DOI: 10.53469/jerp.2024.06(08).04

Practice and Exploration of Teaching Reform in Combustion Science Course

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Abstract: ***With the development of energy science, combustion science, as an important discipline, is also facing continuous challenges and reform needs in the field of higher education. This study analyzes the current situation of combustion teaching, explores reforms in teaching content and methods, and proposes some specific reform measures and suggestions.***

Keywords: Combustion science, Reform in education, Teaching method**.**

1. Current Situation of combustion teaching

1.1 Delayed Updating of Teaching Content

The traditional teaching content of combustion often focuses too much on basic theories and the combustion process of traditional fuels, while neglecting the requirements of new energy technologies and environmental protection. With the development of energy science, traditional teaching content can no longer meet the needs of modern education. For example, combustion technologies for new energy sources such as biomass energy, solar energy, and wind energy need to be included in the teaching content.

1.2 Single Teaching Method

At present, the teaching method of combustion science still relies mainly on the traditional "teacher lectures, students listen" approach, lacking interactive and practical elements. Although this teaching model has some effectiveness in imparting knowledge, it has obvious shortcomings in cultivating students' practical operation ability and innovative thinking. For example, case-based teaching, interactive teaching, and the application of information technology have not been widely used in combustion teaching.

1.3 Lack of Application of Modern Educational Technology

Modern educational technologies, such as digital teaching resources and online courses, provide new possibilities for educational reform. However, the application of these technologies in combustion teaching is not yet widespread enough. For example, through online courses and remote teaching, students can be exposed to more resources and knowledge, broadening their horizons.

1.4 Lack of Practical Operation and Experimental Teaching

Combustion science is a highly practical discipline that requires extensive experimentation and practical operations to deepen understanding. However, there are few experimental teaching components in current teaching, and students lack opportunities for practical operation. This not only affects students' understanding and application of theoretical knowledge, but also limits the cultivation of their innovation and practical abilities.

2. The Necessity of Reforming Combustion Science

Combustion science, as a discipline involving multiple fields such as energy conversion, chemical reactions, and environmental impact, occupies an important position in modern education. However, with the development of technology and the updating of educational concepts, the traditional teaching mode of combustion science can no longer meet the needs of modern education. Therefore, it is particularly necessary to carry out teaching reforms in combustion science.

2.1 Adapting to the Needs of Energy Science Development

With the development of new energy technologies, traditional fossil fuel combustion technologies have gradually been replaced by new energy technologies. Therefore, the teaching content of combustion science needs to be constantly updated and expanded to meet the development needs of energy science. For example, combustion technologies for new energy sources such as biomass energy, solar energy, and wind energy need to be included in the teaching content.

2.2 The Need to Cultivate Students' Practical and Innovative Abilities

The traditional teaching mode of combustion often focuses too much on imparting theoretical knowledge, while neglecting the cultivation of students' practical and innovative abilities. In modern education, it is very important to cultivate students' practical and innovative abilities. Through teaching reform, experimental teaching and case analysis can be added to enhance students' practical and innovative abilities [1].

2.3 The Need to Improve Teaching Effectiveness

The traditional teaching model of "teacher lectures, students listen" often has unsatisfactory teaching results. Through teaching reform, new teaching methods such as interactive teaching and case-based teaching can be adopted to improve teaching effectiveness [2]. For example, classroom discussions, group collaborations, and other methods can

stimulate students' interest in learning and improve their learning motivation. Modern educational technologies, such as digital teaching resources and online courses, provide new possibilities for educational reform. Through teaching reform, these modern educational technologies can be fully utilized to improve teaching effectiveness. For example, through online courses and remote teaching, students can be exposed to more resources and knowledge, broadening their horizons [3].

2.4 Adapting to the Societal Demand for Talent

With the development of society, the demand for talent is also constantly changing. The traditional teaching mode of combustion often cultivates students who lack practical and innovative abilities, making it difficult to meet the needs of society. Through teaching reform, more talents with practical and innovative abilities can be cultivated to better meet the needs of society.

The reform of combustion science teaching is not only to meet the needs of energy science development, but also to cultivate students' practical and innovative abilities, improve teaching effectiveness, adapt to the demand for talents in society, promote interdisciplinary integration, respond to environmental challenges, utilize modern educational technology, enhance international competitiveness, and other needs. Therefore, it is necessary to carry out teaching reforms in combustion science.

3. Content of Teaching Reform in Combustion Science

3.1 Updating and Expanding Teaching Content

The content of the combustion course needs to be constantly updated to adapt to the development of energy science. Traditional teaching content often focuses too much on basic theories and the combustion process of traditional fuels, while neglecting new energy technologies and environmental requirements. Therefore, it is necessary to incorporate combustion technologies of new energy sources such as biomass energy, solar energy, and wind energy into the teaching content.

3.2 Innovations in Teaching Methods

Combustion science is a science that studies combustion phenomena and their applications, involving multiple disciplines such as chemistry, physics, and fluid mechanics. It is imperative to enhance students' practical and innovative abilities.

Experimental teaching: Through basic combustion experiments, students can understand the basic process and principles of combustion. Design some comprehensive experiments to enable students to apply their learned knowledge and solve practical problems during the experiments.

Project driven learning: Project design encourages students to design and implement their own combustion engineering projects, such as designing a new burner or optimizing the combustion process. Teamwork aims to cultivate students' collaborative and project management skills through teamwork.

Innovation Competition: Hold innovation competitions related to combustion science to stimulate students' innovative thinking and practical abilities. Encourage students to collaborate with students from other disciplines and undertake interdisciplinary innovative projects [4].

Case study: By analyzing actual combustion cases, students can understand the importance and complexity of combustion science in industrial applications. Guide students to think about how to solve practical problems through combustion knowledge.

Academic exchange: Invite experts in the field of combustion to give academic presentations, allowing students to understand the latest research trends and application prospects. Encourage students to participate in academic discussions, cultivate critical thinking and academic communication skills.

Technical training: Teach students to use relevant simulation software, such as CFD (Computational Fluid Dynamics) software, to simulate and analyze combustion processes. Train students to operate laboratory equipment such as burners and measuring instruments to enhance their practical skills.

Social Practice: Collaborate with relevant enterprises to provide internship opportunities for students to apply their learned knowledge in practical work environments. Encourage students to participate in community service projects and apply combustion knowledge to solve practical problems in the community.

3.3 Innovation of Teaching Mode

The traditional model of "teachers lecturing and students listening" can no longer meet the needs of modern education. New teaching methods such as case-based teaching, interactive teaching, and the application of information technology need to be introduced. For example, classroom discussions, group collaborations, and other methods can increase students' participation and learning motivation. In addition, using computer programming and simulation software for numerical simulation analysis can also help enhance students' practical abilities and engineering thinking.

Combustion science is a highly practical discipline that requires extensive experimentation and practical operations to deepen understanding. However, the current experimental teaching process is limited, and students lack opportunities for practical operation. Therefore, it is necessary to increase the experimental hours, enrich the experimental content, and guide students to use Internet resources for practical operations through "cloud experiments" and other ways.

Modern educational technologies, such as digital teaching resources and online courses, provide new possibilities for educational reform. We need to fully utilize these technologies to improve teaching effectiveness. For example, through online courses and remote teaching, students can be exposed to more resources and knowledge, broadening their

horizons.

4. Conclusion

The teaching reform of combustion science adapts to the needs of energy science development, cultivates students' practical and innovative abilities, improves teaching effectiveness, adapts to the demand for talents in society, and is of great significance for enhancing talent cultivation in universities and the new quality productivity of society.

Acknowledgments

The present work was financed by Higher Education Research Project of China Association of Higher Education (22WL0306), Research and Practice Project on Higher Education Teaching Reform in Henan Province (2024TSJGLX11), and Research and Practice Project of Education and Teaching Reform of Henan Agricultural University (2024YJGLX012, and 2022XJGLX069).

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