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Exploration and Practice of Teaching Reform in Clothing Materials Science Empowered by AI and Integrated with Curriculum Ideology and Politics

Miao Yu[1]

[1] *Faculty of Art and Design, Shanghai Business School, Shanghai 200235, China*
[1]*Correspoonding author. Email: myu@sbs.edu.cn*

ABSTRACT
In view of the prominent problems such as the complex knowledge system and weak practical links of the course of clothing materials, this paper takes the course of "Clothing materials science" of clothing and clothing design as the object to explore the integration path of AI-empowered teaching reform and curriculum ideological and political education. By constructing an intelligent knowledge graph, deploying AI assistants, building a virtual laboratory and introducing AI design assistants, AI is deeply integrated into knowledge teaching, practical operation and creative design. At the same time, with the ideological and political elements such as silk culture, intangible cultural heritage skills and green textile as the link, the ideological and political case system covering the whole chapter is constructed to realize the same direction of technology empowerment and value guidance. The five-round teaching cycle shows that the number of course visits reached 9,433 times, and the students were guided to win 34 innovation and entrepreneurship projects and 65 design competitions. The course was approved as a triple construction project of municipal key courses, school-level AI + courses, and curriculum ideological and political demonstration courses in Shanghai colleges and universities, which provided a practical paradigm for the integration of technology and ideological and political education in clothing specialty courses in application-oriented universities.

Keywords: *Artificial intelligence, Clothing materials science, Curriculum ideology and politics, Teaching reform, Blended teaching.*

1. INTRODUCTION: PROBLEM PROPOSAL

“Clothing Materials Science” is a compulsory course for students majoring in clothing and apparel design. It requires students to systematically master the structural properties and application rules of fibers, yarns and fabrics, with high knowledge density and close integration with practice. For a long time, the teaching of this course has faced three contradictions: the contradiction between the abstraction of material knowledge and students' perceptual cognitive needs, the contradiction between limited experimental conditions and teaching needs, and the contradiction between knowledge updating and industrial development. At the same time, the fundamental task of moral education requires that professional courses should not stop at imparting knowledge, but also integrate cultural self-confidence, craftsman spirit and sustainable development into the teaching process. In recent years, the penetration of AI technology in the field of education has provided new ideas for getting rid of the above dilemma-knowledge graph can be structured to present fragmented knowledge[1], intelligent question answering system can make up for the gap of after-school tutoring[2], and virtual laboratory can reduce the cost and risk of practice[3]. However, the existing research mostly focuses on the single-point application in general education or science and engineering courses. There are few systematic AI empowerment schemes for materials courses of fashion design majors, and few studies have explored how AI technology and curriculum ideological and political education can achieve collaborative education in professional teaching. Based on the reform practice of the course in the

past five years, this paper discusses the teaching innovation path and its effect under the two-wheel drive of AI and curriculum ideology and politics.

2. REVIEW OF RELATED RESEARCH

AI-empowered education has become a research hotspot. Zhu Zhiting et al.[4] put forward the conceptual framework of “AI-empowered education”, and advocated that artificial intelligence should move from the tool level to the ecological level; Yu Shengquan[5] pointed out the teaching efficiency potential of AI assistants from the perspective of human-computer collaboration. Holmes et al.[6] summarized the role of AI in education as a progressive relationship from “substitution” to “partner”. In the field of curriculum ideological and political education, Gao Deyi et al.[11] proposed that curriculum ideological and political education is an inevitable choice to play the role of the main channel of classroom education. In the teaching reform of clothing materials, Liu Yu et al.[7] advocated increasing the proportion of experimental teaching, and Li Min[9] found that blended teaching can effectively improve learning engagement. The above research provides a reference for the curriculum reform, but there are generally shortcomings such as single application of technology and lack of systematic solutions. In particular, there is little discussion on how AI technology and curriculum ideological and political education work together in professional teaching. This is the blank that this article attempts to supplement.

3. CURRICULUM FOUNDATION AND REFORM IDEAS

“Clothing Materials Science” covers five modules: fiber, yarn, fabric structure, printing and dyeing maintenance. Since the start of online course construction on the superstar platform in 2020, it has accumulated 83 teaching videos, a total length of 1007 minutes, 20 test question banks, 175 teaching resources, 1299 course activities, 9433 visits, and 5 rounds of mixed teaching. The course director has presided over 13 national, provincial and school-level teaching construction projects, including the identification of Shanghai curriculum ideological and political demonstration courses and the identification of first-class undergraduate courses in Shanghai universities. In 2025, this course was approved by Shanghai universities for municipal key courses, school-level AI + courses, and curriculum ideological and political demonstration course construction projects. In terms of practical teaching, in the past three years, students have been guided to complete 34 major projects (9 national, 12 municipal, and 13 school-level), and 65 people have won and participated in design competitions at home and abroad, laying a data foundation for the evaluation of the reform effect.

Based on the above accumulation, the curriculum team has established the reform idea of "technology empowerment, ideological and political guidance, practice-driven, multi-evaluation", emphasizing that AI is not used as a simple auxiliary tool, but embedded in the whole teaching process, forming a new teaching ecology of "man-machine collaboration, virtual reality integration, and unity of knowledge and practice". Among them, curriculum ideological and political education is not an external label attachment, but a value core deeply intertwined with AI technology - technology solves the efficiency problem of “how to learn”, and ideological and political education answers the meaning problem of “why to learn”. The two support each other in each teaching link and go together in the same direction.

4. THE AI-EMPOWERED TEACHING REFORM PRACTICE

4.1 Construction of Intelligent Knowledge Graph and AI Teaching Assistant System

The concept of clothing material science is closely related but scattered in different chapters, and students are easy to fall into the dilemma of “seeing trees but not forests”. The course team used AI to construct a course-specific knowledge graph, which networkedly correlated information nodes such as material classification, production process, and performance indicators. Each knowledge point was labeled with pre-dependency and extension relationship. For example, starting from “cotton fiber”, it can be naturally extended to related knowledge such as spinning process, fabric structure, printing and dyeing characteristics. Teachers show the coordinates of knowledge points in the map before class, and students can browse related knowledge independently after class. At the same time, the course deployed the AI assistant question and answer system on the superstar platform, covering the core knowledge domains such as fiber identification and fabric performance.

Students asked questions at any time, the system provided instant feedback and attached links to relevant knowledge points. AI assistants also have the function of learning situation analysis, which can track the frequency of questions and the correct rate of answers, and push supplementary cases to weak knowledge points. After the deployment, the frequency of students' after-school questions increased by about 40%, and the scope of the problem gradually expanded from the basic concept to the comprehensive application level such as fabric matching.

4.2 Building AI Virtual Laboratory

Traditional laboratories are limited by the number of equipment and material costs, and it is difficult for students to fully operate. The course builds a virtual laboratory with AI, and its core functions include three aspects. The first is to create a three-dimensional virtual model of various types of fibers through AI modeling, and students can rotate 360 degrees to observe the longitudinal and cross-sectional characteristics of the fibers. The second is to use CLO 3D technology to build a fabric VR resource library, and the drape, elasticity and gloss texture of different fabrics are presented in a virtual way. Students can intuitively compare the visual effects of silk, cotton, chemical fiber and other materials on clothing. The third is to adjust the dye concentration, temperature and other parameters in the virtual environment to observe the color effect of the fabric under different conditions. This mode of "first virtual and then physical" not only reduces the cost, but also enables students to establish operational cognition before entering the physical laboratory. Of course, the fabric touch and sewing feel are difficult to replicate in the virtual environment. Therefore, the course adopts the two-stage strategy of “virtual preview-physical verification”, and always retains the physical operation link.

4.3 Introducing AI Design Assistant to Connect Material Cognition and Creative Practice

Students often face the dilemma of “knowing the material but not using it” - being able to recite the fiber performance parameters, but it is difficult to correlate the material and the intention when designing. AI intelligent design assistant is introduced into the course. After students input parameters such as clothing type, style positioning and functional requirements, the system generates fabric recommendation schemes and design sketches based on the material knowledge base. Taking the guidance of the new Chinese clothing design competition as an example, teachers guide students to AI synthesize the color elements of “Thousands of Miles of Rivers and Mountains” and the texture of silk to generate a virtual walk show effect, which encourages students to think about the influence of different materials on design expression. This cycle of “AI generation-artificial analysis-recreation” effectively stimulates deep thinking. It should be emphasized that AI assistant positioning is inspiration rather than substitution. Teachers require students to submit material analysis reports before obtaining suggestions to restrain the excessive use of tools.

4.4 Deepening Blended Teaching and Integrating Curriculum Ideology and Politics with Innovation and Entrepreneurship Education

Online, with Chaoxing AI + platform as the carrier, there are 18 AI applications, 3,360 knowledge slices and 78 knowledge points. Students complete video learning and knowledge detection independently before class, and preview and answer questions through AI assistants. Offline, teachers make full use of off-campus practice bases and adopt diversified methods such as flipped classroom, case analysis and group discussion. For example, teachers can lead students to the workshop of the enterprise to experience the whole process of sorting, tanning, cutting and sewing of fur raw materials, so that students’ understanding of material technology changes from book concept to physical memory.

Curriculum ideology and politics is another core main line of this reform. The course team constructed an ideological and political case system covering five teaching modules according to the idea of "one chapter, one ideology and politics, one section, one case". In the fiber chapter, the cultural self-confidence is cultivated through the narrative of cotton and the Silk Road, and the students are guided to feel the leap of China's textile industry from “following” to “leading” by combining the advantages of Xinjiang cotton quality. In the yarn chapter, the comparison between traditional manual spinning techniques and mechanized production is introduced to discuss the inheritance value of craftsman spirit in the contemporary era. In the fabric chapter, the brocade and kesi crafts in the intangible cultural heritage are taken as the starting

point to enhance students' sense of identity with the Chinese textile civilization; in the chapter of printing and dyeing, the green chemical fiber and ecological printing and dyeing technology are discussed to strengthen the awareness of environmental protection and the concept of sustainable development. In the maintenance chapter, starting from the traditional Chinese virtues of diligence and thrift, students are guided to establish a rational consumption concept. Each ideological and political case is equipped with pre-class reading materials and after-class reflection topics. With the help of AI teaching assistants, relevant expansion resources are pushed, so that ideological and political elements are naturally integrated into knowledge learning rather than rigid grafting.

The course leader closely combines party building with professional teaching as a “double leader”, leading students to give lectures on the production of non-legacy velvet flowers for the community, and the inheritors of non-legacy enter the classroom to guide the weaving of traditional fabrics. Based on this, the students carry out modern design transformation and win the national third prize. The course also organizes students to go to the Silk Museum and the Tubu Textile Intangible Cultural Heritage Workshop to carry out research and study, so that students can feel the rich heritage of Chinese clothing culture in the process of touching historical fabrics. In terms of innovation and entrepreneurship, teachers guide students to use fabric knowledge to develop traditional cultural and creative products and sell them online and offline channels, so that students can experience the complete link from material selection to market sales, and understand the responsibility of professional services to the society in practice.

4.5 Building a Diversified Evaluation System

The course breaks the evaluation method based on the final written examination. The formative evaluation is included in the dimensions of classroom participation, AI teaching assistant interaction record, project assignment and innovation display. The summative evaluation integrates online tests, fabric research reports and design practical assignments. The learning situation data of AI teaching assistants provide an objective basis for formative evaluation, so that teachers can evaluate the learning process based on data rather than impression, not only paying attention to students' “what they know”, but also paying attention to their “what they can do” and “how to think”. In addition, the course encourages students to design the real questions of the competition as a semester project, incorporate the competition results into the evaluation reference, and realize the evaluation of in-class learning and extracurricular practice.

5. TEACHING EFFECTIVENESS AND DATA ANALYSIS

After five rounds of teaching cycle, the curriculum participation continues to improve. The platform data shows that there are 175 course resources, 1,299 activities and 9,433 visits. AI teaching resources cover 18 AI applications, 3,360 knowledge slices and 78 knowledge points. The frequency of students' questions after class has increased by about 40%. The questions have expanded from basic concepts such as fiber identification to comprehensive application levels such as intelligent materials, indicating that AI assistants have stimulated a deeper willingness to explore while reducing the threshold of questions.

In terms of innovative practice, in the past three years, students have been guided to complete 34 major projects (9 national and 12 municipal). Students have won 65 awards in domestic and foreign design competitions, including the international gold medal of Busan International Art Festival in South Korea. The course has been approved by the school-level AI + course and the course ideological and political demonstration course construction project. The person in charge has won the title of a famous teacher and a school-level teaching model in Shanghai. The reform results have been recognized by the gold medal on the international platform, indicating that the path has strong feasibility and promotion value. In terms of Innovation Practices, in the past three years, students have been guided to complete 34 major projects (9 national, 12 municipal, and 13 school-level), and 65 people have won and participated in design competitions at home and students in the abroad, laying a data foundation for the evaluation of the reform effect.

6. DISCUSSION AND REFLECTION

The reform of this course reveals the triple value of AI in the teaching of clothing materials: the change of knowledge representation-knowledge map and three-dimensional model transform

abstract material knowledge into interactive digital form, which conforms to the visual learning preference of art design students; the extension of teaching time and space-AI teaching assistant breaks the limitation of after-school answering questions, and the virtual laboratory expands the boundary of practical training. The reconstruction of the relationship between teaching and learning-AI undertakes repetitive work such as knowledge retrieval and learning situation analysis, so that teachers can devote their energy to high-level teaching activities such as value guidance and creative inspiration. But the reform also exposed problems worthy of reflection. First, some students tend to “skip the direct generation scheme of material analysis” after using AI design assistant, and the course is constrained by adding the link of “material analysis first”. Second, although the virtual experiment reduces the cost, the touch of the fabric is difficult to reproduce in the virtual environment, and the physical verification link needs to be retained. Thirdly, the continuous updating mechanism of AI knowledge base is not perfect, which poses a continuous challenge in human input.

More importantly, AI empowerment should not be a simple pile of technology, but should be designed around the core pain points of the course - each AI application in this course corresponds to a specific teaching problem. Technological empowerment must also be promoted in parallel with educational concepts. Curriculum ideological and political education and professional practice are not the “ornaments” of technology, but should be organically complementary with it. In practice, it is found that there is a “degree” problem in the integration of AI and ideological and political education: when AI assistants push ideological and political development resources, if the content is too preaching, the student click rate decreases significantly; taking cases with aesthetic value such as silk culture and intangible cultural heritage skills as the carrier, students' active reading rate has been greatly improved. This suggests that the integration of ideological and political education in professional courses should follow the principle of moistening things silently", relying on the charm of the discipline itself rather than external preaching to convey value. Technology solves “how to learn”, ideological and political answers “why to learn”, and practice implements “what to learn to do”, all of which are indispensable. Only by deeply integrating the technical efficiency of AI with the value orientation of curriculum ideological and political education can we truly realize the unity of knowledge imparting, ability training and value shaping.

7. CONCLUSION

This paper systematically presents the practical path of the teaching reform of clothing materials course driven by the integration of artificial intelligence and curriculum ideology and politics. Through the construction of intelligent knowledge graph, the deployment of AI teaching assistant system, the construction of virtual laboratory and the introduction of AI design assistant, the course has realized intelligent upgrading in knowledge organization, personalized guidance, practical training and creative design. At the same time, with the case system of “one chapter one ideological and political education”, the value concepts of cultural self-confidence, craftsman spirit and sustainable development are run through the whole teaching process, and the online and offline mixed teaching and innovation and entrepreneurship education are deeply connected to form a complete teaching reform system of “technology empowerment, ideological and political guidance, practice-driven, multi-evaluation”. The data of the five-round teaching cycle show that the curriculum participation and students' innovative practice results have been significantly improved, which verifies the effectiveness of the reform program. In the future, there is a must to explore the deep application of big language model in the automatic updating of material knowledge and the recommendation of personalized learning path, promote the integration of virtual laboratory and augmented reality technology to obtain a more immersive learning experience, and establish an inter-school AI teaching resource sharing mechanism to promote the overall improvement of the teaching level of clothing materials.

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