PIONEER
ACADEMIC PUBLISHING LIMITED

Journal of Advanced Research in Education
ISSN 2709-3980
www.pioneerpublisher.com/jare
Volume 4 Number 4 July 2025

Reform and Reflection on Micro-Course Design of 'Intelligent Design + Human-Computer Interaction' Driven by New Quality Productive Forces

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doi:10.56397/JARE.2025.07.03

Abstract

At present, with the accelerated evolution and wide application of new-generation information technology, the digital economy is booming, and new quality productive forces is constantly released, which pushes the design industry to accelerate the change in the direction of intelligence, integration and cross-boundary, and puts forward a new challenge to the comprehensive quality and innovation ability of design professionals. This paper focuses on the innovation demand of new productivity on design education, combines the cross trend of artificial intelligence and design disciplines, and constructs the micro-course system of 'Intelligent Design + Human-Computer Interaction', which aims to cultivate composite innovative talents with design thinking and intelligent technology application ability, cultivate new design talents adapted to the needs of the artificial intelligence era, provide a digital transformation model for similar institutions, and effectively promote the development of design professionals in the field of human-computer interaction. It provides digital transformation demonstration for similar institutions and effectively promotes the organic articulation of design education chain, talent chain and innovation chain.

Keywords: new quality productive forces, intelligent design, curriculum reform

1. Introduction

In September 2023, General Secretary Xi Jinping first put forward the 'new quality productive forces' during his visit to Heilongjiang, which is supported by its powerful digital technology, intelligent technology, etc. (Liang, H., Mei, C, Taiguang, G., & Xuelian, T., 2025), and has injected a new vitality into our teaching. The rise of new quality productive forces is a comprehensive transformation of the concept, method and mode of design education and teaching. The development and change of artificial intelligence have intensified the transformation of the design industry, and in the context of the development of new quality productive forces, the biggest challenge facing the current design professional curriculum system is the weak practical application ability of design talent training. As an important position for the training of design talents, it bears a key mission in serving the development of the digital economy and creative industries

(Yun, Z., Shanat, M. B. H., & Ya, L., 2023).

However, the current curriculum system construction of design studies is still facing multiple challenges: firstly, the curriculum structure is outdated, which makes it difficult to connect with the fast-evolving digital and intelligent design technology; secondly, the teaching content is fragmented, the knowledge transfer is disconnected from the ability cultivation, and there is a lack of systematic integration between the modules; thirdly, the synergy between the industry and education is insufficient, and the depth of enterprise participation in the curriculum design and practical teaching is not deep enough, which affects the formation of the students' ability of the real project. Meanwhile, under the background of the new round of technological revolution and industrial change, the construction of intelligent, reconfigurable and cross-border integration curriculum system has become an important direction of design education reform. In this context, promoting the reform of 'intelligent design + human-computer interaction' micro-course design for design majors is not only a realistic measure to adapt to the development requirements of 'new quality productive forces', but also a necessary way to improve the quality of vocational education and enhance the students' ability of numerical and intellectual design.

2. Major Problems Encountered in Current Teaching

2.1 Lack of Reflection of Interdisciplinary Pedagogical Thinking

2.1.1 Traditional Disciplinary Boundaries Are Not Clear

'Intelligent design + human-computer interaction' is essentially a highly cross-cutting field, but there are obvious disciplinary barriers in the actual teaching and development process. Micro-course content often focuses on in-depth study of a certain field, while ignoring the connection and intersection between different disciplines, such as design, computer science, artificial intelligence and other disciplines are developed independently of each other, the lack of effective integration mechanism, which leads to a lack of effective collaboration between the teaching team, and the respective syllabus, the assessment standards there are obvious differences.

2.1.2 The Homogeneity of Teaching Methods and Assessment Systems Limits the Development of Interdisciplinary Thinking

The traditional teaching mode is mostly based on lecturing knowledge, lack of interdisciplinary practical application scenarios and diversified forms of interaction, resulting in weak interdisciplinary communication and collaboration ability of students, for example, when completing the intelligent product design project, neither can well transform the design ideas into technical solutions, nor is it difficult to optimise the design expression from a technical point of view, and such a fragmented teaching mode seriously restricts the cultivation of systematic thinking of the students. It is difficult to adapt to the new quality productive forces on the demand for composite design talents.

2.1.3 Curriculum Design Does Not Adequately Reflect the Integration and Cross-Application of Knowledge Between Disciplines

Although the micro-course 'Intelligent Design + Human-Computer Interaction' tries to integrate multiple disciplines, there is a lack of more practical opportunities for interdisciplinary cooperation in the course content and project settings, which makes it difficult for students to carry out effective interdisciplinary innovation in the face of actual design projects, as they can only focus on the knowledge of a single discipline. Therefore, this micro-course serves the national card neck technology to enhance the depth and breadth of interdisciplinary teaching in design in the current strategic context of the country's cultivation of new quality talents.

2.2 Poor Practical Application of Applied Design Talent Cultivation in Colleges and Universities

(1) Disconnect between course content and methodology and technological development. The teaching content of the 'Intelligent Design + Human-Computer Interaction' course is very cutting-edge and specialised, with new technologies emerging every year in the field, while traditional courses usually have a long update cycle. Specifically, the content of the teaching materials is outdated, still stuck in the traditional design software teaching, and the practical teaching project fails to introduce the latest intelligent design tools such as Galileo AI, Midjourney, Stable Diffusion, etc (Yun, Z., 2019). However, this lag directly leads to a 'time gap' between what students learn and the actual needs of enterprises.

(2) Rigid teaching organisation. The traditional

teaching management mode is difficult to adapt to the needs of 'intelligent design + human-computer interaction' micro-courses for flexible teaching. Specifically, it is manifested in: the contradiction between the fixed schedule arrangement and the time flexibility demand of project-based teaching; the credit recognition mechanism is not conducive to the combination of interdisciplinary courses; the distribution of teaching resources is still divided according to the traditional disciplines, which impedes the construction of interdepartmental courses, and so on. For example, a complete intelligent product development project requires the synergy of multiple links such as product design, interaction development, user design, etc. However, the existing teaching management requires that each link belongs to a different course and is under the responsibility of different teachers, which results in the coherence of the project being severed.

(3) The problem of weak practical teaching system in micro-course design. The practice link is the key to cultivate the innovation ability of design students, but the current teaching is deficient in many aspects: the laboratory equipment is outdated; school-enterprise co-operation stays at the surface level, and it is difficult to contact the core technology, and so on. Take a smart home interaction design project as an example, students can only design based on simulation, and can not get real user feedback, resulting in the design programme is detached from the actual application scenarios. This kind of practical teaching 'on paper' is difficult to cultivate students' practical design ability to solve complex projects.

2.3 Problems of Mismatch Between Business Needs and the Structure of Disciplines and Specialisations

(1) Disconnect between industrial demand and design course content. At this stage, China is in a critical period of industrial structure transformation and upgrading, and this transformation process requires that the disciplinary and professional structure of higher education, talent training structure and technology structure be compatible with it (Guangxu, C., Wei, L., & Xiaoxin, S., 2025). However, the construction of the existing teaching system is lagging behind, and there is no integration surface embodied in the intersection of industry, academia, research and intelligent design. Although intelligent design and human-computer interaction have gradually gained importance in the industry, the specific skill requirements of enterprises for talents are often more inclined to practical applications, while the course content in undergraduate education is often biased towards theory and lacks practical training that is directly aligned with the needs of enterprises, which makes it difficult for students to quickly adapt to changes in the industry after graduation.

(2) The school-enterprise collaboration mechanism is not perfect. The industry is in urgent need of composite design talents, but due to the immature mode of school-enterprise cooperation, the degree of participation of enterprises in the course content is low, and the core data of enterprises are difficult to be transformed into teaching cases, which results in the curriculum not being able to fully reflect the latest development dynamics of the industry and the needs of the actual work. The existence of these problems makes the course content out of touch with the industry demand, which affects the effectiveness of the teaching reform of the design profession and the employment competitiveness of students.

3. Analysis of the Causes of Current Major Problems

3.1 Lack of Flexibility in Curriculum Design

The organisational structure of universities is a major barrier to interdisciplinary integration. Faculty. There is a serious shortage of composite teachers, very few of them have interdisciplinary teaching ability, and many of them have deep research accumulation in one subject area, but they are inexperienced in interdisciplinary teaching and integrating the contents of different disciplines. Interdisciplinary courses are at a disadvantage in the evaluation of titles. Statistics of a school show that interdisciplinary teaching achievements are poorly recognised in title assessment, which seriously inhibits teachers' motivation to innovate. The current curriculum design is mostly a single discipline knowledge system, and the interdisciplinary courses are often set up to favour theoretical explanations and lack practical and project-driven aspects. This makes students unable to promote the generation of interdisciplinary thinking through practical problem solving in the learning process, and there is a disconnect between the course content and the actual needs of students.

These factors together lead to a lack of integration between interdisciplinary teaching and the cultivation of students' interdisciplinary thinking.

3.2 The Pace of Technological Change That Is Difficult to Keep up with in the Curriculum

The disconnect between the training and development of design talents in teacher training colleges and universities is caused by the fast technology iteration and the lack of application of course content, weak relevance of teaching organisation and management, and insufficient innovation in teaching management. Although the course involves cutting-edge intelligent design and human-computer interaction technology, the rapid iteration of technology has made many teachers appear to be overwhelmed by the preparation and application of teaching content, method selection and teaching organisation (Pei, H., 2024). At the same time, the construction of the practice platform lags behind, and the traditional teaching methods fail to make full use of modern information technology and interactive platforms, resulting in a relatively single teaching method and a lack of innovation. In addition, there is a conflict between the traditional teaching management system and the new teaching mode, the evaluation system and feedback mechanism reform lags behind, the learning pace of micro-courses is faster, the traditional assessment method fails to effectively respond to the needs of students' personalised learning, resulting in the assessment system can not really fail to adapt to the needs of the new quality of productivity on the cultivation of innovative talents.

3.3 Lack of Industrial Synergy Mechanisms

Institutional deficiencies in the integration of industry and education are the root cause of the lagging curriculum. Firstly, there is a lack of a regular mechanism for industrial demand research, and colleges and universities rely mainly on teachers' personal experience to grasp technology development trends. Secondly, there is a lack of long-term mechanism for school-enterprise co-operation, and the participation of enterprises is insufficient. Furthermore, the participation of industry experts in the process of curriculum standard development is low, and the proportion of enterprise representatives in the teaching steering committee is insufficient. The deeper reasons are the lack of policy incentives and benefit-sharing mechanisms, enterprises' fear of leaking core technologies, and the mismatch between school teaching arrangements and enterprise project cycles, which leads to cooperation floating on the surface. In short, there are not many programmes for teachers and students to participate in the implementation of the project, and they only focus on the curriculum itself, without a good extension of the subject and curriculum expansion.

4. Main Pedagogical Reform Initiatives

4.1 Optimising Course Structure and Building Capacity for Teamwork

(1) To address the disconnect between traditional design education and emerging technologies, the curriculum structure must be optimised. Through the micro-courses of 'Intelligent Design + Human-Computer Interaction', students are guided to study in depth the application of cutting-edge technologies such as artificial intelligence, virtual reality and big data analysis in design, so that they can acquire a broad vision in a multi-disciplinary knowledge system, and cultivate composite talents to meet the requirements of the new quality of productive forces.

(2) Introducing teamwork projects to strengthen interdisciplinary teacher co-operation. Teachers of different disciplines are encouraged to co-design curricula and teaching activities. Through interdisciplinary teamwork, the traditional single-discipline teaching mode is broken down, and students are allowed to think about and solve problems in a diversified teaching and learning environment, so as to enhance the integration of interdisciplinary thinking.

4.2 Innovative Interdisciplinary Teaching Model Reform

(1) Integrate new quality design concepts and intelligent technologies according to the trend of the digital and intellectual future. Designing integrated teaching programmes, updating and expanding course content, introducing cutting-edge technologies such as artificial intelligence, data science and the Internet of Things, etc., and cultivating students' digital design capabilities and innovative thinking. For example, the 'Intelligent Design and User Experience' programme allows students to learn

how to apply intelligent technologies, such as smart hardware and interaction design, in the design process.

(2) Strengthening the practical aspects and improving students' application ability. Focus on the design of practical teaching sessions and increase the proportion of actual projects and practical tasks. Through simulation design projects, user experience testing and other activities, students can apply theoretical knowledge to real situations and improve their problem-solving ability.

(3) Innovative teaching methods using modern teaching techniques and tools. In order to adapt to the development of information technology, traditional teaching methods should be updated and modern teaching techniques and means should be adopted. Teacher training should be strengthened to enhance teachers' ability in new technologies and concepts so that they can provide students with the latest and most cutting-edge design concepts and technical guidance.

(4) Promote university-enterprise cooperation and achieve the deep integration of industry, academia and research. Strengthen the cooperation between schools and enterprises, jointly create a practical and cutting-edge curriculum system, jointly develop the curriculum and teaching content with enterprises in accordance with the industry trends, and set up forward-looking interdisciplinary courses, such as 'Intelligent Product Design', 'Artificial Intelligence and Human-Computer Interaction', 'Data-Driven Design', etc., to ensure that students can master professional knowledge in line with the needs of the industry. We have added forward-looking interdisciplinary courses, such as 'Intelligent Product Design', 'Artificial Intelligence and Human-Computer Interaction', 'Data-Driven Design', etc., to ensure that students can master professional knowledge in line with industry needs.

4.3 Micro-Course Resource Development, Construction and Evaluation System Design

(1) Design and development of micro-teaching resources for 'Intelligent Design + Human-Computer Interaction Technology'. The construction of teaching resources is the core part of this project. Teaching resources include: teaching video (micro-video) and extension resources (mainly including: micro-textbook, question bank, etc.). The development of teaching resources for 'micro-course' mainly includes: analysis of teaching content, analysis of teaching objects, teaching objectives and difficulties, preparation of teaching media, implementation of teaching process, evaluation of teaching effect, etc. Then the micro-course resources will be published online. The micro-course resources are then released on the online wisdom practice platform for students' online learning and credit hour recognition.

(2) Construct modular micro-course system. Based on the ability matrix analysis, deconstruct traditional courses into knowledge units and reorganise them into a series of micro-course modules. Each module focuses on a core competency, such as 'voice interaction design', 'emotional interface development', etc. Design a three-tier curriculum system: basic modules (mandatory), core modules (optional), and expansion modules (optional), forming a flexible learning path. Establish a dynamic updating mechanism, adjusting 20% of the module content every semester according to technological development and research feedback. Establish a dynamic updating mechanism, adjusting 20% of the module content every semester according to technological development and research feedback. For example, the module 'Generative AI-assisted Design' is added to respond to changes in the industry in a timely manner.

(3) Innovative evaluation system design and perfect quality assurance mechanism. When constructing the evaluation system of micro-courses, it is necessary to fully reflect the overall objectives of micro-course teaching, and the subject group draws on the evaluation methods of traditional courses and network courses, introduces enterprise evaluation standards, and designs a diversified evaluation system. At the same time, the education assessment mechanism is strengthened to regularly check the fit between the setting of disciplines and majors and the development of the industry, and make timely adjustments to ensure that the training of talents is always in line with the needs of the industry and the market. The research is mainly carried out according to the reform idea of 'theoretical sorting — resource development — teaching design — application exploration — summary and improvement', and the framework system

of the subject reform content is shown in the following figure.

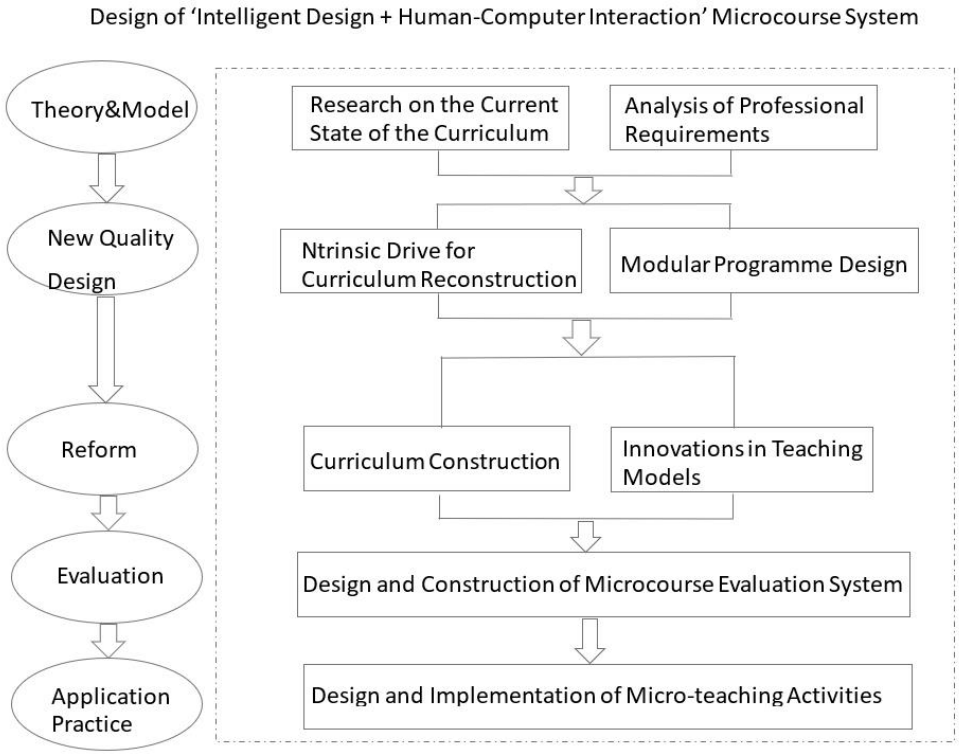

Figure 1. Reform Content Framework System Diagram

5. Summarize

Under the background of new quality design and digital future, this paper focuses on professional construction and applied talent training, introduces the latest technology means such as human-computer interaction technology and intelligent design, combines the latest AI technology and interaction design concepts, constructs a three-dimensional content system of 'technology stack + design flow + industrial surface', develops a series of micro-courses and breaks the traditional one-way teaching mode in teaching. We have developed a series of micro-courses to break the traditional one-way teaching mode and promote the in-depth interdisciplinary integration. From the perspective of 'Productivity Enhancement', we emphasise the cultivation of 'New Quality Design', especially for the future needs of the society for talents, cultivate compound talents with technical, creative and practical abilities, and promote the comprehensive upgrading of the education mode through the introduction of intelligent design and human-computer interaction related technologies, in order to provide the best education for the students. Through the introduction of intelligent design and human-computer interaction related technologies, it promotes the comprehensive upgrading of the education model, injects new momentum driven by technology into higher education, helps to modernise education, and provides reference and demonstration for the teaching reform of other disciplines.

Fund Project

This work was supported by research improvement project of Guangxi Higher Education Undergraduate Teaching Reform Project in 2025 "Design and practice of 'intelligent design + human-computer interaction' micro-courses driven by new quality productive forces".

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