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Study on the Application of Micro-video in the Experimental Teaching of Molecular Biology

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Abstract: This paper combines micro-video with the teaching of molecular biology experimental classes. Taking the application of micro-video in experimental teaching as the core and starting from the current situation of application, I focus on the background, necessity, effect of the application of Micro-video in the experimental teaching of Molecular Biology, problems arising during application and the strategies to solve them, endeavouring to provide references for frontline teachers to apply micro-video scientifically and effectively, and making a contribution to promoting the change of teaching and learning pattern and creating more open and efficient teaching environment of molecular biology experimental classes.

1. Introduction

With the continuous development of network information technology and the increasing improvement of school infrastructure, for teachers who teach life sciences, the use of multimedia teaching has become more and more frequent, and multimedia teaching resources such as micro-video, PPT, flash/cartoon have been continuously applied to the daily teaching of molecular biology[1-3]. Micro-video is also favored by teachers, students, experts and scholars in specific teaching practice for its characteristics like short time, precise content, fast production[4]. At present, most of the domestic and foreign researches on micro-video focus on the construction, design and production, as well as the overall application of micro-video, and there is a lack of research on the application of micro-video in a certain discipline. Fewer studies have associated micro-video with "molecular biology", especially with "molecular biology experiments".

2. Background of the Application of Micro-Video in the Experimental Teaching of Molecular Biology

2.1 Impact of the Epidemic

In 2020, a "Covid" epidemic swept the world, many schools faced the problem of not being able to intensive teaching, so the phenomenon of "Stop taking classes in the classroom but not stopping learning" was extended. But the university's experimental classes can not be carried out, teachers can only use the online "micro-video" teaching method to carry out the experimental teaching of

explanatory and micro-video presentation[5-7]. Although teachers can't "carefully prepare" the experimental activities as they do in the classroom, they can show the operational experimental steps through "micro-video", so that students can be familiar with the experimental process and operation steps in advance, and they will complete the experimental process quickly and efficiently when the school year starts and the experimental teaching is carried out intensively in combination with the specific time. In addition, the use of resources is different compared to the traditional classroom, which mainly uses physical textbooks, lab materials, reagents, etc. The web-based live or recorded courses mainly use resources such as electronic textbooks and digital learning resources, such as pictures and videos[8]. In summary, micro-video is playing an increasingly important role and assuming more responsibility than ever before during the "epidemic".

2.2 The Status of Molecular Biology in the Life Sciences

Molecular biology is a required course of life science majors. Molecular biology is a discipline that has developed rapidly in recent years and has been increasingly used in the field of life sciences, with an increasingly far-reaching impact. Therefore, molecular biology courses are the core courses of undergraduate majors like agronomy, botany, zoology, microbiology, horticulture and so on. The molecular biology course is not only rich in theoretical content, but also has strong technical operability. By combining with experimental classes, the course systematically introduces biotechnology related to genes and proteins, and enables students to master some basic molecular biology principles and techniques. It can rationally construct the structure of students' theoretical and practical knowledge and enable them to master the complete molecular biology experimental operation method in limited class times[9,10]. The introduction of "micro-video" teaching method can maximize the enthusiasm of students to do experiments, improve the abilities of different students to practice, investigate and innovate new knowledge, increase the abilities of teachers to apply information technology and reserve new resources to improve the quality and efficiency of the class, as well as enhance the Knowledge literacy of teachers and train practical college student.

3. The Necessity of the Application of Micro-Video in the Experimental Teaching of Molecular Biology

First of all, it can solve the difficulties of insufficient experimental time and limited operation and thinking time in current experimental teaching. The explanation of experimental principles and the demonstration of detailed operation steps of the experiment in micro-video can allow students to think during the watching process. According to the weak points of students, the shot of this step can be slowed down or repeated. After the experimental video, we can text analyzed and explained the results, as well as combine with the textbook content, making the experiments to reveal the connotations of the corresponding knowledge points. It can also be accompanied by answers and analysis of relevant questions in the exam.

Secondly, students can watch and learn before or during class, without the limitation of time and space, improve the level of experimental operation, clarify the meaning of the experiment. It enriches the experimental teaching and strengthen students' impression of the experiment. If these video resources are put on platforms like the school's website or WeChat public account later, students can also watch them anytime and anywhere after class and can review them in time. At the same time, the experimental videos inside fully combine the characteristics of the school and the experience summed up in the experimental classes over the years. In many years of experimental management, I have learned some experience and made some improvements to student experiments so that students can complete them more efficiently. And students can quickly familiarize themselves with what changes in experimental operations through micro-video. Moreover, the

experimental micro-video can ensure the normal conduct of experimental teaching when the experimental effect is not satisfactory due to environmental factors. Some molecular biology experiments are affected by the weather and environmental factors resulting in the best and most timely results in the experimental class can't achieve, the success rate of the experiment will be reduced, which will affect the students' motivation, bring regrets to students, and also make the teacher embarrassed. If there is a good experimental video data kept at this time, teacher timely plays it to students to watch, it will largely make up for the shortcomings and regrets.

In addition, these video resources can be extended to schools without experimental conditions. At present, some schools in this province do not purchase expensive advanced gene cloning and detection instruments because of their remote location and lack of funds. And their leaders do not pay attention to experimental teaching, so molecular biology basically does not carry out prefatory experiments and is limited to the explanation of some basic operating procedures. This completely limits the hands-on, scientific inquiry and innovation skills for students. However, the molecular biology experiment micro-video can bring the same online educational resources to them. Some teachers in remote areas showed part of the experimental videos made by well-known universities, which brought good results and increased their interest to create conditions to do experiments even if they are not available.

4. The Effect of the Application of Micro-Video in the Experimental Teaching of Molecular Biology

4.1 Enrich Classroom Teaching

The use of micro-video for molecular biology experimental teaching provides flexible and diverse new teaching methods for experimental teaching. In recent years, the popularity of mobile devices is more conducive to the implementation of micro-video courses. The experimental micro-video is shared to the netbook, WeChat, and QQ group, so that students can learn in time. Playing the experimental micro-video at the appropriate time in the process of students preview before class or review after class will yield twice the result with half the effort. On the other hand, in some schools, hardware conditions of the laboratory are poor, can not provide students with the opportunity to actually do hands-on experiments. Then they can play micro-videos on multimedia equipments in the classroom to improve the efficiency of student learning, it not only save time but also enrich the teaching methods.

4.2 Develop Students' Ability

Experimental micro-video is a short video demonstrating and explaining the operation process of molecular biology experiments. By watching the visual micro-video teaching images, students can improve interest in learning. The detailed explanation of the whole experiment and the experimental operation can make the students acquire the experimental related contents and understand the experimental operation steps in a short time, which not only enriches the teaching resources of molecular biology experiment but also improves the students' experimental operation ability. The micro-video teaching content is targeted and designed to emphasize the key points and difficulties in classroom teaching. Students can learn these key points and difficulties through group discussion, which cultivates their own cooperative inquiry ability and also enhances their interest in learning. Students use the experimental micro-videos in conjunction with their own practical situations to check for gaps in a timely manner, which enhances both independent learning and satisfies students' individual learning.In addition, the micro-video is also inspiring, it emphasizes both knowledge learning and ability development, and attaches importance to students' personality development so

that they can better achieve lifelong learning.

4.3 Improve Students' Experimental Skill Level

Compared with other disciplines, molecular biology is closer to life, molecular biology knowledge is more abstract, especially molecular biology experimental steps are complex, some experiments last long, reagents are numerous, and instruments are expensive, which is not convenient to conduct directly in the classroom, and the use of traditional teaching methods is easy to make learners bored. However, micro-video, a new teaching mode, uses micro-video as a carrier to explain a teaching content.

The micro-video of molecular biology experiment is explaination for a series of experiments such as gene cloning, and the teaching is done by watching the micro-video. The detailed explanation of the whole experiment and the experimental operation can make students understand the experimental content more intuitively in a short time, learn the operation steps of the experiment, and then improve the students' experimental operation ability.

4.4 Improve Teachers' Professional Skills

The vocation of teachers is to teach and serve students, and the prerequisite for accomplishing this is to require teachers to have sufficient professional knowledge, and the making and preparation of micro-video is also a big test for teachers' educational and teaching skills. The first requirement for the preparation of micro-video is that teachers must be proficient in experimental operations, followed by familiarity with the basic knowledge of video production in computers, and most importantly, the ability to design micro-video that suits their own classroom teaching process. Therefore, the teaching mode of experimental micro-video-assisted teaching, to a certain extent, will promote the development of teachers' professional competence. Among a large number of various micro-video course resources, the micro-video resources used for teaching molecular biology are relatively scarce, and the resources used for teaching molecular biology experiments are even fewer, it doesn't have a systematic production process. Teachers develop some micro-videos suitable for molecular biology experimental teaching, and construct the design process of molecular biology micro-videos applied in experimental teaching, which can improve teachers' professional skills. At the same time, problems existed in the whole experimental process and relevant suggestions were made to provide reference for frontline teachers in using micro-video teaching process and to provide resources for the smooth implementation of experimental teaching.

4.5 Improve the Employment Rate of Students

Graduates in the life science majors will work in biotechnology companies in China. If students have a high level of professionalism and hands-on skills, it will help them increase their employment rate. During school, students participate in molecular biology experimental operations through micro-video to master the experimental principles and experimental operation methods; after graduation, by viewing molecular biology experimental micro-video again, students can better refresh their memories and also quickly master the experimental operation skills to improve the chances of employment and quickly put into work, which can improve students' professional quality and prolong their career from the long-term goal.

5. Problems and Strategies of Micro-Video Application in the Experimental Teaching of Molecular Biology

5.1 Problems of the Application of Micro-Video in the Experimental Teaching of Molecular Biology

Because the limitations of production tools and technology, and rough micro-video production technology, it is time-consuming and difficult to produce a quality micro-video. Some elder teachers who are accustomed to the traditional teaching methods, even after training, can hardly master the micro-video production techniques in a short time. The teaching contents of some micro-videos are not only difficult and voluminous in knowledge, but also weak in their own knowledge system, which results students cannot master in a short time. Micro-video resources are single, only have core part teaching video, and lack of supporting teaching resources to match the theme of micro-video topics, such as learning task list, micro-teaching plan, micro-video courseware, micro-exercises, micro-reflections, etc. Such a micro-video is incomplete. In the practical application of micro-video, many teachers still ignore the main position of students and continue the traditional one-way teaching method of transferring knowledge, lacking personalized assessment of students' knowledge level, learning ability, learning needs and learning tendencies.

5.2 Strategies for the Application of Micro-Video in the Experimental Teaching of Molecular Biology

As a new era college teacher, we should make good use of the micro-video' characteristics of short, compact, and not limited by time and space, trying to realize students' independent and personalized learning. We should give full play to the advantages of micro-video in setting the mood and context creation to deepen students' understanding of experimental principles in molecular biology and enhance their sense of immersion. To fully exploit the powerful function of micro-video in explaining single knowledge point, we should collect and integrate resources through the Internet to form micro-video with small volume but rich content, profound connotation, and has an enlightening and expanding nature. At the same time, we should update the concept and improve the technology, invite professionals and conduct regular theoretical and practical training for teachers on micro-video, so that they can clearly understand the concept and characteristics of micro-video, grasp the design, application principles and methods of micro-video, and improve teachers' ability to use information technology, so as to solve their technical problems in using micro-video. In the application of micro-video, good technical support and the exchange and sharing of resources are crucial. Schools should not only take relevant measures to encourage teachers to apply micro-video, but also continuously strengthen the construction of micro-video platform, expand the channels of resource sharing and provide technical means support. Teachers should give full play to the micro-video' advantages of short and compact, flexible and convenient, and not limited by time and space, constantly improve the quality of micro-video, carry out micro-video teaching by teaching by learning and teaching students in accordance of their aptitude, apply micro-video reasonably in the processes like before, during and after class and review before exams, fully mobilize students' initiative and enthusiasm, promote students' independent and personalized learning, do a good job of role transformation, and be a good guide for students.

6. Conclusion

In conclusion, the advantages of micro-video can strengthen the integration of micro-video and molecular biology; update teaching concepts of teachers to improve the application technology of

micro-video; strengthen the platform construction to expand the sharing channels of micro-video resources; transform the dominant position of teachers and students to attach importance to the quality of micro video teaching; and finally to promote the effective application of micro-video teaching in the experimental teaching of molecular biology.

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