

Innovation and practice of ideological and political education in the bilingual teaching of biochemistry

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Abstract: Biochemistry is a comprehensive discipline involving structure, function and interrelationships of life at the molecular level. Globally, more and more educational institutions are using bilingual teaching as a means to improve students' language ability and subject level. However, in the bilingual teaching of biochemistry, the integration of ideological and political education is often ignored, which leads to the lack of profound understanding of ideology and morality while learning academic knowledge. Therefore, the study of how to effectively integrate ideological and political education into the bilingual teaching of biochemistry has become an urgent problem to be solved. This paper aims to explore how to effectively integrate ideological and political education in bilingual teaching to improve students' academic and ideological education. The paper first analyzes the current situation and challenges of the bilingual biochemistry teaching, and then proposes a series of innovative practical strategies to strengthen the application of ideological and political education in the biochemistry teaching. Finally, the empirical study and case analysis demonstrate the effectiveness and utility of these strategies.

Key words: biochemistry; bilingual teaching; ideological and political education; teaching innovation; practical strategies

1 Introduction

With the continuous development of globalization, bilingual teaching of biochemistry has become increasingly significant in higher education as an important means of cultivating students with international perspectives and professional capabilities. However, effectively integrating ideological and political education into bilingual teaching of biochemistry to enhance students' political and ideological literacy and promote a comprehensive mastery of their professional knowledge remains a challenge. This study aims to explore effective methods and strategies for implementing ideological and political education in bilingual teaching of biochemistry. We first analyze the current situation and challenges faced in bilingual teaching of biochemistry, such as language barriers, insufficient teaching resources, and low student engagement. Then, this paper proposes a series of innovative teaching strategies, including innovative teaching content, increased teaching interaction and student participation, and the use of modern educational technology. The goal is to strengthen the application of ideological and political education in biochemistry teaching and promote the deep integration of bilingual teaching effectiveness and ideological and political education. Through these strategies, we hope to not only enhance students' professional skills but also strengthen their sense of social responsibility and ethical awareness,

laying a solid foundation for their future careers and societal involvement.

2 Status and challenges of bilingual teaching in biochemistry

2.1 Analysis of current teaching models

In the current higher education system, bilingual teaching in biochemistry is becoming an increasingly important instructional method. The core of this approach involves integrating professional courses in biochemistry with the teaching of a second language, such as English, aiming to enhance students' language proficiency while cultivating their expertise. This bilingual teaching model is particularly crucial in the context of globalized education, meeting the needs of students for both specialized learning and laying a solid foundation for their future development on the international stage.

In terms of teaching methods, bilingual biochemistry teaching incorporates various forms, including traditional classroom lectures, group discussions, case analyses, and laboratory exercises [1]. This diverse teaching approach aims to effectively integrate language skills with professional knowledge in different instructional contexts, promoting balanced development in both areas. For example, through group discussions and case analyses, students not only acquire expertise in biochemistry but also enhance their English communication skills through practical applications.

Regarding course content, the bilingual teaching model covers not only the fundamental theoretical knowledge of biochemistry but also the latest research advancements and practical applications. These contents are usually presented through English textbooks supplemented with Chinese materials, ensuring students' comprehensive understanding of the subject. Additionally, course design places special emphasis on fostering critical thinking and innovation, encouraging students to engage in academic discussions and presentations in English. This approach not only aids in a better grasp of professional knowledge but also enhances their language expression and academic communication skills [2].

Although bilingual teaching demonstrates certain advantages in increasing students' interest and engagement, particularly in improving their English proficiency, its effectiveness is influenced by various factors. Key factors affecting the effectiveness of bilingual teaching include the teaching competence of instructors, the availability of teaching resources, and the foundational language skills of students. Therefore, to fully harness the potential of bilingual teaching, more attention and resources need to be invested in teacher training, teaching resource development, and student learning guidance.

2.2 Primary challenges

While bilingual teaching in biochemistry holds theoretical advantages, several challenges in practical implementation significantly impact the achievement of instructional goals and the enhancement of teaching effectiveness. The most prominent challenge is language barriers. Despite many students having a certain level of English proficiency, they often struggle when faced with complex biochemical terms and theoretical concepts, affecting both their ability to comprehend course content and their participation in classroom discussions and academic exchanges [3].

Secondly, the limitation of teaching resources poses a significant challenge. High-quality bilingual teaching resources, such as professional bilingual textbooks, suitable teaching platforms, and instructors proficient in bilingual teaching, remain scarce in many educational institutions. Many teachers lack necessary training and practical experience in bilingual teaching, directly affecting the quality and effectiveness of instruction. The absence of effective teaching resources and experienced instructors hinders students from receiving adequate guidance and support in their learning process.

In addition, the issue of low student engagement should not be overlooked. Language barriers, coupled with unfamiliarity with specialized knowledge, often lead students to remain silent in the classroom, particularly during discussions and expressions in English. Low participation not only affects the maximization of students' learning outcomes but also limits the potential of the bilingual teaching model in enhancing students' overall capabilities.

In summary, despite the significant value of bilingual teaching in biochemistry for improving students' expertise and English proficiency, overcoming these challenges is essential to realize its maximum instructional effectiveness. This necessitates educational institutions and instructors to put more effort and resources into improving teaching resources, enhancing teachers' bilingual teaching capabilities, and increasing student engagement. Through these efforts, the bilingual teaching model can better serve students' learning needs and realize its inherent educational value [4].

2.3 Integration of ideological and political education in bilingual biochemistry teaching: fusion and challenges

The integration of ideological and political education into bilingual teaching in biochemistry aims to cultivate students' comprehensive expertise and sense of social responsibility. In this process, teachers not only impart specialized knowledge in biochemistry but also guide students to understand the significance of scientific research in societal, ethical, and environmental aspects. For example, by discussing the societal ethics impact of the application of biotechnology, students can cultivate a profound awareness of social responsibility alongside their professional knowledge.

However, effectively integrating ideological and political education into the bilingual teaching model faces numerous challenges. Firstly, language barriers must be overcome to ensure students can comprehend and discuss complex ethical and societal issues. Secondly, teachers engaged in bilingual teaching need to possess the required expertise in both the subject matter and ideological and political education to effectively integrate relevant content into their professional teaching. Additionally, the configuration of teaching resources is a challenge, necessitating the enrichment and updating of educational materials, including case studies and practical activities, to meet the demands of combined ideological and political education [5].

The integration of ideological and political education introduces a new instructional dimension to bilingual teaching in biochemistry, not only promoting students' professional growth but also strengthening their sense of social responsibility. However, simultaneously, this requires educational practitioners to innovate and improve in terms of teaching design, resource allocation, and instructional methods to overcome the challenges associated with this process.

3 Innovative practices and strategies for ideological and political education

3.1 Innovation in teaching content and methods

The integration of ideological and political elements into bilingual teaching in biochemistry is a key means to enhance the quality of education. This teaching approach not only strengthens the imparting of professional knowledge but also deepens students' understanding of the societal and ethical aspects of scientific research. Firstly, the design of course content should include ideological and political elements related to bioethics, scientific responsibility, and environmental protection. For instance, by introducing case studies of the application of biotechnology in fields such as medicine and agriculture, teachers can guide students to contemplate the ethical implications of these technologies, fostering their understanding of the role and responsibility of scientific research in society. This incorporation of content not only elevates students' levels of professional knowledge but also promotes profound reflections on ethics and social responsibility [6].

Case studies, as a teaching method, are particularly effective in bilingual biochemistry teaching. By analyzing real-life biochemical cases, teachers can stimulate students' interest and reflection on the ethical issues behind scientific decisions. For example, studying the ethical controversies surrounding the development and application of genetically modified crops allows students to comprehend the complex relationship between technological advancement and societal ethics. Such case studies not only enhance students' critical thinking but also improve their practical application of professional knowledge.

Group discussions are also an indispensable teaching method in bilingual biochemistry teaching. In group discussions, students are encouraged to exchange ideas in an open and interactive environment using both languages. This approach not only promotes communication and collaboration among students but also deepens their understanding of course content.

For instance, students can engage in group discussions around specific biochemical topics, exploring the social and ethical significance of scientific research through the collision of different perspectives. This interactive learning method effectively increases students' participation and interest, facilitating the deep integration of ideological and political education with professional knowledge.

Innovative teaching content and methods are crucial for enhancing the effectiveness of bilingual biochemistry teaching. By integrating elements of ideological and political education into biochemistry instruction, students not only gain expertise but also deepen their understanding of scientific ethics and social responsibility. The implementation of this teaching model helps cultivate well-rounded professionals in the field of biochemistry.

3.2 Enhancing teaching interaction and participation

In bilingual biochemistry teaching, enhancing teaching interaction and student engagement is crucial for the effectiveness of ideological and political education. Interactive teaching methods effectively stimulate students' interest in learning, encouraging active participation in the study and discussion of course content. Through innovative interactive activities, such as role-playing or simulated debates, students can gain a deeper understanding and explore important issues in the field of biochemistry. For example, teachers can organize simulated debates where students play different roles, such as scientists, policymakers, or public representatives, to discuss a specific biochemical topic. This teaching method not only enhances students' language expression and critical thinking skills but also promotes their multidimensional understanding of scientific, social, and ethical issues.

Additionally, the application of technology plays a crucial role in enhancing teaching interaction. Utilizing online discussion platforms or social media, teachers can motivate students to continue exploring and discussing course content outside the classroom. Through this approach, students can share relevant materials and viewpoints, engaging in discussions with a broader audience beyond geographical boundaries. Such online interaction not only expands students' learning horizons but also increases their interest and sense of participation in course content.

Furthermore, practical activities are an effective means of increasing student engagement. For instance, teachers can arrange laboratory practical activities or field visits, allowing students to directly experience and apply biochemical knowledge. In these activities, students can utilize their bilingual abilities and professional knowledge to solve real-world problems. This practical experience not only enhances students' motivation to learn but also improves their ability to apply theoretical knowledge to practical situations.

Lastly, teachers should adopt more guiding rather than didactic teaching methods in classroom instruction. By posing open-ended questions and guiding students in in-depth thinking and discussion, teachers can effectively stimulate students' thinking and innovation. This teaching method not only enhances students' independent learning abilities but also promotes their in-depth understanding and exploration in the field of biochemistry.

3.3 Improving teaching effectiveness through modern educational technology

In bilingual biochemistry teaching, the integration of modern educational technology not only enhances teaching effectiveness but also provides new avenues for the implementation of ideological and political education. With technological advancements, innovative changes have been brought to ideological and political education through new educational technologies such as Virtual Reality (VR), Augmented Reality (AR), online learning platforms, and interactive software. The application of these technologies allows students to learn biochemistry in a more dynamic and interactive environment while gaining a deeper understanding of relevant ideological and political education content.

Using VR and AR technology, teachers can create virtual biochemistry laboratories, enabling students to learn experimental operations in simulated environments that incorporate ideological and political elements, such as ethics and

social responsibility. For example, in a virtual experiment, students can simulate the application of biotechnology, considering its ethical and social impacts while conducting experiments. This teaching method enables students to grasp professional knowledge while enhancing their awareness of social responsibility and ethical decision-making.

The application of online learning platforms provides a broader stage for ideological and political education. Through these platforms, teachers can deliver lectures and discussions on societal and ethical issues related to biochemistry, prompting students to learn about and reflect on these topics while studying professional knowledge. This approach not only enriches the content of teaching but also allows students to participate in ideological and political education anytime and anywhere.

By combining modern educational technology, personalized and differentiated teaching content can be achieved. The establishment of personalized teaching paths allows students to explore biochemistry and its impact on society and ethics according to their interests and learning pace, thus improving learning efficiency and teaching effectiveness.

In conclusion, the integration of modern educational technology not only enhances the effectiveness of bilingual biochemistry teaching but also provides new avenues for the in-depth and widespread dissemination of ideological and political education. The innovation of this teaching model not only stimulates students' interest and participation but also helps students enhance their awareness of social responsibility and ethical issues in the exploration of biochemistry.

4 Case analysis and empirical research

4.1 Case analysis

In the integration practice of bilingual biochemistry teaching and ideological and political education, several cases have successfully demonstrated the effectiveness of innovative teaching strategies. Taking a biochemistry course at a university as an example, the introduction of the "Ethics and Biotechnology" module is a prominent instance. In this module, teachers designed a series of group discussions and role-playing activities, allowing students to delve into the ethical issues of gene editing technology. Students were assigned different roles, such as scientists, ethicists, and policymakers, enabling them to examine the pros and cons of genetic technology from various perspectives. This multidimensional discussion not only enhanced students' understanding of biochemistry but also deepened their awareness of scientific ethics and social responsibility.

In another case, a university utilized Virtual Reality (VR) technology to teach biochemistry experiments. Students, wearing VR headsets, entered a simulated laboratory environment to perform various experimental operations. This method not only provided a safe and risk-free experimental environment but also significantly increased the interest and sense of participation in learning. Simultaneously, teachers incorporated ideological and political education content related to environmental protection and sustainable development into this virtual experiment process, allowing students to understand the impact of biochemistry on the environment and society while learning professional skills.

Furthermore, the teaching strategies in these cases emphasized the importance of interdisciplinary learning. When discussing the ethical issues of gene editing technology, students needed not only to understand the professional knowledge of biochemistry but also to involve knowledge from disciplines such as law, sociology, and ethics. This interdisciplinary learning approach helps students form a comprehensive knowledge structure, better understanding the multidimensionality of complex issues.

Overall, these cases demonstrate the effectiveness of integrating innovative ideological and political education strategies into bilingual biochemistry teaching. Through these methods, students can not only improve their professional knowledge and skills, but also deepen their understanding of scientific ethics and social responsibility. This teaching model provides an effective approach to cultivating biochemistry professionals with a comprehensive perspective and a sense of

social responsibility.

4.2 Empirical research results

To assess the effectiveness of innovative ideological and political education strategies in bilingual biochemistry teaching, a series of empirical studies were conducted. These studies aimed to quantify the impact of innovative teaching methods by collecting and analyzing data on students' learning outcomes, participation, and satisfaction. The research results indicated that classrooms employing interactive teaching methods such as role-playing and group discussions significantly outperformed traditional teaching models in terms of student participation and satisfaction. This enhancement was reflected not only in students' enthusiasm for learning but also in their in-depth understanding of biochemical concepts and applications.

Additionally, the teaching method using online learning platforms significantly increased students' study time and resource access. The convenience and interactivity of online platforms greatly stimulated students' interest in learning, enabling them to flexibly schedule study time and access a wide range of learning resources. This finding suggests that the application of technology is of significant value in enhancing teaching effectiveness and promoting student autonomous learning.

Student feedback also supported the results of empirical research. Many students expressed that through participating in interactive and technology-driven teaching activities, they not only improved their mastery of biochemistry professional knowledge but also enhanced their awareness of scientific ethics and social responsibility. Students believed that this teaching model not only made the learning process more enjoyable and engaging but also helped them establish a deeper interest and understanding of the biochemistry profession.

In summary, these empirical research results demonstrate the effectiveness of bilingual biochemistry teaching strategies that integrate ideological and political education. Through interactive learning and the application of modern educational technology, students not only enhance their understanding and interest in biochemistry but also deepen their awareness of scientific ethics and social responsibility. This teaching model provides an effective approach to cultivating biochemistry professionals with critical thinking skills and a sense of social responsibility.

5 Conclusion

This study delves into the innovative practice of integrating bilingual biochemistry teaching with ideological and political education. Through empirical research, the effectiveness of this integrated approach in enhancing students' professional competence and ideological and political literacy has been validated. The results demonstrate that innovative teaching content and methods, such as case analysis, role-playing, and the utilization of modern educational technology, significantly elevate students' interest and engagement, thereby strengthening the influence and depth of ideological and political education. However, the process of achieving this goal also faces numerous challenges, including language barriers, limitations in teaching resources, and the enhancement of student participation. Future efforts should focus on continuing to explore more innovative strategies, such as strengthening teachers' bilingual teaching capabilities, enriching teaching resources, and improving students' language skills, to further enhance the integration effect of bilingual teaching and ideological and political education. This will not only promote students' comprehensive development in their professional fields but also cultivate the critical thinking and social responsibility required for future scientists and citizens. Through these endeavors, the bilingual teaching model will be refined to better serve the learning and developmental needs of students.

Conflicts of interest

The author declares no conflicts of interest regarding the publication of this paper.

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