International Education Forum, 2024, Volume 2, Issue 5
http://ojs.bbwpublisher.com/index.php/IEF

Construction and Practice of Collaborative Education Mechanism for Teachers' Science and Education Integration under the Perspective of "Double First-class" Strategy

Cong Chen*, Xiurui Zhang

College of Materials Science and Opto-Electronic Technology, University of Chinese Academy of Sciences, Beijing 100049, China

***Corresponding author:** Cong Chen, chencong@ucas.ac.cn

Abstract: In the context of the implementation of the "double first-class" strategy, teachers have important responsibilities in education and teaching. The professional level of the teaching team is related to the quality of talent cultivation. In the face of the new requirements of talent cultivation recently, it is of great significance to establish a mechanism for teachers to integrate science and education and collaborate in educating people, adhere to the fundamental task of establishing morality, commit to building a first-class faculty, improve the quality of education and teaching, and simultaneously apply the innovation of scientific research achievements to the practical application of the research results to cultivate and deliver more high-quality talents. The article is mainly based on the "double first-class" strategy background, explores the science and education fusion collaborative education mechanism construction-related content, clarifies its importance based on the search for a reasonable strategy into practice, and looks forward to the front-line education practice to provide reference support.

Keywords: Collaborative education mechanism; Science and education integration; "Double first-class" strategy; Talent cultivation

Online publication: July 11, 2024

1. Introduction

In the context of the implementation of the "two first-class" strategy, higher education is booming and facing new challenges and opportunities. To fully implement the "double first-class" strategy, the integration of science and education and collaborative education have been gradually introduced into the field of higher education, which emphasizes the promotion of teaching reform through scientific research activities and the realization of in-depth cooperation between different majors and disciplines within universities, cooperation between universities and enterprises, and the cultivation of more high-quality talents required by the society under collaborative innovation. Therefore, the implementation of the "double first-class" strategy aims to

promote the construction of teachers, science, and education fusion, encourage collaborative education mechanisms, facilitate the organic integration of resources effectively, and ensure comprehensive overall student development.

2. Overview of "double first-class" and the integration of science and education

"Double first-class" refers to the construction of world-class universities and first-class disciplines, and is also one of the core strategies for the development of China's higher education. The implementation of the "double first-class" strategy promotes the construction of faculty, optimizes the layout of disciplines, and enhances the ability of scientific research and innovation, which helps to improve the overall level of higher education and develops toward world-class ranks. Additionally, colleges and universities can not only have perfect research facilities and excellent faculty but also establish a scientific and reasonable talent training system to cultivate a more innovative and international vision of talent [1].

The integration of science and education refers to the deep integration of education, teaching, and scientific research, and the common development of the education model. Under the integration of science and education, the connection between scientific research and education and teaching is further enhanced where the former can provide cutting-edge research results for teaching and enriching the teaching content while the latter provides talent support for scientific research and boosts the development of scientific research at a higher level.

3. The specific practice of collaborative education mechanism for teachers' science and education integration under the strategy of "double first-class"

3.1. Transformation and application of first-class scientific research results

Under the strategy of "double first-class", the construction of science and education integration and collaborative education mechanism can realize the deep integration of scientific research and teaching, improve the quality of higher education teaching, and cultivate more high-quality talents.

3.1.1. Transformation of scientific research results into teaching resources

Under the background of the "double first-class" strategy, universities have produced valuable scientific research results with significant educational potential. Transforming these scientific findings into teaching resources is crucial to promote the integration of science and education. To promote the transformation of scientific research results into teaching resources, it is emphasized to present them in front of students in a vivid and intuitive form to stimulate students' interest in learning. Teachers can turn scientific research results into more practical and innovative teaching resources through case teaching, leading students to discuss and analyze them, which will help students to deeply understand the knowledge and effectively cultivate their critical thinking and problem-solving ability. Teachers should focus on giving full play to their scientific research ability, designing research results into more challenging experimental projects, encouraging students to learn and master subject knowledge in hands-on practice, and using them to strengthen students' innovative spirit and practical ability. First-class scientific findings can provide rich and diverse material support for constructing cutting-edge content teaching materials so students are exposed to advanced academic dynamics [2]. Teachers should encourage students to engage in scientific research projects, allowing them to experience the whole process firsthand. This approach promotes active learning, enhances practical skills, and improves learning outcomes and teamwork abilities.

3.1.2. Research equipment into experimental instruments

With the continuous progress and development of science and technology, university research equipment continues to update and improve, covering various disciplines. Research equipment of high performance and high precision can support students' experiments and become the main measure of collaborative science and education fusion. Colleges and universities can establish open laboratories to introduce scientific research equipment to all aspects of experimental teaching. Students can get hands-on experience to master the principle and operate the equipment simultaneously promoting internalization and consolidation of knowledge through practice and improving learning efficiency. Teachers can also use scientific research equipment to design innovative experimental courses where students can systematically learn the use of scientific research equipment, operating procedures, and data processing techniques. This encourages students to participate in experimental scientific research projects and stimulates their research and innovation ability [3]. Moreover, to achieve synergistic education between different professions and disciplines, a research equipment-sharing platform can be established. Different professional disciplines can borrow research equipment from each other to improve the efficiency of equipment usage. This platform further broadens the practical operation channels for students to reserve the equipment for independent experiments and scientific research.

3.1.3. Scientific research projects support the cultivation of innovation ability

To build a collaborative education mechanism between science and education, it is necessary to focus on the teaching and application of scientific research results and encourage students to strengthen their innovation ability in scientific research projects. Research projects are the main carrier to integrate science and education. They are linked to cutting-edge disciplines and social needs, guiding students to engage in scientific research projects, stay updated on the latest developments, and learn research methods and processes. Teachers can organically integrate scientific research projects within their course design. Then students will participate in scientific research projects while completing course assignments to deepen their knowledge and understanding, further cultivate innovative thinking, and practical ability. Combining relevant science and education with the establishment of research project-driven practical teaching mode, teachers encourage students to carry out scientific research projects through literature research, experimental design, data analysis, and analysis of the results linked to different factors. This strengthens students' scientific research ability and innovative thinking [4]. After completing the research project, students are given the chance to present and discuss their results with other students and teachers which enhances students' self-confidence in learning and instills a lasting passion for innovation.

3.2. First-class undergraduate teaching and research method innovation

Under the implementation of the "double first-class" strategy, with guidance from professional faculty, we promote the innovation and optimization of the teaching mode. Alongside guiding students to learn subject knowledge efficiently, broaden their horizons, grow their knowledge, and permeate scientific research elements in the whole teaching process to cultivate first-class undergraduate innovative talents in practice.

3.2.1. Optimizing the teaching content of innovative courses

To promote the innovation of first-class undergraduate teaching and research methods, the curriculum should be optimized following the new teaching requirements. The teaching content should be dynamically adjusted and the achievements of teaching reform should be comprehensively put into the construction of the curriculum. In the optimization and innovation of teaching mode, teachers should pay attention to the utilization and fusion of network education resources, and introduce more extracurricular teaching resources to support students'

learning and practice. Additionally, actively incorporate big data, artificial intelligence, the Internet of Things, cloud computing, and other disciplines into the original multidisciplinary framework to optimize and reconstruct professional courses. The professional and technical courses are included in the scope of professional elective courses while the core courses of each major are screened to focus on construction [5]. To consciously and purposefully build professional main courses into national high-quality open courses it is required to deepen the digital transformation of professional courses, introduce high-level content of professional teaching materials, and establish a network education platform for professional main courses. Furthermore, integrating high-quality educational resources and faculty, realizing the MOOC construction of multiple courses under coordinated planning, regularly updating and improving the course content, especially introducing cutting-edge scientific research results, so that students can master cutting-edge professional knowledge on time. In addition, courses on Computational Thinking and Artificial Intelligence are offered while Visual Basic courses are converted into Python language design courses to promote the construction of new liberal arts or new engineering disciplines.

3.2.2. Refinement of curriculum standards

In first-class undergraduate teaching, the refinement of curriculum standards and the innovation of teaching methods are closely linked. Traditional teaching methods focus on the indoctrination of knowledge points and do not pay enough attention to students' subjectivity and creativity. Under the implementation of the "double first-class" strategy, the focus is on the interactivity and diversity of teaching methods, encouraging students to take the initiative to explore and learn, and providing specific paths to support the achievement of the objectives [6]. Firstly, the objectives of the course are clear, including knowledge mastery, emotional attitude, ability cultivation, etc. The objectives are testable and operable so that teachers and students can clearly define the teaching requirements and learning outcomes of the course. Secondly, to refine the teaching content, clear chapters or modules of the important and difficult content, to determine the supporting teaching methods and teaching resources, and to achieve more targeted teaching activities [7]. Thirdly, the development of detailed evaluation criteria corresponding to the objectives of the course, including the ability to develop the level of knowledge mastery and learning attitudes and other requirements, refinement of the evaluation criteria can be a more objective and comprehensive assessment of student learning outcomes. Lastly, to enhance the practicality and innovation of the course, emphasizing the combination of course content and application, guiding students to consolidate what they have learned in practice, exposing students to the frontiers of the discipline, and cultivating students' innovative thinking [8].

3.2.3. Innovative teaching and research methods

Innovative teaching and research methods under the "double first-class" strategy should closely focus on the needs of students' comprehensive development, abandon the traditional teaching mode, and focus on the cultivation of students' innovative thinking and problem-solving abilities. First is problem-oriented learning. Problem-oriented learning adheres to the teaching method of problem orientation, guiding students to learn and explore actively. Teachers are no longer a single knowledge transmitter, but a guide and facilitator, combining the course content to design more challenging problems, encouraging students to learn independently and co-operatively, stimulating students' interest in learning, and promoting the development of students' teamwork and problem-solving ability [9]. Second is flipped classroom. In the flipped classroom, students watch videos and read materials before class, learn knowledge independently, summarize the problems in learning, and discuss and solve them later in class. This method can promote students' independent learning and enhance the learning effect. Third is blended teaching. Blended teaching can realize online and offline blended teaching,

organic integration of network resources and technical means, through the network platform to release learning materials, organize discussions and assignments, etc., so that students can learn knowledge at any time and place, to meet the personalized learning needs of students, and to promote the development of students' independent learning ability [10].

3.3. Innovative science and education integration mode

Based on the "double first-class" strategy, we can implement the research feedback teaching mode that integrates the latest scientific research results and research methods into the curriculum. This includes offering scientific research courses and activities to engage students in scientific research and foster their interest in it. Students can also be encouraged to take the initiative to express their unique insights in teaching, providing innovative ideas and methods for scientific research. Colleges and universities can establish practice bases with enterprises and research institutes. Under the cooperation between industry-university research and school enterprise, students can be encouraged to deeply understand theoretical knowledge in practice and promote the development of students' practical ability.

4. Conclusion

To sum up, under the background of the implementation of the "double first-class" strategy, promoting the establishment of collaborative education mechanism for teachers' science and education integration can help to integrate educational resources, achieve mutual promotion and mutual influence between scientific research and teaching, create a favorable learning environment, enhance students' learning effect and promote the overall development of students' comprehensive quality all together.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Ruan L, Li X, Zhang Y, et al., 2024, The Construction of a Sinking Governance Mechanism for School-Family-Society Collaborative Parenting–An Action Research Based on the Programme of "Social-Emotional Competence of Elementary School Students". Journal of Beijing Institute of Education, 38(03): 49–59.

[2] Yang H, 2024, Exploration of the Path of Three-Whole Nurturing System Construction for Undergraduate Freshmen's Civic and Political Work–Taking the Mechanism of Collaborative Nurturing by Counsellors-Academic Tutors-Class Teachers-Part-time Counsellors as an Example. Modern Business Industry, 45(10): 123–125.

[3] Li Y, Ji X, Ji L, Shang C, 2024, Research and Implementation of School-Enterprise Dual-Body Collaborative Nurturing Mechanism–Taking CNC Technology Major as an Example. Modern Business Industry, 45(10): 109–110.

[4] Zhang Z, Zhang K, An Y, 2024, Research on the Construction and Practice of Collaborative Education Mechanism of School-Enterprise "Eight Common" Joint Creation. Shaanxi Education (Higher Education), (04): 52–54.

[5] Peng L, 2024, Construction of Collaborative Educational Mechanism between Universities and Research Institutions–Based on the Perspective of Resource Dependence Theory. Graduate Education Research, 2024(02): 73–79.

[6] Zhang C, 2024, Research on "3+N" Collaborative Education Mechanism of Medical Colleges and Universities under the Theory of Comprehensive Human Development. University, 2024(08): 189–192.

[7] Wang H, Dai G, Ma S, 2023, Research on Collaborative Education Model of Teaching and Research in "Double

First-Class" Universities. Health Career Education, 41(11): 1–4.

[8] Bai Y, 2022, Research on Teaching and Research Collaboration between Teachers and Researchers in Universities of "Double First-class" Construction, thesis, Fujian Normal University.

[9] Li H, 2022, Research on the Mechanism of Collaborative Nurturing Between Teaching and Scientific Research in Colleges and Universities Under the Construction of "Double First-Class", thesis, Fujian Normal University.

[10] Wang K, Ni Y, Wang L, 2021, Construction and Practice of Collaborative Education Mechanism for Teachers' Science and Education Integration Under the Perspective of "Double First-Class" Strategy. Heilongjiang Education (Higher Education Research and Evaluation), 2021(08): 1–4.