

# Research on the Curriculum Model of "History of Design" in Engineering Colleges from the Perspective of Knowledge Production Theory

Cong An

Beijing Information Technology University, Beijing 100192, China.

**Abstract:** Under the background of the development of new engineering disciplines, the talent training model and teaching model have undergone profound changes, and the teaching of design history theory needs to re-establish a suitable curriculum teaching system. Aiming at the problem of the mismatch between the current curriculum design and the students' subject knowledge, this article is based on the knowledge production theory, and tries to construct a history theory curriculum system under the background of a new engineering subject from four aspects: knowledge orientation, content system, teaching mode, and teaching objectives.

**Keywords:** Knowledge Production Theory; Engineering Colleges; History of Design; Curriculum Structure

As the world's manufacturing industry undergoes profound changes, the deep integration of "Industry 4.0" and "Made in China 2025" is triggering far-reaching industrial changes. As one of the five major projects of "Made in China 2025", intelligent manufacturing engineering has become the country's full effort to build manufacturing an important starting point for a powerful country.

The concept of "new engineering" is my country's initiative to make strategic choices in response to the new round of industrial upgrading, technological development, and the strategy of building a strong manufacturing nation.

With the introduction of the "New Engineering Course", colleges and universities are actively exploring the training model of design professionals in the context of the new engineering discipline.

The article takes the "History of Design", a compulsory course for industrial design majors in engineering colleges and universities, as the breakthrough point, and discusses the construction and reform of the theoretical curriculum system under the background of new engineering.

## 1. Overview of knowledge production theory

American economist Fritz Machlup proposed the definition of "knowledge production", emphasizes the generation of personal knowledge. He also pointed out that knowledge production includes not only discovery, invention, design and planning, but also dissemination and delivery.

In the 1990s, scholars Gibbons and others pointed out: In the era of knowledge economy, knowledge production and application have broken through the traditional model of discipline autonomy and elite academics. It is increasingly focused on specific issues and has become a whole a new process of extensive social participation.

They summarized the two modes of knowledge production in the book "New Modes of Knowledge Production: The Dynamics of Contemporary Social Science and Research": In Mode 1, knowledge production is guided by the production of systematic discipline knowledge and theoretical science Or experimental science-led as the characteristic, through internally-driven subject classification, relying on independent scientists and other institutions and universities. In Mode II, knowledge production is socially distributed, application-oriented, interdisciplinary, and subject to multiple responsibilities.

Copyright 2021 Cong An

doi:10.18686/ahc.v5i6.3774

This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.00>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

With the development of the times and social changes, knowledge production has transformed from "Mode 1" to "Mode II", and the knowledge structure has features such as diversification and interactivity. The transformation of knowledge production methods has promoted the organization of traditional universities characterized by knowledge-intensive production. Evolution and innovation of function reconstruction. As a result, the teaching mode and talent training mode are gradually changing.

British educator Michael F.D. Young, under the influence of Gibbons' knowledge production, Bernstein's (Basil Bernstein, 1924-2000) social code theory, knowledge society construction theory, etc. Proposed the concept of "Powerful Knowledge", and constructed three future knowledge production and curriculum models. In terms of the organization of curriculum knowledge, "Future One" uses classic culture and 3R knowledge as the curriculum system. Subjects differentiated from academic disciplines; "Future II" is an interdisciplinary theme that breaks the internal boundaries of academic knowledge; "Future III" courses are created by various academic groups in society, and are characterized by objectivity and openness.

As a theoretical course of practical disciplines, under the background of new engineering construction, the course of design history theory is explored from the perspective of knowledge production and Mike Young's curriculum model theory. It is useful for establishing a design theory curriculum system, improving the effectiveness of design theory teaching, and matching engineering disciplines. Professional development has important practical significance.

## **2. Analysis of the "History of Design" curriculum system based on the theory of knowledge production.**

### **2.1 Establish the knowledge orientation of the design history curriculum: interdisciplinary development**

According to the internal development logic of Gibbons knowledge production, mode 1 is that knowledge output is concentrated in the same subject field, which is based on the simple reproduction process of knowledge. This stage is characterized by independent development of disciplines, and education knowledge focuses on self-renewal; In mode 2 the point of view is the expanded reproduction stage of knowledge. Knowledge seeks solutions in a way that transcends a single discipline. The boundaries of disciplines, research types, basic research and applied research are becoming more and more blurred. From the perspective of this article, the above two models describe the differentiation and integration of knowledge, namely the two processes of vertical in-depth and horizontal development. Under this development logic, it is now a period of transformation and reproduction of knowledge. In the fundamental education field, the in-depth integration and mutual penetration of disciplines form an inevitable trend for interdisciplinary development.

Mike Young also recognizes this shift. The pressure for university education to shift from relying on disciplines to a more "connected" interdisciplinary knowledge production model; Curriculum content from subject-based courses to modular, academic and vocational subjects comprehensive curriculum transformation combining basic skills. This new transformation is consistent with the five major connotations of the development of new engineering: new professional knowledge structure, new training concepts, new training goals, new training systems and new training models are consistent in development requirements.

Aiming at the problem of interdisciplinary cooperation in teaching practice, under the background of new engineering, when establishing the knowledge orientation of curriculum content, curriculum content design is not to simply superimpose the training plans and syllabuses of related majors in the disciplines. But to build a modular design history curriculum system. There should be a clear mapping relationship between the training model and the course content. Each module in the training model should be supported by clear course content and tasks. In other words, each content requirement of the course should be certain for the realization of the talent training structure contribution. The mapping relationship between the curriculum system and the training model requires the design of a set of cross-curricular teaching theories, models, methods and tools suitable for large-scale training.

### **2.2 Establish the content system of design history course: systematic knowledge**

In the curriculum system of Mike Young's "Future Three", the emphasis is on the systematic, interconnected, and disciplinary nature of the curriculum, which are different from the concept of daily life and form the elements of the school curriculum.

At the same time, Mike Young also clearly pointed out that each discipline forms its own inherent characteristics in its own development, and has specific research objects, concepts and methods, so professional learning of knowledge should be emphasized.

Specifically, the design history theory teaching content system is composed of three modules: theory teaching, case teaching, and practical teaching. The theoretical teaching part takes the relationship between design and machinery,

industry, and technology as the core content, and divides the theory into industrial design aesthetics. Three modules of mechanical design aesthetics and technical aesthetics; In case teaching, project cases are refined, and the workflow, steps, methods, and concept sketches in real design cases are synchronized with the design history curriculum, which not only allows students to understand the design process and methods, but It also gradually cultivates students' design thinking ability, generates various types of teaching modules with design theory as the core, forms a solid and effective connection between scientific theories and specific cases, and provides students with more effective teaching results; In practical teaching. Selecting typical product design cases in the design history, and appropriately letting students practice it, is a necessary supplement to the course of design history. Through the process of drafting stage, deliberation stage, presentation stage, design achievement stage, etc., students can understand more thoroughly from design practice to design theory, from concrete scheme to abstract concept.

The systematic learning of knowledge avoids fragmented learning methods, and the principles, concepts and methods of different disciplines allow the recipient to have a systematic and comprehensive understanding of the complex knowledge system. The ultimate goal of this systematic knowledge learning is to cultivate the development of students' design thinking and the improvement of their design abilities.

### **2.3 Establish the teaching mode of the design history course: interaction and participation**

In Mike Young's "Future Three" curriculum system, curriculum knowledge should surpass the learners' daily life experience. He believes that knowledge is not established, but has social characteristics and historical foundations; Knowledge is not closed and immutable. And possesses temporal and spatial variability, co-construction and interaction. Based on this theoretical foundation, the interactive style of the design history curriculum has two levels of meaning: First, the curriculum content, the timely update of knowledge. According to the characteristics of knowledge formation and development, interactive courses are dynamic and historical, which are reflected in the social and historical nature of knowledge production and knowledge transfer in courses. Its development changes over time and is influenced by society. Restricted by cultural, historical development, political and economic factors.

Second, in the teaching method, interactive teaching is implemented. Change the traditional teaching mode of theoretical teaching, and implement the five links of "proposed problem requirements→guide students in group discussion→design project plan→explain plan details→plan implementation". In traditional teaching methods, for teachers, subject and professional knowledge have allowed them to establish an authoritative image among students. The update of teaching content depends on personal subjective wishes; For students, the acquisition of knowledge depends on the guidance and teaching of teachers.

Under the new engineering teaching system that emphasizes innovative research and the cultivation of students' design thinking ability, teachers' knowledge system and experience should not be the shackles that restrict students from forming their own design history knowledge framework. In the interactive and participatory teaching model, teachers encourage students to construct their own knowledge structure through information retrieval, discussion, homework, etc, through guidance.

Daily experience is the starting point for learners to master knowledge, but it is not the school's goal of educating people. Since the curriculum system of the "Future Three" is different from ordinary knowledge acquired in students' daily life experience, schools and teachers should consciously realize the publicity and extensiveness of knowledge production and transmission through interactive and participatory teaching methods.

### **2.4 Establishing the teaching goal of the design history course: pointing to education equity**

Based on the analysis of the unfairness of students with disadvantaged family environment in the social redistribution. Mike Young's contribution to the study of the relationship between curriculum knowledge and social justice corrected the long-spread knowledge at that time. The student's personal success Whether it is related to talent and effort. Yang pointed out that the inherent sociality and publicity of knowledge production and transmission.

The "Future Three" courses emphasize subject basic knowledge. He believes that knowledge-based courses are not elitism, and knowledge-based courses. The knowledge available to all students is precisely what a school does to satisfy education fairness as much as possible. According to the core of the concepts of "powerful knowledge" and "future three" proposed by Yang, schools should "endow knowledge rights" to students, and teachers should select useful and better knowledge for students, so that students can obtain "powerful knowledge", so as to obtain education equity.

In essence, the design history course is a basic course system based on the development of disciplines and knowledge. In terms of course content, design theoretical knowledge, design style development context, technological changes and other basic knowledge of disciplines are emphasized. The relevance and integration of knowledge also stimulates the development of students' interests, hobbies and expertise. In the teaching method, the theory and practice are shared, and the problem-oriented teaching method is tried to stimulate students to think about the relevance of

knowledge points, and take the initiative construct a cognitive framework for design history. Especially in the form of homework supplemented by practice, from theory to practice, it re-understands, interprets, elaborates, and deconstructs design knowledge, emphasizing students' daily life experience beyond the context of students. This interactive and participatory curriculum model realizes knowledge and the publicity and extensiveness of the transmission ultimately point to the fairness of education.

### 3. Conclusion

In the context of the new engineering discipline, discussing the construction of the curriculum system of the theoretical compulsory course "History of Design" is that the humanities of engineering colleges can adapt to the development needs of new engineering models, new industries, and new structures. Gibbons' knowledge production model and Mike Young's "powerful knowledge" thought unify the sociality and objectivity of knowledge, providing a basis for understanding and reflecting on the current school curriculum reform and implementation. According to the theory of knowledge production, the "History of Design" course has found a theoretical basis in terms of knowledge orientation, course content arrangement, teaching mode innovation, and teaching effect implementation. Under the development of new engineering disciplines and the needs of a complex knowledge structure, by means of updating and expanding the content of the curriculum, exploring a design history curriculum system suitable for mechanical engineering disciplines is important in strengthening teaching, broadening professional calibers, and cultivating compound talents. significance.

### References

1. Machlup. Knowledge Production and Distribution in the United States. Sun Yaojun. Beijing: Renmin University of China Press 2007: 25.
2. GIBBONS M, LIMOGES C, NOWOTNY H. The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies. London: Sage Publications 1994: 179.
3. HELGA NOWOTNY, PETER SCOTT and MICHAEL GIBBONS, INTRODUCTION: 'Mode 2' Revisited: The New Production of Knowledge, Minerva, Vol. 41, No. 3, Special Issue: Reflections on the New Production of Knowledge (2003), pp. 179-180
4. Michael, David L, Knowledge and the Future School Bloomsbury 2014: 68
5. Michael Young, David Lambert, Carolyn Roberts, Knowledge and the Future School: Curriculum and Social Justice. London: Bloomsbury Publishing 2014. 74- 76