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Exploration and Practice of Ideology and Politics in Biochemistry Course for Normal Students of Biological Sciences

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Abstract: Biochemistry is a core course in the bioscience major (normal school). The course content is complex and covers a broad spectrum that provides a good breeding ground for the integration of ideological and political matters into the curriculum. This study analyzes the ideological elements in the biological chemistry course. It optimizes the teaching content, improves the teaching mode, and optimizes the teaching evaluation way of course education teaching exploration. Through listing the examples of related scholars, mining ideological case in life, combining with the experimental course and online teaching resources, it conducts values guide in knowledge and ability cultivation. This aims to promote the cultivation of the concept of moral education and talent cultivation, improve normal research ability, expand the cultivation of normal ethics education way. "Who should be educated, how should be educated and for whom" is the fundamental problem of education and also the cornerstone to measure the effectiveness of talent training in colleges and universities. Under the background of the new era, promoting the high-quality development of ideological and political courses is not only the only way to comprehensively improve the quality of talent education, but also the urgent need to improve and strengthen the ideological and political work in colleges and universities. Biological science (normal) professional students (hereinafter referred to as "normal") after graduation will be the high mission of teaching, ideological and political theory study is particularly important in the teaching process, teachers should be professional knowledge, ideological and political learning and cultivation of students comprehensive quality organic combination, realize the unity, give full play to the educational function of the course, to carry out the idea of "three education"[1]. This paper takes the author's professional course - "Biochemistry" in the College of Life Science as an example to further explore the course containing ideological elements. By listing the examples of related scholars, mining the ideological cases in life, combining with the experimental courses, online teaching resources and normal research ability, it integrates the educators' minds and normal ideological and political education into the biochemistry classroom teaching, providing references for students majoring in biological science (normal) in similar colleges.

1. The necessity of ideological and political development in the biochemistry course of the normal major

1.1 The importance of ideological and political education in the normal major course

In addition to the knowledge, skills and abilities of (normal) biology students and the comprehensive quality and ability for professional development, the moral value orientation, social responsibility and humanistic care of the students are also emphasized. In education, the main goal of moral education is to educate, establish and teach the values of caring education through virtue. We should infuse course education and ethical education into normal education, from education courses to professional courses, from classroom to classroom, to ensure that students gradually deepen the understanding of ethics and experience through long-term learning and practice, and finally realize the effective implementation of ethical education.

1.2 Insufficient integration of ideological and political education in vocational training

In 2020, the Ministry of Education published the Guide for the Construction of Ideological and Political Curricula in Higher Education, which explains in detail the general meaning, core values and specific content of the construction of ideological and political curricula. The implementation of ideological and political courses is not limited to the traditional ideological and political courses. The shaping of students' values cannot only rely on a single ideological and political curriculum, but requires the cooperation and complementarity of multiple disciplines and courses. This requires that we give full play to the function of ideological and political education in various subjects and realize the deep integration and mutual promotion of vocational education and ideological and political education [2]. Therefore, teaching vocational subjects not only plays a central role in the education of students, but also is an important platform and carrier of ideological and political education.

1.3 Benefits of integrating ideological and political education into the biochemistry curriculum

Biochemistry is a central compulsory course in biology studies at colleges and universities. It occupies a very important position in the system of disciplines and is an important cornerstone for the development of biology studies. Biochemistry courses have more teaching hours and more teaching examples, and the quality of teaching is directly related to the development of students' professional quality and comprehensive ability. In view of this, biochemistry courses should give full play to their educational function, and teachers should incorporate ideological and political education into the teaching process to realize comprehensive education, ensure the thorough implementation of the pedagogical concept of moral education, and effectively guide students to have a correct outlook on life, world outlook and values.

2. Mining of ideological and political elements in the biochemistry course of normal major

Biochemistry is the core foundation course of the Biological Sciences degree program (normal), which focuses on the study of the composition and structure of macromolecules, nature and function, metabolism and regulation, transmission of genetic information and regulation of gene expression in living organisms. Biochemistry is closely related to many key knowledge points in middle school biology, such as proteins, nucleic acids, lipids and sugars, which is an extension and reinforcement of high school biology knowledge. In view of this, integrating elements of ideological and political education into the teaching process of biochemistry is a reliable way to implement moral education and train excellent biology teachers in middle school biology, and can make full use of the

biochemistry curriculum as a carrier of ideological and political education for ordinary college students (Table 1).

Table 1 Ideological and political cases of biochemistry course

Teaching module	**Curriculum ideological and political integration point**	**Curriculum ideological and political elements**
The development of the biochemistry	History of biological sciences, the contributions of Chinese scientists 1. Wu Xian: Protein denaturation theory 2. Tu Youyou: The discovery of artemisinin 3. Shi Yigong team: protein structure analysis	spirit of patriotism National confidence Rigorous and meticulous scientific research spirit the spirit of teamwork
Structure and function of a protein	1. Toxic milk powder incident 2. CO poisoning mechanism 3. Sickle-shaped cell anemia disease	Integrity values sense of social responsibility Cherish your life and protect your health
Structure and function of the enzyme	1. induced fit theory 2. competitive inhibitor 3. Vitamins and enzymes, Vitamin deficiency causes various diseases 4. organophosphorus intoxication	sense of social responsibility Pharmaprojects Research frontier High school biology teaching and research ability
Structure and function of nucleic acids	1. DNA double coiled spiral structure 2. Sequencing of the human genome 3. Novel coronavirus, nucleic acid testing 4. The basic physical and chemical properties of nucleic acids, derived from molecular hybridization, PCR and other modern biotechnology generation;	Strengthen the sense of community of the Chinese nation Social ethics；Cherish life sense of social responsibility safety consciousness
Synthesis of biological macromolecules	1. central dogma 2. Protein synthesis and processing	Scientific research spirit High school biology teaching and research ability
Metabolism and gene expression regulation	1. Dysregulation of glucose metabolism is closely related to many diseases, such as tumors, diabetes, hyperglycemia, and hypertension 2. Lipid metabolism, the harm of trans-fatty acids 3. Histone modification and regulation of immunity and inflammation	Harmonious and balanced development Scientific research hotspot and frontier safety consciousness Research frontier consciousness of innovation
Cell signal transduction and regulation	1. Development of novel targeted agents 2. Insulin and signaling 3. Cell death and cell apoptosis	Research frontier consciousness of innovation safety consciousness

2.1 Integrate into the history of science, explore the contributions of Chinese scientists, cultivate the patriotic spirit of normal university students, and establish national confidence

When teaching biochemical knowledge, it is necessary to incorporate elements of the history of science and especially to emphasize the outstanding contributions of Chinese scientists in order to promote students' patriotism and national pride. In the interpretation of the primary structure of proteins, such as insulin, it details how Chinese scientists, through precision research and unremitting efforts, successfully completed the full synthesis of crystalline insulin in September 1965. This achievement not only marked the important breakthrough in the field of biochemistry in our country,

but also marked the progress of the milestone for the first time in the world[3]. In the explanation of protein denaturation, I introduced the scientific research contribution of Wu Xian, one of the founders of biochemistry in China. The theory of protein denaturation was first proposed by Professor Wu Xian. Today, Wu Xian's theory of denaturation is widely recognized in the biochemical community and forms the basis of current international research on protein denaturation and protein folding. These stories not only show their firm faith in the face of difficulties, but also illustrate the reality of China's growing scientific and technological strength. In this way, I hope to arouse students' patriotic feelings, strengthen their cultural confidence and instill the pride of the Chinese nation in my heart.

2.2 Create experimental situations to cultivate the scientific spirit of rigorous and meticulous work and teamwork of normal university students

Biochemical experiments play a central role in the biochemistry curriculum. In order to improve the comprehensive quality of students, the author has skillfully integrated the ideological and political teaching into the biochemistry experiment course. While focusing on the training of professional knowledge, we pay attention to cultivate students' ideological and moral cultivation through the penetration of ideological and political content, and stimulate their scientific spirit to seek and innovate the truth from facts. Take the "Nature of Protein" chapter for example. In the protein quantitative experiment, the teacher is obliged not only to guide students to master professional experimental skills but also to provide timely ideological and moral guidance. Through the comparison of various quantitative methods and their applications in production and testing practice, the teacher can let students understand relevant knowledge and help them develop a truth - seeking attitude from facts, a diligent work attitude and a high sense of social responsibility. Through the form of group cooperation experiment, students can play their own strengths in the team and work together to complete the measurement of experimental indicators. In this process, teachers emphasize the importance of scientific rigor and dialectical thinking. If the experimental results do not achieve the expected effect, the teacher will give timely advice, analyze the reasons and guide students to face the experimental results with the right attitude. He encourages students to make bold assumptions and check carefully, even if the experimental results are ideal, they must maintain an attitude of excellence, integrity and innovation[4].

2.3 Strengthening the social responsibility and safety awareness of normal college students by combining it with life cases

In addition to imparting specialist knowledge, biochemistry courses are also an important channel for promoting students' social responsibility and improving their safety awareness. For example, when exploring the principle of the "Kays method" for determining protein content", the case of a "toxic milk powder" was presented as a teaching example. In this case, illegal enterprises had added melamine to milk powder for infant formula and used cheap food raw materials as a substitute for milk powder, causing serious harm to the growth of infants. By analyzing this event, students will be sensitized to social responsibility and safety awareness. It also aims to examine the limitations of the "Kais solid nitrogen method" from a professional and technical point of view and propose improved or alternative detection methods to prevent the recurrence of similar events. This teaching method not only tests students' ability to apply their professional knowledge, but also gives them a deep understanding of the value of biochemistry, thus enhancing their professional pride and social responsibility[5].Teachers can use this opportunity to guide their students to develop healthy habits, stay away from harmful substances and appreciate life. By combining ideological and political courses with theoretical knowledge, students will be guided to address current social issues and people's livelihood and health, thus sharpening their sense of social responsibility and safety

awareness.

2.4 Use online and offline resources to convey the idea of applying what you learn, cultivate the teaching and research skills of normal university students, and strengthen their professional identity

The content of the biochemistry course is closely related to high school biology, such as proteins, nucleic acids, lipids and sugars in cells. In effect, it is a broadening and deepening of upper level biology knowledge, with more attention to detail and depth of knowledge. In learning biochemistry courses, students have a more comprehensive understanding of the biology course content and then propose innovative curricula. They constantly adjust and optimize the teaching methods and enrich the course content to improve their teaching and scientific research skills. In addition, the new teaching concept is combined with the micro-teaching of practical courses, so that students can simulate teaching in the teaching scene, popular science videos are made for primary and secondary school students, popular science courses are carefully polished, and biological knowledge is popularized through the use of network resources. This combination of online and offline learning method not only encourages normal university students to apply what they have learned, but also greatly promotes the improvement of their teaching and research skills [6] (Figure 1). By linking the biochemistry course with the cultivation of normal college students' teaching and research abilities, it not only cultivates the scientific spirit and values of normal college students, but also encourages them to spread the scientific spirit and moral quality in popular science service. Normal students are not only the recipients of knowledge but also the positive advocates and transmitters of socialist core values. They explore the ideological - education elements of teacher professional ideal and teacher professional ethics contained in this course, combine biochemistry courses with the professional qualities of normal students, internalize the ideological concepts in mind, and externalize the ideological concepts into actions and apply them in the later teaching process.

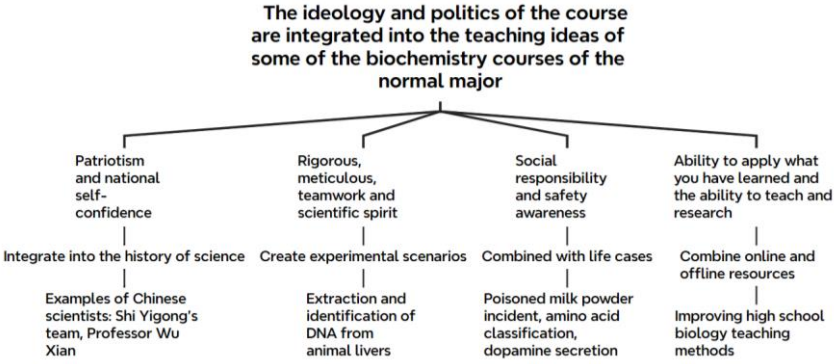

Figure 1 Mining and integration of ideological and political elements in the biochemistry course of normal majors

3. Didactic effects and evaluation of ideological and political integration in biochemistry courses of normal majors

3.1 Teacher evaluation

In the field of higher education, ideological and political education not only sets higher standards in teaching methods, but also opens up a new way to improve the quality of teaching and teacher training. In the process of integrating ideological and political education into the biochemistry curriculum, we have improved the curriculum evaluation system and strengthened the process

evaluation mechanism. The evaluation of students is no longer limited to the results of the final exam, but takes into account the whole learning process, especially the evaluation of online courses, ideological and political discussions, homework and papers, which greatly improves the overall learning atmosphere, so that students no longer rely solely on the final exam[7]. As for the online learning platform data, the number of clicks per capita, video viewing time, discussion activity, chapter learning frequency, chapter test completion, assignment point completion rate and course video progress have all improved, which actually proves that students' enthusiasm to participate in class has been greatly enhanced. The school set up the training camp. Influenced by ideological and political elements such as scientific research spirit and team cooperation, students actively participate in life science competitions, teaching skills and other major competitions, reflecting students' firm idealistic belief and professional self-confidence.

3.2 Student evaluation

In order to promote the effective implementation of ideological and political case teaching and evaluate its teaching effect in depth, the author has designed a series of questionnaires to grasp students' understanding of ideological and political teaching, the role of ideological and political teaching in the educational process, and the possible direction of improvement[8].

The questionnaire survey was mainly conducted among the 2022 (normal) life science students. A total of 117 questionnaires were distributed and 117 were collected. The survey statistics show that 75.21% of the students can basically distinguish between the concept and meaning of "ideological and political curriculum" and "ideological and political curriculum"; 92.31% students believe that what teachers teach in biochemistry course, 96.58% believe that the integration of ideological and political education in professional courses is conducive to improving the learning enthusiasm of the course; 9 4.87% students believe that ideological and political cases can help deepen the understanding of professional knowledge; 97.44% of students believe that ideological and political cases can help cultivate patriotism and national confidence; 98.29% of students believe that the ideological and political cases can help cultivate the scientific spirit of rigor, meticulousness and teamwork, cultivate a sense of social responsibility and security consciousness, it also helps to instill the idea of learning, improve teaching and research ability(Figure 2). Students also expressed related opinions and suggestions, such as having more group discussions, setting more relevant discussion topics, encouraging students or teams to do extended studies or research combined with their majors, and guiding students to reflect and explore the hot issues in people's life.

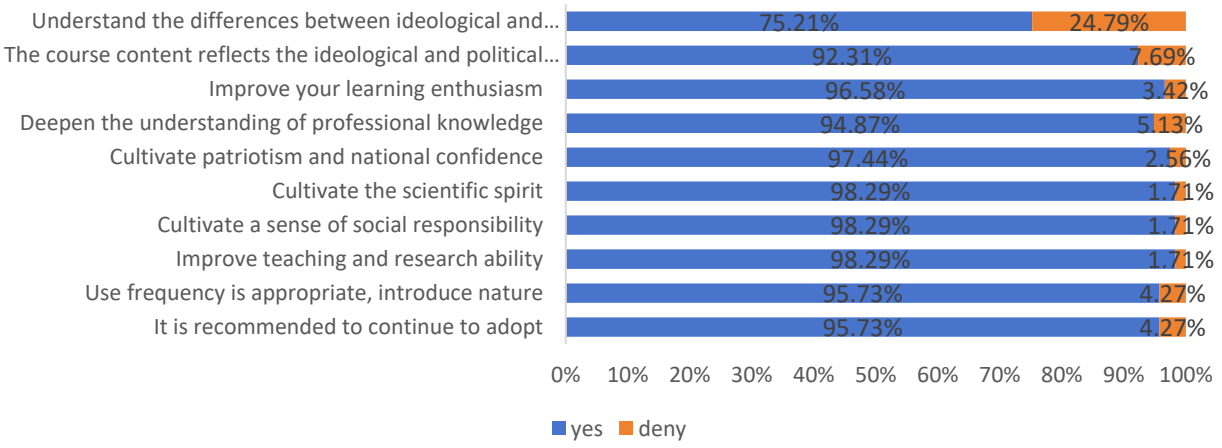

Figure 2 Results of the course ideological and political survey questionnaire

From the survey results, the vast majority of students recognize the use of ideology and politics courses in biochemistry classes. The integration of ideological and political courses in the undergraduate program improves students' ideological and political cultivation, learning interest and humanistic quality, and plays a positive role in promoting students' understanding of the forefront of scientific research and improving the teaching and research ability of normal university students.

4. Conclusion

In the education of ordinary students of biological sciences, the biochemistry course, as one of its core courses, provides a high-quality platform for the implementation of ideological and political courses. The biochemistry course is complex and covers a wide range of fields, which provides rich opportunities for the skillful integration of ideological and political elements. In the teaching practice, the author has deeply studied the ideological elements of the biochemistry course and combined with the history of science, biochemical experiment, case teaching, mixed teaching and other teaching forms, closely following the specific requirements of national normal education and the characteristics of life science professionals, and thoroughly researched and practiced them. These efforts not only expand the ethics education pathways for normal college students, but also greatly improve the concept of moral education contained in the curriculum. In the implementation, more attention should be paid to the natural integration of ideological and political education and curriculum content, avoid mechanical copying, and strive for subtle influence on students to achieve the pedagogical effect of "silent moistening". In the future, further reflection and summarization are needed to find more and more appropriate examples of ideological and political education in biochemistry courses.

References

[1] G. Liu, The ways and methods of ideological and political education for postgraduates. Advances in Educational Technology and Psychology 5 (2021) 80-87.

[2] L. Jianjun, Curriculum ideology and Politics: connotation, characteristics and path [J]. Education research 41 (2020) 28-33.

[3] C. Zhang, Y. Liu, X. Qi, X. Wang, and Z. Zhao, Exploration and practice of ideological and political education in biochemistry and molecular biology for cultivation of ethical and medical talents, SHS Web of Conferences, EDP Sciences, 2023, pp. 01043.

[4] Y. Hu, and Y. Yao, Exploration and Practice of Curricular Ideology and Politics Education Reform in Biochemistry Course Ideological and Political Education, 2021 2nd International Conference on Modern Education Management, Innovation and Entrepreneurship and Social Science (MEMIESS 2021), Atlantis Press, 2021, pp. 246-250.

[5] C. Zhang, The Effective Teaching Reform of Biochemistry under the Ideological and Political Mode in the Classroom of Nursing Specialty in Higher Vocational Colleges. Journal of Modern Medicine and Nursing 1 (2024).

[6] G. Wu, P. Mu, Z. Zhang, and G. Zhu, Exploration and Practice of Ideological and Political Teaching Construction for Biochemistry Course in Agricultural Colleges and Universities. Agricultural Biotechnology 13 (2024) 31-42.

[7] J.-d. Wang, Exploration and Practice of the Construction of Biochemistry and Molecular Biology Curriculum Ideology: Take Chengdu Medical College as an Example. Chinese Journal of Biochemistry and Molecular Biology 38 (2022) 537-545.

[8] Y. Zhang, and Z.-h. Liu, Reform and Practice of Ideological and Political Teaching in Frontier of Life Science. Chinese Journal of Biochemistry and Molecular Biology 38 (2022) 823-828.