



Exploration and Research on the Diversified Reform of Experimental Teaching Methods of Animal Pathology in Applied Undergraduate Colleges

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Abstract. Taking the implementation of the training of applied talents as the starting point, we should build a reform plan of animal pathology teaching curriculum that integrates production and education and pays attention to practice. By using the “production, teaching and research” base, new media auxiliary technology and other means, we should adopt the methods of “promoting learning through competition”, “double teachers and the same class”, and the main purpose is to improve the teaching methods of animal pathology and improve the knowledge level of students. The project will be implemented by creating an experimental teaching laboratory, which will allow teachers to use a variety of different models to create their own courses to test new ideas and technologies. The goal is to develop a more effective teaching method of animal pathology, which is applicable to all levels from preschool to university, and to provide a facility for researchers to study new technologies and tools.

Keywords: Applied undergraduate colleges · Diversification · Animal pathology · Experimental teaching

1 Introduction

The 21st century is the century of animal pathology. Life science plays an important role in many fields. Whoever masters life science will master everything. The university stage is the most important stage in students' life. It is the key period to form a scientific world outlook, outlook on life and values. It is also a period of rapid development of scientific literacy, which is the core content of the proposed curriculum standards. Animal pathology is an experimental science. Improving experimental ability helps to improve students' scientific literacy. The core content of the biology curriculum standard formulated by the Ministry of education in 2003 is to improve each student's biological science literacy (Dong Jing 2006) [1]. The curriculum concept advocated therein - facing all students, improving biological science literacy, and advocating inquiry learning can

be well implemented through experimental classes (Wang Lu 2013). Students' learning evaluation is an indispensable part of the process of education and teaching. The general university biology curriculum standard (Experiment) points out that experimental ability is an important part of learning evaluation (Ministry of education 2003). However, at present, the evaluation of biological experiment courses is often single, mostly through paper and pencil tests or experimental reports, and a set of operable evaluation system has not been established [2]. Changing the traditional way of single evaluation of students, looking for an evaluation method that can improve students' learning interest and experimental results, and improve students' scientific literacy, is one of the important problems faced by the reform of basic education in China.

Animal pathology is a natural science based on experiments. Interest is the guide of learning, and biological science literacy is the core content of the new curriculum standard, which requires attention to the development of students. Therefore, the learning evaluation of biological experiment course should be based on improving students' learning interest and promoting the formation of biological science literacy, and the goal of teaching evaluation should establish an evaluation and examination system consistent with the concept of quality education. In experimental teaching, the purpose of evaluating students is not to grade students, but to better understand students and promote their development (Wang Lu 2013) [3]. The author's research on the diversified learning evaluation system of high school biological experiment class is to explore the mode of combining multiple subjects, multiple contents and multiple ways, improve the existing learning evaluation system of animal pathology experiment class, and provide reference for teachers' biological experiment class students' learning evaluation. At the same time, it is hoped that through this research, teachers can pay more attention to the learning evaluation of animal pathology experimental courses, promote the development of students with diversified learning evaluation methods, improve students' scientific literacy, and cultivate students' lifelong development ability [4].

2 Related Work

2.1 Educational Purpose of Applied Undergraduate Colleges

Educational purpose is the core of the whole educational and teaching activities. Educational purpose is the starting point and basis of educational and teaching activities, and it is also the final destination of school educational and teaching activities. It plays a guiding role in the determination of educational tasks, the establishment of educational systems, the selection of educational content and the organization of all educational activities. Therefore, clarifying the educational purpose of Applied Undergraduate Colleges and universities is the primary problem that colleges and universities should solve.

Application-oriented undergraduate not only has the generality of undergraduate education, but also pays more attention to practicality, application and technology. Its educational purpose is to cultivate applied talents suitable for social needs and high-level applied technical talents mainly composed of front-line engineers. These talents have a solid theoretical foundation, a wide range of professional knowledge, strong practical ability, high comprehensive quality, and strong ability to apply, promote and convert science and technology.

From the current pattern and level of talent training in Higher Education in China, higher engineering and technical talents can be divided into engineering research talents, engineering application talents and engineering management talents. Applied undergraduate talents are engineering applied talents, mainly engineering technicians engaged in application research, technology application and development, and product trial production in a professional field in the front line of production [8].

The training objectives of applied undergraduate talents are: solid foundation, wide caliber, strong ability and emphasis on application. For application-oriented undergraduate talents, the most basic human qualities that best reflect the requirements of the times are as follows:

In terms of knowledge, we should not only have a broad range of knowledge, a solid mathematical foundation, strong theoretical skills and solid professional basic knowledge, but also have excellent applied knowledge.

In terms of ability, we should have strong research ability, practical ability, grasp flexible scientific methods, and have strong innovation ability. Have the ability to accept and apply new knowledge, and be able to apply professional knowledge and practical technology to comprehensively solve practical problems. Self learning and sustainable development.

In terms of quality, we should have a strong sense of responsibility, excellent psychological quality, strong will quality and good physical quality.

The connotation of the basic quality of Applied Undergraduate Talents provides a solid foundation for their future sustainable development.

2.2 Application Analysis of Rough Set Theory

Up to now, rough set theory has been widely used in various fields of data mining. Applying rough set theory to teaching evaluation is mainly aimed at the unreasonable weighting of teaching evaluation subjects. For example, there is no scientific basis, only through artificial determination or reference to the weight settings of other institutions, and the evaluation results obtained in this way often do not accurately reflect the teaching quality. At this stage, domestic experts have used data mining to conduct research on teaching evaluation. This kind of evaluation research usually requires a two-way approach, which involves assessing both the performance of students and the level of teachers, such as the quality of exam questions. The theoretical basis for evaluation is still teaching measurement and evaluation theory, and the technology used is data mining, while the method is the rough set algorithm of data mining technology. This algorithm is a new mathematical theory for analyzing incomplete and uncertain data. It is mainly used in teaching evaluation to make the data become the subject with decision-making power. In teaching evaluation, if the combination of clustering analysis and rough set theory is used, relatively better evaluation results can be mined. Because the improved methods (hard clustering methods) in the field of clustering analysis can more objectively adapt to practical applications, they have become a hot spot in clustering research. At the same time, based on the fuzzy C-means clustering method, clustering analysis is conducted for the data in teaching evaluation, and then the different weight coefficients of various factors in teaching evaluation are mined using rough sets. It can be seen that the combination of these two technologies provides a reliable theoretical basis for the

teaching evaluation system, and the application results show that the division of weights conforms to the actual situation.

The numerical characteristics of rough sets represent the size of the set boundary region, but do not explain the structure of the boundary region; However, the topological characteristics of rough sets do not provide information about the size of boundary domains, but rather provide the structure of boundary domains. Therefore, in the practical application of rough sets, we need to combine the two types of information from the boundary domain, taking into account both the accuracy factor and the topological structure of the set.

Rough set theory also defines upper approximation and lower approximation for the classification of set classes on approximate spaces. Let $F = \{X_1, X_2, \dots, X_n\}$ be a classification or division of U that is independent of knowledge R , and the subset X_i is the class that divides F . The lower approximation and upper approximation of R for F are defined as:

$$\underline{R}F = \{\underline{R}X_1, \underline{R}X_2, \dots, \underline{R}X_n\} \quad (1)$$

$$\overline{R}F = \{\overline{R}X_1, \overline{R}X_2, \dots, \overline{R}X_n\} \quad (2)$$

There are two metrics to describe the imprecision of approximate classification. The first metric is the approximate classification accuracy based on knowledge R , F :

$$\alpha_R(F) = \frac{\sum_{i=1}^n |\underline{R}X_i|}{\sum_{i=1}^n |\overline{R}X_i|} \quad (3)$$

The second metric is the approximate classification quality based on knowledge R , F :

$$\gamma_R(F) = \frac{\sum_{i=1}^n |\underline{R}X_i|}{|U|} \quad (4)$$

The accuracy of approximate classification describes the percentage of correct decisions in possible decisions when using knowledge R to classify objects; The quality of classification represents the percentage of objects that can be accurately classified as F using knowledge R .

The reduce process then collects the output of the mapping task as input and combines these given key/value tuples into a smaller set of pairs to generate the final output. The MapReduce framework is shown in Fig. 1.

Comparing the concept of rough sets with ordinary set theory, it can be seen that the basic properties of rough sets, such as member relationships of elements, equivalence and inclusion of sets, are related to the knowledge of the universe represented by indistinguishable relationships. Therefore, whether an element belongs to a certain set is not an objective property of the element, but depends on our understanding of it; Similarly, the equality and inclusion of sets have no absolute significance, but depend on our understanding of the set in the problem under study.

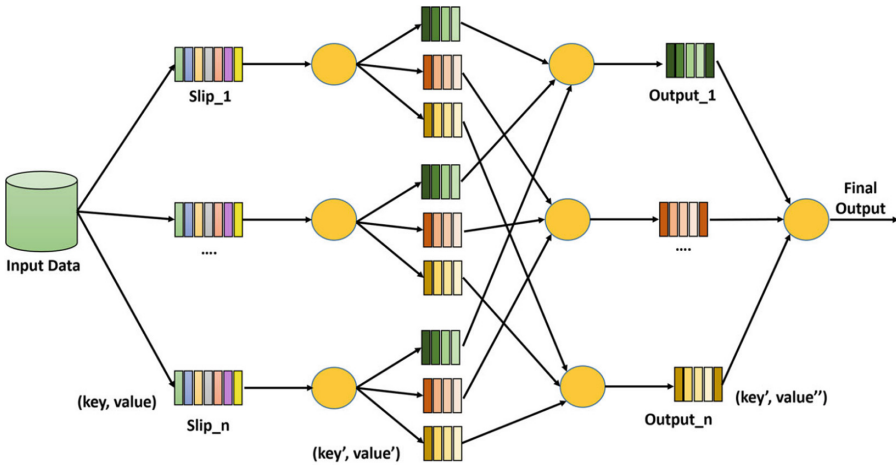


Fig. 1. The process of the MapReduce framework

3 Experimental Teaching Methods of Animal Pathology

3.1 Adopt Multimedia Teaching in Combination with the Characteristics of Animal Pathology

The fundamental goal of higher education is to cultivate college students into talents useful to society. This is not only the requirement of the country and society for higher education, but also the ardent hope of college students' parents. "That is, this function cannot be replaced by any institution." The content of the course of animal pathology is complex, and the current teaching model cannot meet the requirements of higher education. Therefore, it is imperative to reform the teaching of animal pathology. Through the reform of teaching content, teaching methods, and assessment models, students' learning interest and innovative thinking ability have been improved, making it easier for them to master boring knowledge.

Animal pathology focuses on understanding and mastering the essence, occurrence and development of diseases from the perspective of morphology. Multimedia teaching has the effect of image, text, sound and the combination of dynamic and static. It is clear and beautiful, vivid and informative. The formation, development and change of various diseases are vividly, vividly and concretely reproduced in the classroom by using the scene of sound and image synchronization and the picture of dynamic and static combination, forming a relaxed and pleasant teaching scene and atmosphere, which is conducive to stimulating students' interest in learning and enhancing the teaching effect, as shown in Fig. 2.

Using multimedia teaching can save the time of blackboard writing, so that teachers can provide students with as much information as possible in limited time and space; It can change the previous limited, one-sided and intermittent teaching mode, and show the occurrence and development process of a disease to students continuously, dynamically and comprehensively. It can also make up for the shortcomings that the microscope can only be observed by a single person, and it is not easy to communicate between teachers

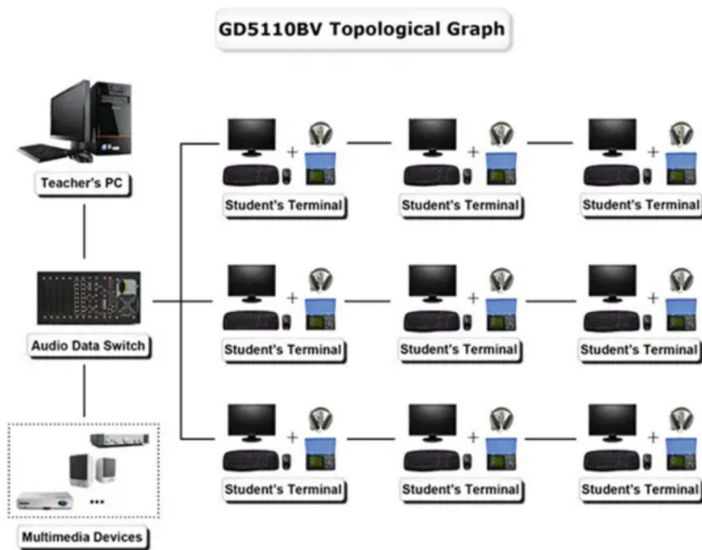


Fig. 2. Multimedia teaching mode

and students. The interactive teaching between teachers and students can also make up for the lack of typical specimen sources, and improve the teaching effect [9].

When applying multimedia teaching, it should be noted that multimedia teaching cannot completely replace the traditional teaching methods, especially the dominant position of teachers in the teaching process. When using multimedia teaching, teachers still need to impress and influence students through their body language and personality charm, a key. The difficult content should also be displayed in the form of blackboard writing, and the teaching outline should be kept on the blackboard, so that students can see the whole class, and have a general impression after class, so as to avoid the negative effects of fast switching of multimedia screen content, passing through the key points and difficulties as soon as they are put on the blackboard, and not easy to remember.

3.2 Combining Pathological Changes with Clinical Diagnosis and Clinical Manifestations, Case Teaching is Adopted

Animal pathology knowledge is an important basis for clinical diagnosis, and pathological changes determine clinical symptoms and signs. Combining pathological changes with clinical manifestations in teaching can enrich pathological changes and stimulate students' interest and enthusiasm in learning. During the teaching process, some cases can be arranged for discussion according to the contents of each chapter and common diseases. Students are required to diagnose the diseases of animals from the clinical manifestations, signs and pathological changes found during autopsy, discuss the evolution and development of diseases, and analyze the cause of death. Through case discussion, we can not only cultivate students' connecting, developing and overall thinking methods, promote the development of students' clinical thinking, but also It can also

enrich the teaching content of Pathology, activate the classroom atmosphere, stimulate students' interest in pathology, and enhance students' understanding and understanding of diseases.

For example, when describing the chapter of tumor, first introduce some pathological pictures of typical tumors to improve students' interest in learning, then introduce a case picture of clinical tumor, and ask students why they can judge whether the sick animal is inflammation or tumor, benign or malignant, early or late tumor by observing the tissue sent for examination, and then introduce the basic points of tumor diagnosis in combination with the content of books, Advance layer by layer to introduce the general characteristics and microscopic characteristics of the tumor, so that students can have a deeper understanding of the pathological changes of the tumor.

As teachers, they should pay attention to collecting and sorting out relevant clinical data in their usual work, and gradually establish and optimize animal pathology question bank, basic discussion question bank of clinical cases, medical history and case analysis, and picture Bank of histomorphological diagnosis. Organize students to use their knowledge of animal anatomy, histology and animal pathology to discuss relevant cases Medical history and means of diagnosis and treatment. It can not only cultivate students' clinical thinking ability in advance before they enter the clinical learning stage, but also improve students' interest, initiative and enthusiasm in learning animal pathology knowledge.

With the popularization of information technology, a large number of information technology and information database resources are used to assist teaching during the teaching process, such as course PPT, digital images, FLASH animations, hands-on videos, and course resource libraries, which can greatly increase the intuitive nature of the teaching process, save time in course teaching, simplify the teaching process, enable students to obtain various cognitive changes in pathology through various ways, and improve their ability to diagnose diseases, It is conducive to stimulating students' interest, mobilizing learning enthusiasm, and improving learning effectiveness. In addition, offline interaction between teachers and students is increased through QQ, WeChat, and other means to provide timely feedback on students' questions, breaking the gap between space and time, and extending the time and content of learning. With the help of information based teaching platforms, such as Learning Connect and Cloud Classroom, students can preview or review PPTs, lesson plans, and videos and pictures that accompany the course, both in and out of class, to deepen their understanding of pathological changes. It is also possible to continuously test the learning situation and effectiveness of students through the rational use of the test question library.

4 Exploration of Diversified Reform of Experimental Teaching Methods

Adopt a combination of traditional teaching methods and rational use of information based teaching methods, make full use of rich network information resources, and upload relevant course construction materials (such as lesson plans, PPTs, question banks, videos, photos, etc.) using network platforms (such as Xuetong or cloud course construction courses). Guided by the traditional teaching model, the abstract content

of animal pathology is divided into lectures, and 9 main teaching modules for Animal Pathology are designed. Theory is followed by practical training, alternating between theory and practical training, to deepen students' understanding of pathological changes. At the same time, the release of group tasks is used to promote students to actively seek for lesions, group students discuss lesions, group classroom reports, and inter group questions to stimulate students' understanding of the lesions. Finally, the teacher comments to deepen their understanding of the lesions (see Fig. 3).

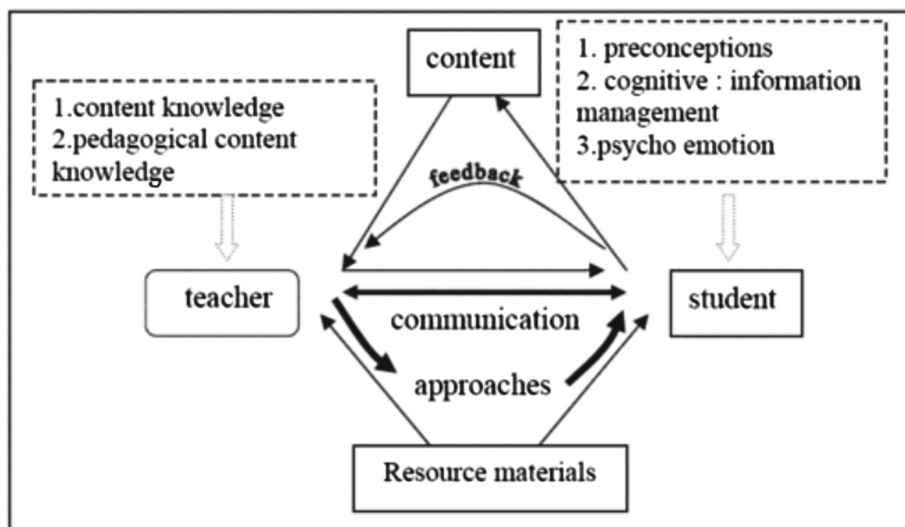


Fig. 3. Teaching and learning process

At present, many colleges and universities have less class hours for animal pathology experiments. Generally, 4–6 experiments are arranged in the second half of the second grade, with about 3 class hours for each experiment, a total of 18–20 class hours. The content of experimental courses is mostly the observation of specimen pathological tissue sections, and the teaching method is relatively simple, which often makes students in a state of passive acceptance of knowledge, and the classroom teaching effect is poor. In order to strengthen the practical teaching links and increase the corresponding class hours, the practical teaching is divided into three stages: the first stage, the pathology experiment course is opened at the same time as the pathology course is opened in the second semester of the second grade, and the pathological anatomy practice is increased, so that students can deepen their understanding of the pathological characteristics and changes of the disease, and enhance the basic operation and skill training; 2. In the second semester of the third grade, the veterinary skill experiment course is offered, including the autopsy and film reading of animal pathology; in the third stage, during the senior internship, the cases encountered in the clinical pathological diagnosis of animal diseases are described in writing, typical clinical cases are collected, and students are allowed to observe a large number of ocular and microscopic specimens, multimedia courseware, slides and wallcharts, so as to carry out pathological practice teaching at

multiple levels and angles. In the above three stages of teaching, the TBL (team based learning) teaching mode can be introduced into the traditional animal pathology experiment teaching, as shown in Fig. 4. For example, the College of life sciences of Longyan University has set up more than ten comprehensive and designed experimental projects, such as the observation of clinical symptoms and pathological autopsy of Newcastle disease in chickens, the establishment of a carbon tetrachloride liver injury model in mice, the observation of tissue and organ damage in mice caused by acute heat stress, and the pathological autopsy and observation of *Pasteurella* infected rabbits, using good experimental platform conditions such as the Institute of animal medicine and the Fujian swine epidemic prevention and control engineering center, Students will be divided into free groups, with 5–6 people in each group. Each group will randomly select an experimental project to complete relevant learning tasks such as data collection, observation, analysis and drawing of pathological specimens, production and presentation of PPT, interactive Q & A, etc. In class, each group will show the learning situation to the whole class in turn, and lead everyone to learn the content of the experimental project together. After the speech, interactive Q & A will be carried out, and the student representatives and teachers of each group will score the whole group. Finally, the teachers will comment and make necessary analysis.

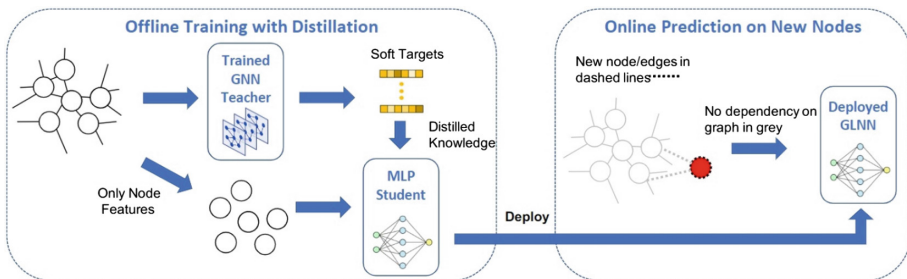


Fig. 4. Relying on the “industry university research” base to build a teaching mode map of industry education integration

During the practice week of pathological anatomy, based on some pathological cases submitted for clinical examination, students are required to diagnose the disease of animals from the clinical manifestations, signs and pathological changes (including ocular and microscopic examination) found during autopsy, discuss the evolution and development of the disease, and analyze the cause of death. For example, the pathogen of yellow diarrhea and white diarrhea of piglets is the same, both of which are acute and fatal intestinal infectious diseases of newborn piglets caused by pathogenic *Escherichia coli*. The difference lies in the age of onset, fecal color and mortality; Both transmissible gastroenteritis and epidemic diarrhea can cause diarrhea in piglets, but the mortality of piglets is different. The length of villi and the proportion of intestinal gland recess are different in pathological sections. In this way, through the analysis of some diseases with similar symptoms, students can draw inferences from one instance.

In addition, establish a comprehensive experimental performance evaluation system based on four indicators: experimental class performance, experimental report,

film reading assessment and group learning display. Through the examination of specimen microscopy, case analysis and defense, we can have a more in-depth and specific understanding of the extent to which students master practical operation skills.

5 Conclusion

With the development of science and technology and the mutual penetration of adjacent disciplines, some new fields and branches of animal pathology have emerged, such as molecular pathology, genetic pathology, comparative pathology, etc., and new technologies and new research fields will still appear in the future. However, in the future, animal pathology will still put the diagnosis of diseases in the first place, and the means and methods used should be advanced and modernized. In other words, in addition to extending the use of autopsy technology, we should also make full use of various ways to absorb some of today's high and new technologies, develop and establish new methods and technologies suitable for pathological diagnosis in combination with the actual situation of Pathomorphology, so as to improve the level of animal pathological diagnosis, so that some diseases that were difficult to be diagnosed by general methods of animal pathology in the past can be diagnosed in time and accurately. It should be the responsibility and task of contemporary Chinese animal pathologists to make the development of animal pathology in China keep pace with the development of animal pathology in the world and take the lead in some aspects.

References

1. Huang, L., Zhao, W.: Research on the Construction of Teaching Staff for Innovative Experimental Class in Applied Undergraduate Universities (2021)
2. Wang, W., Yin, G.: Analysis and research on the application of internet technology in sports track and field teaching. *J. Phys. Conf. Ser.* **1881**(4), 042026 (7pp) (2021)
3. Xia, L., Yu, J.B.: Research on the experimental teaching reform of "material analysis and test method" based on OBE engineering education mode (2021)
4. Meng, J.: *The Necessity and Influencing Factors of Constructing a Diversified Cooperative Educational Mechanism for E-Commerce Major*. Springer, Singapore (2022)
5. Manan, M.S.A., Wang, X., Tang, X.: Innovating animation teaching system: an experimental survey on the integration of design thinking and creative methods for animation education in China. *Open J. Soc. Sci.* **10**(3), 10 (2022)
6. Wang, S.Y.: *Exploration and Practice of Quality Education for Undergraduates in Private Applied Undergraduate Colleges Based on TOPCARES*, vol. 2. Francis Academic Press (2021)
7. Zhou L. The Experimental Research on Stylized Teaching Method Used in the Art Guidance of Chinese Undergraduates (Piano Accompaniment) — Take the Teaching of Haidun Piano Sonata as an Example[J]. *Arts Studies and Criticism*, 2021, 2(4)
8. Deng, X., Lei, J., Chen, M.: Application of VR in the experimental teaching of animation art. *Mobile Inf. Syst.* (2021)
9. Aoife, F., Ornaith, K., Long, N., et al.: P03 A qualitative exploration of antimicrobial stewardship and resistance education in undergraduate healthcare professional programmes. *JAC-Antimicrobial Resistance (Supplement_1):Supplement_1* (2022)

10. Yang, J., Han, X., Gao, K.N., et al.: *Listeria monocytogenes* inoculation impedes the development of brain pathology in experimental cerebral malaria by inhibition of parasitemia. *ACS Infect. Dis.* **8**(5), 998–1009 (2022)
11. The assessment and exploration of forensic nursing concepts in undergraduate nursing curricula: a mixed-methods study. *Int. J. Nurs. Educ. Sch.* **18**(1), 16–21 (2021). Louisiana Tech University, 105 Wisteria Lane, Ruston, LA, 71272, USA
12. LIXianyu.: Analysis on the application value of experimental teaching method in the teaching of “Plant Cells and Animal Cells”. 外文版:教育科学 (5), 4 (2022)
13. Chen, X., Pan, L., Wang, X.: Exploration on the Reform of Teaching Mode and Method of Product Design under Internet Mode (2021)
14. Ye, P., Zhou, W., Zhao, C., et al.: Research on the forming method of lightweight body and parts. *IOP Conf. Ser. Earth Environ. Sci.* **632**, 032066 (2021)
15. Zhang, W.: Exploration and online sharing network teaching platform based on information technology (2022)