation loses enthusiasm for practical courses (Wang, 2015). In the traditional teaching model, students can't get practical opportunities to operate, and it's reduced the efficiency of the class. Teachers need repeated the experimental again and again which caused the fatigue and inefficiency of teacher. Students previewing the degree of completion of the experiment are less than the required standard while watching the lecture and operating laboratory instruments. For emergency situations become helpless, teaching is ineffective (Zhai, 2013). After the end of the experiment process, students can integrate knowledge and skills by data analysis. However, whether the data processing or the problem's extension thought, they only get superficial understanding. Once the parameter changes slightly, they wouldn't do the test and have no way to summarize the idea of experiment behind the reflection. So the reform of Engineering Mechanics Experiment is imminent.

## II. TEACHING PRINCIPLE OF MICRO-LECTURE

Traditional teaching is not limited to transferring of knowledge from one to another. It requires various techniques in order to transfer knowledge effectively. As shown in Fig. 1, Micro-lecture teaching revolves around the teaching principles to improve the quality of engineering mechanics experiment.

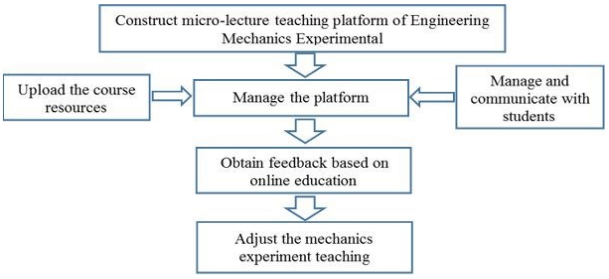


Fig. 1: Micro-lecture teaching principle

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As is shown in Fig. 2, the teacher should improve points ahead of unit design of class teaching content, actual operation and demonstration. The specialist is responsible for the video shooting. Then shoot video and do later processing, make the video display as interesting as possible. Students will be willing to accept the teaching content. The Micro-lecture is divided into teaching classes and presentation classes. Teaching class is a class which teachers teach students knowledge content by using oral language, including painted scene, narrative facts, explaining the concept, principle, etc. Presentation class is a class which teachers teach instruments, laboratory equipment, then do the demonstration experiment to confirm the imparting of knowledge.

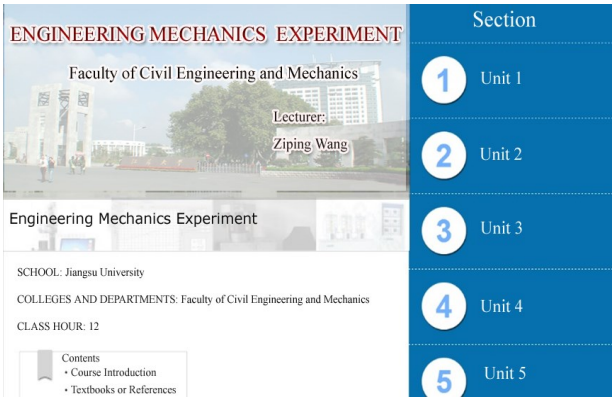


Fig. 2: Micro-lecture teaching design of Engineering Mechanics

Teachers create their own network module on administration system of network teaching platform, upload Micro-lecture video which has completed. So the students can download it to preview ahead of time, understand the experiment content, familiar with laboratory equipment. Last is the communication and interaction. After watching the video, if they have any difficulties or any questions, they can comment on below section. So the teacher and other students can answer for them. When having objections, they have discussed between teacher and students, which can also solve the problem as soon as possible.

## III. Application of Micro-lecture for Engineering Mechanics Experimental Teaching

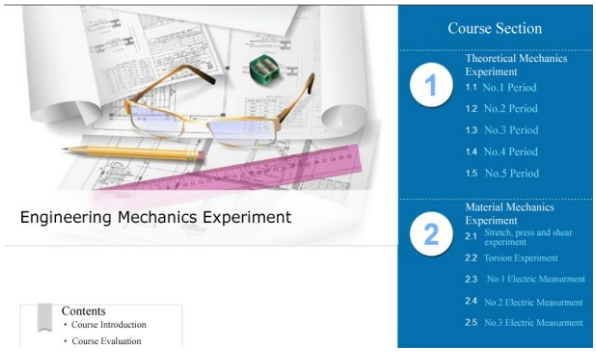


Fig.3: Content Setting of Micro-lecture teaching

Engineering mechanics experiment include many test, such as: measure the center of gravity of irregular objects, stretch test, compression test, shear test, torsion test and so on, the content settings as shown in Fig. 3. Aim at the question of engineering mechanics experiment teaching and combine with the characteristics of the Micro-lecture, try to introduce the Micro-lecture into the engineering mechanics experiment teaching to improve the level and quality of engineering mechanics experiment teaching. With the rapid development in science and technology, it can provide the precondition for Micro-lecture study with the popularity of smart phones

### *A. Improve the learning efficiency of students*

The information of traditional teaching mode is too large, learners lose patience easily due to tired, which lead to bad consequences of "spend more time, but get low efficiency". The remarkable feature of Micro-lecture is short and concise. It's not only realized with knowledge highly concise summary, but also can make learners in the process of learning is always focused. Learners can replay it to study when they can't understand briefly, which is better than the traditional way, and can improve the learning efficiency significantly. The capacity of Micro-lecture is small and can be downloading to all kinds of mobile terminal equipment quickly, so students can choose learning time flexibility according to their own needs. Study way of Video is more novels, which can mobilize student's positive and initiative effectively.

### *B. Make the reader feels as if he is participating and can acquire knowledge*

The handouts of traditional experiment class almost only have the principle of the experiment, lack of specific and direct introduction about the laboratory equipment. So it's hard for students to operate in person because of lack of laboratory equipment. Micro-lectures have visual and vivid introduce for equipment by many ways such as video, pictures, music, writing and so on. Students seem to be in practice. They are familiar with kinds of instrument operation, and have deeper comprehension of principle, function and announcement. It will be much easier when students do experiment actually.

### *C. Mobilize the positive and initiative of students preview and review oneself.*

Teachers should base on the principle of thinking from the perspective of learner's, put problem as direct, motivate student's learning interest. A clear and definite idea was guided by students to think independently, divergence thinking. Teachers send Micro-lecture video to students one week ago in advance, students answer questions and ask question through learning handouts to complete the preview. Students can send their problems feedback to teachers through the network platform. Teachers can make higher quality Micro-lecture for students according to it. Especially through the specific practice of the plain knowledge skills, dig deeper into the philosophy behind the experiment, guide students to solve problems deeply. In Micro-lecture, the link of review consolidate is designed. Teachers are going to summarize the problems of data processing on time, guiding students to analysis of causes of biggish error. Students return to

the laboratory and correct measurement. Students are more capable not only in the data processing, but also in comprehension of experiment principle. It's benefit for developing innovative thinking.

### *D. The implementation of interactive teaching in class can improve the ability of practical innovation.*

The statistics in experimental results, experimental operation and classroom discipline accounted for 50% and experiment report accounted for 50%. Through the Micro-lecture teaching practice, experiment results improved obviously. Due to the traditional teaching time is limited, the interaction between teachers and students is limited. But in interactive Micro-lecture communication platform, the teachers and students can realize the one-to-one communication and solve the problem in time. To ensure the learning efficiency at the same time, students cannot be affected by other student's different ideas. They can express their views boldly, it will inspire their practical ability. It's beneficial to the cultivation of innovative thoughts. According to the course content, teachers choose related questions for students to answer. This virtually broke the "teaching" of the situation, try to let the students themselves on lectures, student-centered, teacher led, change teaching to learn to think by the change, greatly improve the students' interest in learning, training students' comprehensive ability.

## IV. CONCLUSION

As a new teaching mode, Micro-lecture has the advantage of improving students' autonomous learning ability, stimulating students' interest in learning, helping student effectively complete preview and review, enhancing the teaching effect. Micro-lecture in our school is still in its infancy. It still has many shortages in breadth, depth and complexity, and put forward higher requirements for teachers' comprehensive quality. So it still needs to constantly improve in the future. With the constant problems in Micro-lecture teaching is being solved, the quality of engineering mechanics experiment teaching will be improved greatly.

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## AUTHOR'S PROFILE

Was born in Xiangtan City, Hunan province, China in Dec. 17, 1979. Has graduated from Jiangsu University and be a teacher in Jiangsu University. From now on began to study the hybrid teaching mode for colleges and universities and New health monitoring technology for modern structure damage.
***Email:*** wzp@mail.ujs.edu.cn