Construction and Thinking of Virtual Simulation Laboratory under the Background of New Liberal Arts—Taking Science Education as an Example

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Abstract: The comprehensiveness, practicality, and intersection of science education major determine the necessity of constructing professional laboratories. This article explores the necessity of constructing a virtual simulation laboratory for science education in the context of the "new humanities", which meets the goals of cultivating new talents, the basic requirements of the new humanities construction, and the high-quality development requirements of higher education. In this context, considerations and prospects have been put forward for the construction of virtual laboratories, building virtual simulation laboratories that are in line with the new liberal arts background, modernization, and subject characteristics.

Keywords: New liberal Arts; Science Education; Virtual Simulation Laboratory

Introduction

In August 2018, on the occasion of the National Education Conference, the Central Committee of the Communist Party of China proposed in a document that "higher education should strive to develop new engineering, new medical, new agriculture, and new humanities" (referred to as the "Four New" construction). As a result, the requirement to build a "new liberal arts" has been officially put forward. In April 2019, 13 departments including the Ministry of Education and the Ministry of Science and Technology jointly launched the "Six Excellence and One Top" Plan 2.0 to comprehensively promote the construction of new engineering, new medical, new agriculture, and new humanities. The proposal of the new liberal arts construction also poses new challenges to the talent cultivation goals, curriculum system, curriculum teaching resources, practical teaching, and other aspects of traditional liberal arts, providing guidance on how to cultivate new era liberal arts talents that are coordinated with national construction and development.

1. The necessity of constructing virtual simulation laboratories for science education in universities

1.1 Meet the goal of cultivating innovative talents

The Science Education major is designed by universities to cultivate high-quality science teachers with good scientific literacy, scientific exploration ability, innovation ability, thinking ability, and practical ability for primary and secondary schools. At present, the current science education majors in Chinese universities mainly focus on theoretical courses in their curriculum, with a focus on theoretical teaching in their teaching methods. This leads to a lack of scientific exploration, practical ability, and innovative ability among some students, and a lack of adaptability in the positions of science teachers in primary and secondary schools.

Therefore, with the high development demand of modern education, the functional requirements of laboratories are changing faster and faster, while traditional laboratory teaching platforms have a relatively single mode and content, which affects the quality of experimental teaching and talent cultivation.

The science education major aims to cultivate high-quality innovative talents based on the new liberal arts background and in line with economic and social development. Virtual simulation experimental platforms can be introduced into traditional experimental teaching processes, replacing experimental teaching projects that cannot be completed by traditional experimental platforms with virtual experimental projects. This not only stimulates students' interest and improves their enthusiasm, but also saves experimental materials to a certain extent, It can also strengthen the cultivation of students' innovative ability and achieve the effect of keeping up with the times.

1.2 Meet the requirements of new liberal arts construction

The new humanities and social sciences have put forward new requirements for talent cultivation goals, models, curriculum systems, and content. Humanities and social sciences not only need to innovate in learning methods, subject systems, teaching models, and research paradigms, but also need to directly connect with the practical needs of emerging fields. In laboratory construction, it is necessary to change existing concepts, fundamentally change the research methods of traditional humanities and social sciences, reform practical teaching methods, and improve the quality of education. As an essential part of improving students' innovative, comprehensive, and practical abilities, the experimental stage is particularly important and urgent in how to change traditional concepts in the context of the new liberal arts, and how to build a liberal arts experimental teaching system on the existing foundation, so that the experimental teaching system can be carried out in the same direction, in the same industry, and in sync with the construction of the "new liberal arts", and make up for and change the shortcomings in traditional liberal arts experiments.

2. Reflections and Prospects on the Virtual Simulation Laboratory of Science Education under the Background of "New Liberal Arts"

2.1 Building a Modern Virtual Simulation Professional Laboratory

The development of experimental teaching in the "New Liberal Arts" requires the construction of a modern laboratory based on hardware to support the merger and introduction of intelligent technology. Therefore, in terms of funding investment, schools should change their mindset and provide strong support; In terms of laboratory output, more attention should be paid to the integration and transformation of scientific and technological achievements; In terms of laboratory management, it is necessary to combine modern management models and change the outdated management system of the past.

(1) Change mindset and increase investment. The demand for comprehensive and high-quality talents in today's society is increasing. Under the OBE concept (Output Based Education), this requires universities to keep up with the times when cultivating students. With the development of artificial intelligence and informatization, virtual simulation experiments require students to combine their mastery of modern technology with traditional skills. Therefore, this requires schools to change their mindset from top to bottom and attach importance to the development of modern education. In this regard, the school can incorporate its development into its daily laboratory construction, and update the laboratory software and hardware equipment in a timely manner according to the school's own unique positioning to meet the teaching arrangements and the comprehensive improvement of students' abilities.

(2) Integrate modern technological achievements and keep up with the times. In the era of rapid development of big data, the construction of virtual simulation laboratories should be more closely aligned with the new characteristics of the times, and a more realistic virtual environment should be established on the basis of big data to provide a good environment for immersive teaching and learning. In addition, with the development of information technology, different majors have also generated different new concepts and software to accelerate the classification of information. Therefore, how to effectively combine emerging products with virtual simulation has become a challenge in the construction of contemporary virtual simulation laboratories. This not only requires schools to increase investment in timely updating and upgrading of laboratories, but also requires teachers to continuously improve their self-quality and keep up with the times.

2.2 Establish a new virtual simulation experimental teaching system with prominent disciplinary characteristics

(1) Change the traditional teaching mode. The traditional teaching mode mainly focuses on theoretical courses, while virtual simulation courses, due to their emphasis on practical and hands-on abilities, make education more focused on the development of experimental courses, allowing students to personally participate in the entire experimental process, and inspiring students' creative thinking through more intuitive teaching methods. Correspondingly, the assessment mechanism of the curriculum should be changed to focus more on open-ended assessments, in order to comprehensively assess students' mastery and understanding of knowledge points.

(2) Break through the limitations of the venue. The popularity of laptops at present is to some extent conducive to the development of virtual simulation experiments, allowing teachers to flexibly select locations during experimental courses, thus breaking through space limitations. This can also stimulate students' inspiration to the greatest extent, and enable them to immediately convert it into results after receiving inspiration, without having to go to specialized computer laboratory operations.

2.3 Clarify talent cultivation goals and adapt to the educational development trend under the background of "new humanities"

With the introduction of the concept of "new humanities", the cultivation of talents should also be combined with the background requirements of "new humanities", and clear training plans and goals should be established, in order to better carry out teaching reform and laboratory construction work. In terms of talent cultivation, we should adhere to the premise of putting morality first, break the traditional teaching goal of pursuing theory in cultural courses, and more importantly, strengthen the integration and integration of various disciplines to achieve a multi-disciplinary learning mode under a single subject education. Especially for virtual simulation courses, it is necessary to master information technology and comprehensively develop majors such as physics, geography, and life sciences in order to achieve the goal of applying what is learned. In summary, with full consideration of the changes in the "new liberal arts" and the technical requirements for talent abilities, as well as the promotion of OBE concepts, the comprehensive training objectives for talents are clarified, and comprehensive talents with comprehensive application ability for their respective majors and interdisciplinary technologies are obtained. The knowledge framework of students is improved, and their scientific literacy is improved.

3. Conclusion

In the context of the construction of the new liberal arts, there are both opportunities and challenges in the construction of virtual simulation laboratories, which require universities to make strong reforms and advances in teaching concepts and actions. Establish a complete development plan based on teaching staff, laboratory platform, and administrative management system. In addition, the construction of virtual simulation laboratories should also comply with the development and requirements of the times, actively cultivating composite talents with high professional level and strong comprehensive quality for the country and society.

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