

# *The Reform and practice of "learning and innovation integration" type of animal breeding theory and biotechnology curriculum system based on "project-driven"*

Jingchun Li\*, Yanbing Li, Qing Guo, Xue Wang, Guoan Yin

*College of Animal Science and Technology, Heilongjiang Bayi Agricultural University, Daqing, Heilongjiang, 163319, China*

*\*Corresponding author: ljchun112@163.com*

**Keywords:** Project-driven teaching, Animal husbandry, Integration of learning and innovation, Graduate education reform

**Abstract:** Graduate student training not only needs to focus on the exploration and development of scientific research projects, but also is particularly important for the cultivation of graduate students' innovation and entrepreneurship ability based on the current country's continuous demand for compound innovative talents. This study took the animal reproduction theory and biotechnology course as an example to analyze the current problems faced by the course, such as the fragmentation of knowledge points, the separation of teaching and learning, and the disconnection between learning and application by taking "project-driven" as the main line, the curriculum system reform of "integration of learning and creation" is carried out. The "project driven" was introduced into the cultivation of innovation and entrepreneurship ability, and the "integration of learning and creation" curriculum system and comprehensive curriculum ability evaluation system based on the "project driven" of animal science graduate students are constructed, and the graduate students are encouraged to participate in various academic competitions. In order to further improve the ability of innovation and entrepreneurship of postgraduates in animal husbandry, and cultivate modern agricultural talents suitable for the development of new agricultural science in China.

## 1. Introduction

Animal reproduction theory and biotechnology is an important branch and teaching course of animal husbandry, which is one of the key content sections that graduate students must learn and master during their master's study [1]. However, the training objectives for students in the graduate stage are different from those of undergraduates, and more emphasis is placed on cultivating students to have certain independent scientific research ability in a certain discipline, requiring students to make certain innovative achievements upon graduation. Therefore, postgraduate courses, as an important adaptation process for students from undergraduate to postgraduate stage, must play an important guiding role in transforming students' learning methods, cultivating their thinking mode of

scientific research, training relevant computational means and mastering the knowledge system of the discipline. This paper mainly aims to update and reform the cultivation of innovation and entrepreneurship ability, systematically improve the academic research ability, innovation ability and scientific research quality structure of postgraduates in this major, and cultivate interdisciplinary talents with coordinated development of professional knowledge and research ability, who are good at grasping frontier hot issues and capable of using tools to conduct in-depth research [2].

However, there are the following characteristics in the teaching of this major: In the content of relevant textbooks, there is a general tendency to overemphasize the principle part and explain the theoretical background too much. When students started to contact the course, they were easy to fall into the boring theory, and the lack of practical content that students expect causes the deviation of students' learning interest. In particular, during the adjustment of the talent training program, part of the class hours were compressed, and the number of teaching hours was also reduced, which made the teaching content of each class continue to increase. Using traditional teaching methods, it is difficult to achieve the expected effect, the teaching effect is not good. It needs to be improved in cultivating students' innovation consciousness and enhancing their innovation and entrepreneurship ability. Although the new content oriented by innovation and entrepreneurship is involved in undergraduate education, the deep integration with different industries, disciplines and professions in the postgraduate curriculum system still has limitations. Especially in today's era of big data, Internet, Internet of Things and artificial intelligence, as well as the latest proposed "intelligence +", it is necessary to integrate new technologies into different fields and products in a timely and full manner to promote the transformation of the entire industry and the continuous development of society [3,4].

Therefore, it is necessary to re-design the course teaching content based on real and specific entrepreneurial projects. By combining the theoretical basis and practice of the course, it can stimulate the learning interest of graduate students, broaden their horizons, innovate in theoretical knowledge and start businesses in practice, and lay a good foundation for cultivating high-quality innovative and entrepreneurial talents. It was to explore the course system reform of animal science graduate students under "double innovation".

## **2. Current teaching situation of animal reproduction theory and biotechnology course**

In the teaching practice of animal reproduction theory and biotechnology course, it is easy to cause boring, disconnection between theory and practice, and lack of innovation and application ability.

### **2.1 Knowledge fragmentation**

Animal reproduction theory and biotechnology course is based on animal anatomy, animal histology, animal physiology, animal production science, animal embryology and other pre-teaching subjects, the knowledge coverage is wide, knowledge points cross and scattered, in traditional teaching practice is easy to lead to a simple list of knowledge points and content straight. The curriculum reform needs to take the preparation and operation of artificial insemination in animal reproduction theory and biotechnology as the main line of project-driven teaching, so that students can systematically connect and summarize scattered knowledge points, have a good grasp of the course teaching logic and macro framework, and facilitate the cultivation of follow-up innovation ability [5,6].

### **2.2 Separation of teaching and learning**

The knowledge points of animal gametogenesis and embryo development mechanism involved in the course of animal reproduction theory and biotechnology are relatively abstract, and the traditional

teaching mode is easy to lead to obscure and boring courses and lack of practical innovation, and ultimately lead to students losing interest and motivation in learning. At the same time, students' understanding and mastering level of pre-teaching subjects are also different, which ultimately leads to the difficulty of achieving the curriculum training goal. Therefore, it is necessary to be student-centered, project-driven and problem-oriented, organically combine teaching content with practical training, make abstract knowledge concrete, and ultimately improve learning effect. [7].

### **2.3 The disconnection between learning and application**

At the same time, there is also an obvious gap between the study of animal reproduction theory and biotechnology theory and the operation practice. The practice teaching often focuses on copying the teaching content in books, lacking the training of students' hands-on ability and innovative ability, and objectively lacking in the internalization of book knowledge and the ability to analyze and solve problems, making it difficult to apply the theoretical knowledge and operational skills learned by them to the experiments and practices of postgraduates. Therefore, it is of great significance to combine basic theoretical knowledge with new ideas and new ideas in the teaching reform with the orientation of new agricultural science, and to actively explore the "learning and creation integration" curriculum reform that integrates "learning, knowledge, thinking and action" for the next generation of intelligent animal husbandry.

## **3. Objectives and routes of animal reproduction theory and biotechnology curriculum reform**

### **3.1 Objectives of curriculum reform**

#### **3.1.1 Knowledge Level**

Master the basic concepts, principles and methods of Animal Reproduction Theory and Biotechnology, and master the operation process of artificial insemination technology.

#### **3.1.2 Ability**

This course not only requires students to work hard to learn theoretical knowledge, but also to take the initiative to practice in the practice environment. Since there are many technical situations in the actual experimental operation process of graduate students, it is impossible to teach all of them in class, which requires students to deeply grasp the knowledge in the course and internalize it into the operation ability.

#### **3.1.3 Innovation and entrepreneurship**

After students have mastered the theories and methods of animal reproduction and biotechnology, students are encouraged to participate in various national innovation and entrepreneurship competitions. Students are encouraged to solve various problems across disciplines and disciplines, and to apply theoretical knowledge to concrete practice.

#### **3.1.4 Thinking level**

On this basis, further train students' logical thinking ability in this course field, and gradually form a logical thinking mode with academic theory as a solid foundation and problem solving as a practical approach.

## **3.2 Curriculum reform route**

### **3.2.1 Introduce "project driven" into the cultivation of innovation and entrepreneurship ability**

"Project-driven" teaching mainly means that with the assistance of teachers, student-centered, curriculum standards as the basis, and projects as the carrier, learners are allowed to cooperate with each other, personally investigate, summarize, and gradually complete a series of decomposition tasks and projects, and finally form project products or solutions. Secondly, through questionnaires, communication with graduate entrepreneurs and field study, through empirical analysis of individual factors, family factors, school factors, government factors and other aspects, the influencing factors of graduate students' innovation and entrepreneurship ability are clarified, so as to provide reference for students' future healthy development.

### **3.2.2 Build a "project-driven" curriculum system of "integration of learning and innovation" for animal science graduate students**

The "project-driven" teaching reform and practice process will be applied to the teaching, learning, development and design practice of Animal Reproduction Theory and Biotechnology course as well as the application and completion process of big innovation project. The overall planning, analysis and design of the teaching development design of the course and the application of innovation and entrepreneurship project will be carried out, and the course evaluation mechanism will be reformed and practical teaching will be carried out. Focusing on the integration of professional courses with innovation and entrepreneurship education, a series of related professional course teaching activities will be carried out in turn. The core is "project" and "case", and the form is "group collaboration". "Project", "competition" and "results" are the carrier, and it is based on "innovative projects". And "innovative projects" is from life practice, which is combined with the teaching content of the course. Refine innovation and entrepreneurship projects. Rely on discipline competition, and ultimately achieve the purpose of transformation of results.

### **3.2.3 Build a comprehensive curriculum ability evaluation system and encourage graduate students to participate in various academic competitions**

The students' innovation and entrepreneurship ability is evaluated comprehensively by combining process evaluation and outcome evaluation. Encourage capable students to participate in national college students's innovation and entrepreneurship competitions, such as "Challenge Cup" and "Internet +". And they can improve the design of scientific research projects, get familiar with the writing of project declaration, road show, defense and other aspects. They can also cultivate teamwork ability and improve comprehensive ability. This paper analyzed the practical effects of the "project-driven" and "learning-innovation integration" system for professional courses through classroom teaching and student questionnaires, established the courses with the advantage of "project-driven", further optimates the integration degree of teaching objectives of professional course learning and innovation and entrepreneurship, and forms a "learning-innovation integration" system for graduate courses in animal science. Evaluate and analyze the index system of innovation and entrepreneurship ability of graduate students in animal science and its influencing factors.

## **4. Implementation plan of animal reproduction theory and biotechnology curriculum reform**

### **4.1 Redesign of teaching links**

The course "Animal Reproduction Theory and Biotechnology" is based on the teaching design and

implementation of "project-driven" and "integration of learning and creation". First, the teaching concept of the course should be based on basic theoretical teaching, and at the same time, innovation and entrepreneurship projects should be the center, and a series of related teaching activities should be carried out in turn. Secondly, according to the students' learning perspective, in the theoretical stage, the basic theory is mainly studied. For group design in the practical stage, relevant problems must be "real scenarios" that students may encounter in their projects, unstructured problems, no fixed solutions and processes, and focus on group cooperation and independent learning. Groups conduct group evaluations and self-evaluations of each student at the completion of each question and at the end of each course unit. Finally, in practice teaching, we should consider adjusting the traditional form of teachers simply demonstrating, explaining and assigning tasks, fully mobilizing students' initiative, giving play to teachers' leading role, and giving students a clear direction. Teachers should pay attention to the cultivation of students' innovative consciousness and ability[8].

#### **4.2 Teaching content focuses on practice and innovation**

On the premise of maintaining the basic integrity of the course content system, the theoretical teaching content is moderately compressed, which is less used in the actual development and design. In the course of teaching, only the basic theory needs to be explained clearly, without in-depth teaching. At the same time, we should increase the content of innovative teaching in practice, encourage students to actively and flexibly apply what they have learned, fully learn from the abundant data resources on the network, practice and operate frequently, and flexibly apply relevant knowledge to different fields. In actual teaching, teachers put forward systematic development project tasks according to the teaching plan and textbook content, fully combined with the project design objectives, so that students can complete the integration of theory and innovative practice content.

#### **4.3 Establish a project team with students as the main body**

The course teaching mode based on "project driven" and "integration of learning and creation" has the characteristics of modularization, process, task and group. Teachers reconstructed and designed the practice and training links, and each learning group formed a development and design team to complete the selection of innovative and entrepreneurial projects; The teacher further designs the practical teaching content according to the specific situation of the project design team; Promote the teaching task according to the experimental teaching process, and promote the completion of the teaching task with the mode of "integration of learning and creation"; Each development and design team gives full play to their learning ability to promote the development and design of innovative and entrepreneurial projects faster and better.

#### **4.4 Establish a scientific evaluation system**

How to evaluate the teaching reform and practice based on the "project-driven" and "learning-creation integration" teaching mode based on the perspective of students is a sign to measure the success of the teaching reform. It is planned to start from three aspects. Firstly, it is necessary to see whether the school can successfully apply for the annual mass innovation project organized by the school and the successful conclusion of previous mass innovation projects. The second is whether the students really learn something, which needs to set up the index system, set the weight, from the different perspectives of teachers and students, to carry out a horizontal and vertical comparison, comprehensive evaluation; Finally, in the long run, whether the students can be recognized by the market after graduation and can better adapt to the market demand.

## **5. Effect analysis of animal reproduction theory and biotechnology curriculum reform**

### **5.1 Implementation scope and teaching benefit analysis**

On the basis of full investigation and research, this project makes reference to the successful experience and practice of "mass entrepreneurship" in undergraduate education, deeply explores the resources of "mass entrepreneurship", deeply implements the "vigorously support graduate students to carry out innovation and entrepreneurship activities", "integrate the training of innovation and entrepreneurship ability into the curriculum system", "promote the construction of graduate students' innovation and entrepreneurship education center, and strengthen the practical training of innovation and entrepreneurship." Aiming at the characteristics of graduate education and aiming at the "innovation and entrepreneurship" pattern of three-dimensional education, the main channel of professional classroom teaching is used to build a "learning-creation integration" system in the graduate professional courses of animal husbandry. Through the implementation of "integration of learning and creation" in the graduate education of animal husbandry, it is beneficial to cultivate senior innovative and entrepreneurial talents in animal husbandry.

### **5.2 Analysis of reform results and model popularization**

This project reformed the teaching content of Animal Reproduction Theory and Biotechnology, fully integrated the application of innovation and entrepreneurship projects with the course teaching, restructured the course system, optimized the theoretical teaching content, and redesigned the experimental links of the course, so as to fully integrate the content related to innovation and entrepreneurship with the course based on the reform of the teaching mode of "integration of learning and innovation". Continue to explore the innovation and innovation of the curriculum teaching mode of innovative and entrepreneurial talents training, cultivate students' innovative spirit, strengthen entrepreneurial awareness, and enhance innovative and entrepreneurial ability. At the same time, the relevant experience and research results of this project can provide reference for the training of graduate students in other disciplines, especially the construction of "double innovation" system in similar majors such as veterinary medicine, grass science, aquatic products and biology, and promote the construction of innovation and entrepreneurship education system for graduate students in agriculture and forestry.

### **5.3 Innovative analysis of curriculum reform**

This reform proposes the integration of graduate professional courses and innovation and entrepreneurship education in a pioneering way by introducing the domestic and foreign professional integration experience of undergraduate innovation and entrepreneurship education,. At the same time, it will promote the communication between postgraduate students and entrepreneurs to understand the methods, ways, approaches, difficulties, successful experiences and lessons from failures of postgraduate students who are willing to innovate and start businesses, so as to further avoid the repetition of mistakes of graduate students, who are willing to innovate and start businesses. In addition, this reform also deeply explores the elements and matrix of innovation and entrepreneurship in the professional courses of animal husbandry graduate students, takes the lead in carrying out research on the integration of innovation and entrepreneurship education and professional courses based on "project driven" and "learning and innovation integration", and explores the organic integration of professional courses and innovation and entrepreneurship education. Construct a "project-driven" and "learning-creation integration" system for graduate innovation and entrepreneurship education, which is based on complementary advantages of professional courses.

Accurate position and fully implement. And achieve a three-dimensional education pattern of professional courses and “innovation and entrepreneurship education” in the same direction.

## 6. Conclusions

Aiming at the reform and practice of the course system of Animal Reproduction Theory and Biotechnology for graduate students in Animal science, this paper carried out systematic series and project-driven teaching of knowledge modules, concretizes abstract knowledge, systematizes fragmented knowledge, timalizes theoretical knowledge and innovates existing cognition, and finally realizes the reform of "student-centered" teaching mode. The teaching effect has been significantly improved, and it also played a significant role in promoting students' understanding and mastery of knowledge, practical ability and innovative literacy.

## Acknowledgements

This work was supported by Heilongjiang Higher Education Teaching Reform Project "Construction and Practice of" Learning and Innovation Integration "Curriculum System based on" Project-driven "", Project No.: SJGY20210642.

## References

- [1] Gao Fei, Liang Shuang, Jiang Hao, et al. Teaching reform of the graduate course "Animal Reproduction Theory and Biotechnology" under the background of new agricultural science [J]. *Animal Breeding in Heilongjiang Province*, 2023, 31 (01): 70-73.
- [2] Wang Chengyong, Zhou Huijie, Zhu Xiaoyong. A new way to cultivate college students' innovation ability driven by scientific research projects [J]. *Higher Education Forum*, 2011 (10): 23-25,50.
- [3] Hu Debao, Zhang Linlin, Guo Yiwen, et al. Exploration and practice of thinking and politics of animal Reproduction Theory and Biotechnology under the background of new Agricultural Science [J]. *Pig Industry Science*, 2023,40 (11): 46-48 + 4.
- [4] Hu Jianhong, Sun Xiuzhu, Jiang Zhongliang, et al. Animal reproductive technology of teaching reform exploration [J]. *Journal of Livestock Ecology*, 2014,35 (05): 93-96.
- [5] Guo Qing, Li Yanbing, Wang Xue, et al. Curriculum Ideological and political elements mining and teaching practice [J]. *Modern Animal Husbandry Science and Technology*, 2024, (02): 166-168.
- [6] Li Jingchun, Li Yanbing, Wang Shuo, et al. Investigation and analysis of the current situation of innovation and Entrepreneurship activities of college students majoring in Animal Science—Take animal Science major of Heilongjiang Bayi Agricultural Reclamation University as an example [J]. *Modern Animal Husbandry Technology*, 2021, (06): 10-12.
- [7] Li Jingchun, Li Yanbing, Wang Shuo, et al. The cultivation of the innovation ability of animal science professionals under the CDIO model [J]. *Modern Animal Husbandry Technology*, 2021, (05): 4-6 + 26.
- [8] Li Lingyan, Li Jingchun, Chen Xuelong, et al. Exploration of the curriculum system of cultivating applied talents of animal production [J]. *Livestock and Feed Science*, 2020,41 (06): 116-119 + 128.