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Reflections on the Innovative Talent Training Mode of Genetic Engineering Practice

Helmi Zulhaidi Mohd Shafri

Royal Swedish Institute of Technology, Sweden

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Abstract: Genetic engineering is a discipline that emphasizes both theory and technology. The traditional experimental teaching mode can no longer meet the needs of innovative talent training. In order to meet the needs of innovative talent training, innovative teaching mode reform is imperative. We should carry out reforms in the content system, teaching methods and assessment methods of genetic engineering, thus improving the teaching quality of genetic engineering courses and comprehensively improving students' comprehensive quality and innovative ability. This paper makes a preliminary discussion and summary of the innovative talent training mode of genetic engineering, and introduces some methods and experiences of innovative talent training.

1. Introduction

The 21st century is the century of life sciences and the century of genetic engineering. Genetic engineering is the frontier of life sciences. Its development has led to the development of biotechnology systems with its core. It has become one of the most vital and compelling frontier disciplines in the field of life science research. Genetic engineering is directly related to the transformation of traditional products such as medicine, food, agriculture, animal husbandry, chemical industry, environmental protection, energy, and the formation of new products. Its development has promoted the development of the entire life sciences. In order to meet the needs of the development of the times, many colleges and universities have listed genetic engineering courses as the main courses in related fields such as biotechnology and bioengineering. "Gene engineering" as a very important professional theory and practice class, the quality of the course will be directly related to the cultivation of students' professional quality and innovative ability. Reasonable construction of students' theoretical and practical knowledge structure and efforts to cultivate the educational concept of high-quality innovative talents requires us to change the educational ideas and concepts of higher education institutions and reform traditional teaching methods and models.

2. Problems in the Innovative Talent Training Mode of Genetic Engineering Practice

1) The experimental teaching content is aging. The theory and practice of genetic engineering are developing very rapidly. Many new technologies are becoming more and more mature. The old knowledge theory has been introduced into textbooks for too long, and the experimental content is aging and cannot be updated in time. There are many types of genetic engineering experiment guide books, but due to the particularity of genetic engineering experiments, there are few reference books that are suitable for undergraduates to conduct experiments, and many teachers have an aging knowledge structure and outdated teaching modes, which leads to experimental teaching and The social development is out of touch, and students are limited in their understanding of the most cutting-edge dynamics and the most advanced technologies.

2) The experiment is difficult and the cycle is long. The cultivation of genetic engineering experimental skills is quite lagging behind the basic theory of genetic engineering. With the development of modern biological technology and the requirements for talents, the cultivation of genetic engineering experimental skills must be upgraded to a new level. However, the experiment is difficult, and there are not many experimental contents in the guide book, and because the experiment time is small, the possibility of completing the relevant experiment within the prescribed time is reduced, which requires the students to use the spare time to make up for the class experiment time. However, students have limited spare time, limited laboratory space, and lack of professional teacher guidance and strict management measures. Therefore, students who have completed a huge amount of genetic engineering experiments in a short period of time are not guaranteed.

3. Innovative Talent Training Method

1) Basic training is the root of innovative talent training. The foundation is the root of innovation. Only a solid foundation can cultivate students' innovative thinking. The genetic engineering curriculum has strong theoretical and operational characteristics. Therefore, it is very important to study the courses of molecular biology and biochemistry. In the teaching practice, the combination of theory and practice teaching should be strengthened. After the corresponding theoretical teaching is carried out, the experimental teaching should be carried out in time to improve the students' practical ability and combine the experimental analysis of the experimental principle so that the students can digest the theoretical knowledge in time. At the same time, relying only on limited classroom teaching, it is not enough for students to have a solid foundation and experimental operation ability. Some extracurricular practice exercises should be added. Combining all the teachers' research projects, some basic verification experiments are required for students to practice repeatedly. Not only master the method, but also the principle should be deeply understood. Students in the upper grades are instructed by senior students. Students who have certain experimental skills in familiar with laboratory practices guide students who are new to the laboratory. Students will have more opportunities to learn and practice, and make full use of the laboratory to train talents with solid theoretical foundation and operational ability.

2) The cultivation of problem-solving and problem-solving skills is the core of innovative talent training. The ability to discover and ask questions is an important literacy for successful people. Throughout the history and the achievements of today's society, all are successful in thinking, observing, discovering and asking questions, or finding others' solutions and solving problems and succeeding. Cultivate students' ability to find problems and solve problems. Correctly treating difficulties and setbacks is the core value of innovative talents training. In genetic engineering

teaching, we should focus on cultivating and training students' experimental ability. Teachers should be good at discovering students' psychological changes and give guidance and encouragement. When students learn basic skills and abilities, set appropriate difficulties and mistakes, train students to analyze problems, find problems and solve problems, and consciously develop students' ability to find problems, and at the same time train students to correctly treat difficulties and frustrations. Help them analyze the innovations and deficiencies in the experimental design and experimental operation, so that they can truly solve the problem through innovative experiments.

3) The cultivation of scientific thinking mode is the essence of innovative talent training. On the basis of social practice, thinking analyzes and synthesizes perceptual materials, and through the form of concept, judgment and reasoning, it creates a logical theoretical system, reflecting the essential attributes and movement laws of objective things. Its purpose is to reproduce the essence of objective things in thinking and to achieve a specific understanding of objective things. Good at finding problems and solving problems or suggesting the feasibility of solving problems. It is an important part and premise of scientific thinking to cultivate students' awareness of induction and summarization. Students are required to systematically summarize and summarize the lessons learned in the experiment. Through literature reading, collecting, collating and analyzing and summarizing experience, and drawing on the experience of predecessors, to get the most cutting-edge technology. The analysis of the literature is a logical thinking process. The reading and analysis of the literature helps to improve the students' logical thinking and vision, and to understand the corresponding research trends and research progress. Before the genetic engineering innovation experiment is carried out, the instructor should guide the students how to read the literature. Encourage students to listen to academic reports, communicate more, explore, learn from them, and present their own research ideas. In the process of innovative experiment, a group work meeting is held regularly, and the students are fully exchanged and discussed, and the experimental report is gradually improved. Finally, the experimental report is completed in the form of a paper, and the students are clearly stated in the process of writing the experimental report. This has a good training effect on students' expressive ability and scientific thinking mode.

4. Measures to Cultivate Innovative Talents in Genetic Engineering Practice

1) Select teaching content and optimize the knowledge system. The genetic engineering course is for students in the third year of biotechnology and bioengineering. Before that, students have completed the teaching of basic theoretical courses and experimental courses in cell biology, genetics, microbiology, and molecular biology. They have a relatively complete theoretical knowledge base and have accumulated a comprehensive range of experimental skills in molecular biology experiments. The genetic engineering theory and experiment course established on this basis aims to further develop students' scientific research ability, cultivate good scientific research attitude, and stimulate scientific research enthusiasm and innovation consciousness by using systematic and comprehensive theoretical knowledge and experimental content. At present, the development of genetic engineering theory and technology is changing with each passing day, and the teaching time of the new training program genetic engineering course is reduced from 54 hours to 32 hours. How to arrange teaching content reasonably within a limited number of hours to develop practical teaching plans, optimize teaching content, and reduce duplication between teaching content is particularly critical. The textbook is the blueprint of the teaching content, but not all. In the preparation of the textbook, in order to complete the knowledge system, there will inevitably be overlapping between different textbook knowledge content. In the teaching, while

selecting the appropriate teaching materials, reasonable choices and adjustments to the teaching content, as much as possible to make this course and other courses of knowledge closely linked and avoid unnecessary duplication.

2) Improve teaching methods and improve teaching results. The reform of teaching methods is an important guarantee for improving the quality of teaching. In order to improve the teaching effect of genetic engineering courses, we use a variety of teaching methods. The first is questioning teaching. When the course is taught, randomly ask the knowledge points and requirements for the pre-study in the previous lesson, check the students' understanding of the knowledge and the new content preview, and encourage students to ask questions actively. On the one hand, it enhances the interaction between teachers and students, and changes the teaching mode of "cramming" to make the classroom atmosphere more active. On the other hand, students can improve their learning initiative and improve their independent analysis, induction and summarization skills by preparing in advance and listening with questions. The second is heuristic teaching. It is necessary to start from the students' actual situation, adopt a variety of methods, and focus on enlightenment thinking to mobilize the students' initiative and enthusiasm to maximize their knowledge and skills. In genetic engineering teaching, the research ideas and experiments of each important technology are introduced into the classroom. For example, scientists have automated the expansion of DNA in vitro using Taq DNA polymerase isolated from thermophiles; discovery and application of luciferase gene in green fluorescent protein and firefly in luminescent jellyfish, etc, stimulate students' interest in learning and exploration through vivid examples, inspiring students to discover and solve problems through observation. The third is seminar-style teaching. In order to further mobilize the enthusiasm, initiative and creativity of students, they become the main body of the classroom. After explaining the basic theory of genetic engineering, let the students 4 people be a group, and check the latest literature and materials in the form of PPT for the new technology and its application of interest, as well as the research progress of animal and plant genetic engineering and walked to the stage to explain. This kind of teaching method mobilizes the initiative and interest of students, and at the same time enables students to be physically trained in reading ability, self-learning ability and verbal ability.

3) Use multimedia and online teaching methods to broaden students' knowledge. The genetic engineering course has many contents, large amount of information, fast knowledge update, many technical principles are abstract and difficult to understand, and traditional teaching methods are difficult to receive good teaching results. Using multimedia teaching in teaching, text, sound, pictures, video, and animation can be combined to display teaching content in a vivid, intuitive, and systematic manner. For complex abstract teaching content, such as PCR basic principles, Southern hybridization, western hybridization, etc., students are difficult to understand. Using multimedia teaching, animation can be used to dynamically display abstract principles, make them visualized and concrete, and deepen students. The understanding and memory of knowledge effectively stimulates students' interest in learning, thereby improving learning efficiency and teaching effectiveness. While using multimedia teaching, make full use of the school's genetic engineering network course and genetic engineering network teaching integrated platform, through the uploading of courseware and teaching materials, to achieve the sharing of teaching resources. Students can learn and ask questions online. Teachers can also arrange homework online, communicate with students online, answer questions, realize organic integration inside and outside the classroom, broaden students' knowledge, improve learning efficiency, enhance students' enthusiasm and initiative for independent learning, and improve learning effect.

5. Innovative Talent Training Algorithm

Through the reform of innovative teaching mode, we can promote the practice of genetic engineering to meet the needs of the cultivation of innovative talents. As an important support and guarantee for the construction of an innovative country in China, innovative talents can improve the cultivation of students' innovative experimental ability, enable students to have a solid theoretical foundation, cultivate students' innovative ability, scientific thinking habits and team spirit, Improve the competitiveness of students. K-means clustering algorithm, as a basic division method of clustering algorithm, can provide professional customized training scheme for innovative talents and make the decision scientific, reasonable and objective. The clustering algorithm used in this paper uses the error leveling method and the criterion function as the clustering criterion function, its function is defined as:

$$J = \sum_{j=1}^{C} \sum_{k=1}^{n_j} \left\| x_k^{(j)} - m_j \right\|^2 \tag{1}$$

Where j = 1,2,..., C; MJ is the center of C clusters, and its value is the mean value of cluster Ci,

$$m_j = \frac{1}{n} \sum_{j=1}^{n_j} x_j \tag{2}$$

In this paper, K-means clustering algorithm is applied to the training mode of genetic engineering practice and innovation talents. The conditions required for the training of genetic engineering practice and innovation talents are imported into the database, and then the conditions are divided into training conditions by clustering algorithm, and corresponding measures are taken. According to the corresponding characteristics of personality division, to achieve the practice of genetic engineering innovative talents training.

6. Analysis and Research on the Training Mode of Practical and Innovative Talents in Genetic Engineering

6.1. Analysis of the Impact of Students on the Indicators of Innovative Talent Training Mode

The quality of genetic engineering course is directly related to the cultivation of students' professional quality and innovation ability. To reasonably construct the structure of students' theoretical knowledge and practical knowledge and strive to cultivate high-quality innovative talents requires us to change the education concept and education concept of colleges and universities, and to change the traditional teaching methods and modes In order to improve the teaching quality of genetic engineering, the comprehensive quality and innovation ability of students should be improved. In this paper, through the form of questionnaire survey, the influence degree of students on the indicators of innovative talent training mode is studied. The results of collecting and sorting the questionnaire data are shown in Table 1.

Table 1. Analysis of the impact of innovative talents training mode indicators

variable	mean value
Training concept and goal	4.43
Campus infrastructure	4.25
Professional curriculum	4.32
Teachers' teaching methods	4.41
Experimental teaching method	4.42
School management system	4.23
Talent evaluation system	4.22

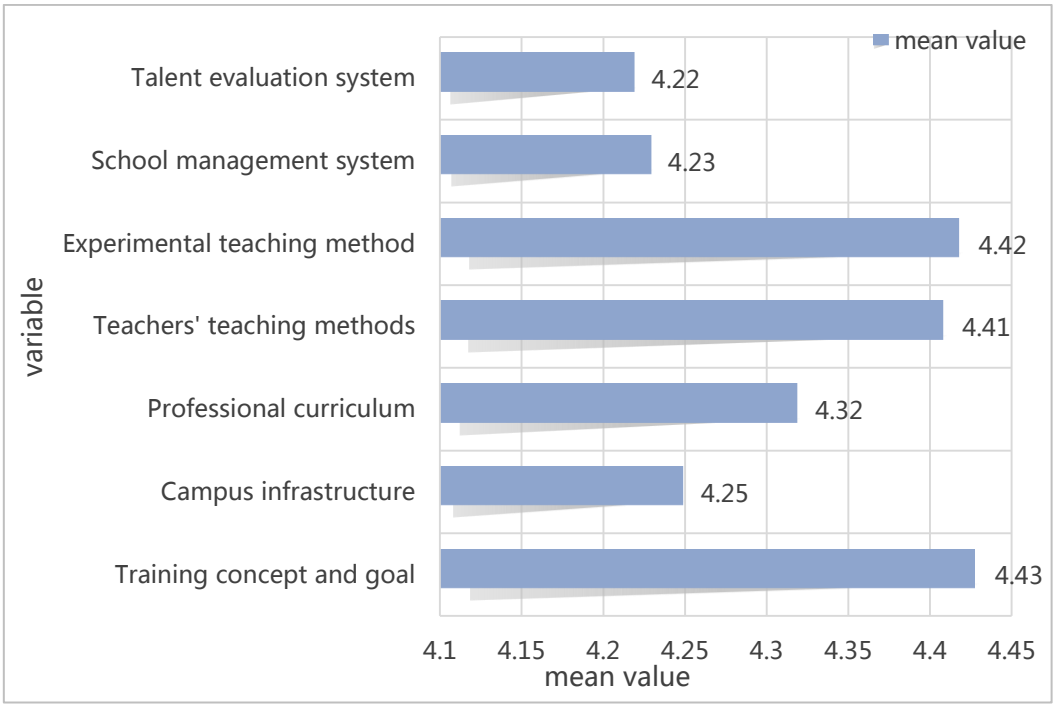

Figure 1. Analysis of the impact of innovative talents training mode indicators

As can be seen from Figure 1, in the analysis of the influence degree of students on the indicators of innovative talents training mode, students think that the most important thing in the cultivation of innovative talents is the concept of training objectives, with an average value of 4.43, the average value of experimental teaching methods is 4.42, the average value of teachers' teaching methods is 4.41, the average value of professional curriculum is 4.32, and the average value of campus infrastructure is 4.25, The average value of school management system is 4.23, and that of talent evaluation system is 4.22.

6.2. Analysis of Students' Opinions on the Cultivation of Innovative Talents

In the modern teaching system for the purpose of cultivating innovative talents, how to cultivate innovative talents in the discipline of genetic engineering, so that students can comprehensively cultivate the theory, application ability and research quality of genetic engineering, is an important problem in the current teaching of genetic engineering. Students themselves have their own goals

and opinions on the cultivation of innovative talents. In this paper, the questionnaire data are collected and sorted out in the form of questionnaire survey, and the results are shown in Figure 2.

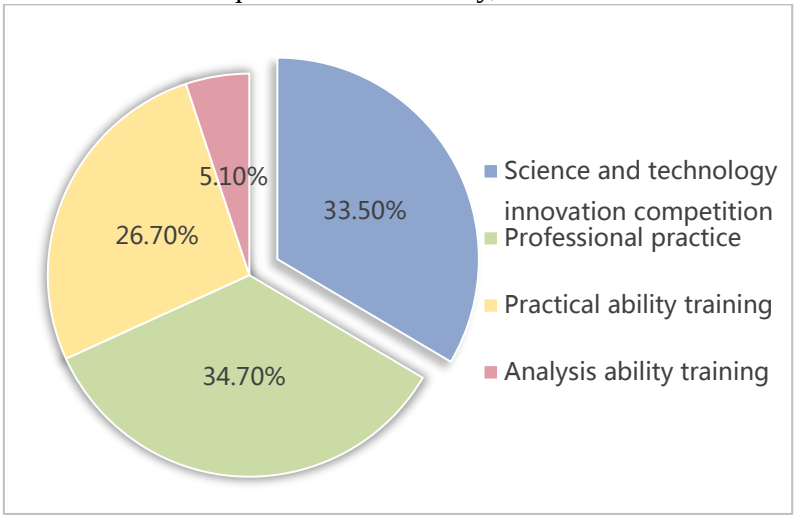

Figure 2. Analysis of the opinions on the cultivation of innovative talents

As can be seen from Figure 2, among the students' own goals and opinions on the cultivation of innovative talents, 34.7% of the students think it is necessary to increase professional practice, 33.5% think it is necessary to increase scientific and technological innovation competition, 26.7% think it is necessary to cultivate practical ability, and 5.1% think it is necessary to cultivate analytical ability.

7. Summary

Innovative talents are an important support and important guarantee for China to build an innovative country. In the modern teaching system with the purpose of cultivating innovative talents, how to cultivate innovative talents in genetic engineering disciplines, so that students can cultivate all aspects of genetic engineering theory, application ability and research quality, which are important questions currently faced in genetic engineering teaching. Due to the differences in students' ability and basic knowledge, the effects of teaching are also different. The students with strong foundations and strong interest have improved their abilities in innovative experiments. However, genetic engineering is relatively difficult in terms of technical difficulty. Some students have poor basic knowledge. In the teaching process, students should pay more attention to problems and help and encourage them. At the same time, the cultivation of innovative talents, the workload of teachers has become more, which requires teachers and more teachers to have dedication. In short, innovative talent training is an important aspect of teaching reform. The cultivation of innovative talents in genetic engineering can not only enable students to have a solid theoretical foundation, but also cultivate students' innovative ability, scientific thinking habits, and teamwork spirit. This has an important role in increasing students' competitiveness.

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Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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