

Interdisciplinary Competence Reconstruction for New Liberal Arts in Digital-Intelligent Era

Rong Cao, Yu Nan, Huibin You*, Guihong Qiao

School of Data and Target Engineering, Information Engineering University, Zhengzhou, China

Email: *zzuyhb@163.com

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Abstract

In the digital-intelligent era, traditional liberal arts education is undergoing profound paradigm changes. The integrated training of “technology + humanities” faces prominent problems such as superficial knowledge integration, fragmented competence system, and ambiguous value orientation. Based on the construction philosophy of new liberal arts, this paper constructs an “大-shaped” (Chinese character-inspired) integrated talent competence model and a dual-track curriculum system of L-BEST and AI-BEST, and conducts an empirical test taking the course Intelligent Text Processing as a case. Adhering to the student-centered concept and focusing on solving core problems, this research can provide theoretical reference and practical enlightenment for the transformation of traditional liberal arts majors.

Keywords

Digital-Intelligent Era, New Liberal Arts, Talent Training, Interdisciplinary Integration, Competence Reconstruction, Dual-Track Curriculum System

1. Introduction

In the digital-intelligent era, knowledge production has transformed into a data-driven mode, and information communication has upgraded to multi-dimensional interaction, putting forward fundamental transformation demands for the talent training of traditional liberal arts (Balmer, 2006; Ma, 2018). A number of national guiding documents have clarified the development direction of new liberal arts: the Declaration on the Construction of New Liberal Arts (2020) proposed promoting interdisciplinary integration of arts and science and reconstructing the curriculum system (Working Group on New Liberal Arts Construction of Ministry of Education, 2020); the Outline of Building a Powerful Country through Education (2024-2035) issued in 2025 clearly emphasized that artificial intelli-

gence should facilitate educational reform (CPC Central Committee & State Council, 2025); the Action Plan of “Artificial Intelligence + Education” released in 2026 required the offering of interdisciplinary integrated courses and the cultivation of interdisciplinary compound talents (Ministry of Education et al., 2026).

Academic circles have carried out diverse explorations on new liberal arts talent training. Lv (2021) proposed reconstructing the training framework for liberal arts talents; Song et al. (2025) explored the digital-intelligent transformation path of new liberal arts laboratories; H. T. Zhang et al. (2024) constructed an intelligence-oriented talent cultivation system of “Information Science +”; Huang et al. (2023) established the computational humanities system; H. Zhang and Gao (2025), and Y. H. Zhang and Gao (2025), analyzed the supporting role and practical dilemmas of artificial intelligence in new liberal arts construction.

Existing research presents a polarized shortcoming: macro research mostly focuses on conceptual guidance lacking implementable practical guidelines, while micro research is limited to a single course or major without forming a popularizable systematic framework, making it difficult to solve the problem of mere curriculum combination. From a meso perspective, guided by the student-centered philosophy, this paper focuses on three major “fault lines”, constructs an integrated model and a dual-track curriculum system, and conducts empirical research, so as to provide theoretical and practical support for the transformation of liberal arts education (Jia et al., 2025; Liu & Cheng, 2025; Xu & Wang, 2025; Xun et al., 2025).

2. The “Fault Line” Problems in Cultivating Compound New Liberal Arts Talents

The integrated training mode of “technology + humanities” still has obvious fault lines concentrated in three core dimensions of knowledge, competence and value, which have become the key bottleneck restricting the practice of new liberal arts construction (Liu, 2020; Song & Zhang, 2021; Wu, 2021; Zhang, 2023).

This section takes the teaching practice of computational communication and computational finance, two typical interdisciplinary liberal arts tracks in domestic universities, as practical evidence to elaborate the above problems (Huang & Xue, 2024).

2.1. Superficial Knowledge Integration: Separation between Humanities and Digital-Intelligent Knowledge

Most integrated training remains at the simple superposition of “humanities courses plus digital-intelligent courses” without in-depth knowledge integration. Traditional liberal arts courses focus on imparting classic humanities knowledge without integrating application scenarios of digital-intelligent technologies; digital-intelligent courses are mostly added sporadically, focusing on tool skills teaching without connecting with professional liberal arts knowledge and humanistic literacy.

This issue prevails in computational communication and computational finance programs nationwide. Courses are taught separately without in-depth integration, and technical contents are divorced from professional scenarios. This status runs counter to the requirements of interdisciplinary integration stated in the Declaration on the Construction of New Liberal Arts.

Such superficial integration makes it difficult for students to form a systematic knowledge system combining humanities and digital intelligence, failing to achieve the integration goal of “humanities + digital intelligence”.

2.2. Disconnected Competence Chain: Fragmented Training of Core Competencies

The dual-core competence training of “humanistic literacy + digital-intelligent literacy” required for compound liberal arts talents is fragmented, resulting in competence disconnection. The cultivation of humanistic literacy emphasizes basic text interpretation ability while ignoring humanistic insight and value judgment ability needed in the digital-intelligent era; the training of digital-intelligent literacy only offers basic tool application courses, lacking a complete competence chain of “acquisition—processing—structuring—modeling—application”.

Most colleges arrange computing courses only for senior students and lack progressive training. Students can master technical tools but struggle to translate professional demands into computable tasks, forming a fragmented competence system.

The lack of collaborative design between the two types of competence further aggravates disconnection, making students unable to adapt to the demands of the digital-intelligent era.

2.3. Ambiguous Value Orientation: Imbalance between Technical Tools and Humanistic Values

The practical community generally faces the value imbalance of “prioritizing technology over humanities”. Some universities overemphasize the mastery of digital-intelligent technical tools while neglecting the cultivation of humanistic spirit, leading students to the misunderstanding of valuing technology over humanistic value. Meanwhile, curriculum design lacks infiltration of humanistic values, and digital-intelligent teaching fails to integrate ethical norms.

Ethics and compliance courses are isolated from technical teaching. This phenomenon deviates from the ethical guidance requirements of the Action Plan of “Artificial Intelligence + Education”, leaving students unaware of technical application risks. Consequently, students lack thinking about application boundaries and social impacts when using digital-intelligent tools, violating the new liberal arts philosophy of “humanity as the core, technology as the application”.

Essentially, the three major fault lines reflect the disconnection between integrated training concepts and practice, and constitute the root cause of low talent training quality, which provides a realistic basis for subsequent model construction and curriculum design.

3. Construction of the 大-Shaped Competence Model for Compound New Liberal Arts Talents

Targeting the three major fault lines and adhering to the new liberal arts philosophy of “humanity as the core, technology as the application, and interdisciplinary integration”, this paper constructs an “大-shaped” (Chinese character-inspired) integrated talent competence model taking DIKWI as the core cognitive chain and humanistic & digital-intelligent literacy chains as dual supports (Varlotta, 2018; Wang & Ye, 2020; Ye & Cheng, 2022). The core positioning is to cultivate compound liberal arts talents who understand humanities, master technologies, excel at integration, and attach importance to values, laying a foundation for curriculum system design. The overall structure is shown in Figure 1.

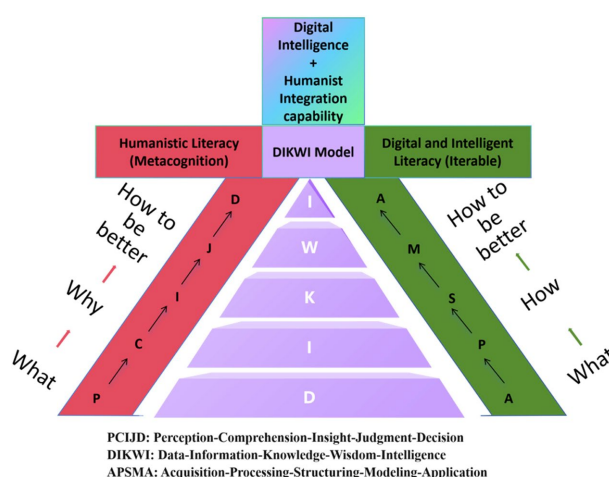


Figure 1. “大-shaped” (Chinese character-inspired) capability model.

3.1. Core Cognitive Chain: Data—Information—Knowledge—Wisdom—Intelligence (DIKWI)

As the central axis of the model, the core cognitive chain runs through the whole process of competence training, connects the two literacy chains, and promotes the progressive evolution from data to intelligence and the in-depth integration from technology to humanities. Each link is closely connected: data refers to meaningless original materials as the cognitive foundation; information is meaningful data after interpretation; knowledge is structured correlated cognition; wisdom is the value judgment ability based on knowledge; intelligence is the comprehensive ability to solve practical problems, ultimately realizing the goal of “intelligence serving humanity and humanity guiding intelligence”.

3.2. Humanistic Literacy Chain: Perception—Understanding—Insight—Judgment—Decision (PUIDJ)

As the left support of the model, the humanistic literacy chain is the soul of new liberal arts talent training and focuses on adhering to the essence of humanities to solve the disconnection of values and competence. Each link is deeply bound to

the core cognitive chain: perception is the sensitivity to capture original materials; understanding is screening and interpreting valuable information; insight is refining regular cognition; judgment is the decision-making ability centered on humanistic ethics; decision is formulating practical schemes combining humanities and technologies to implement concepts.

3.3. Digital-Intelligent Literacy Chain: Acquisition—Processing—Structuring—Modeling—Application (AP SMA)

As the right support of the model, the digital-intelligent literacy chain is the core carrier to adapt to the digital-intelligent era and solves the disconnection of knowledge and competence. Each link collaborates with the other two chains: acquisition refers to obtaining profession-related data; processing means screening valid information; structuring is transforming information into knowledge conforming to computer logic; modeling forms computable thinking to interpret humanistic problems; application realizes technology implementation combined with humanistic needs and human-machine collaboration.

3.4. Core Characteristics of the Model: Integration, Systematicness and Orientation

Distinguished from traditional models, this model has three core characteristics: first, integration, breaking the barrier between humanities and digital intelligence to realize in-depth integration of three chains; second, systematicness, covering cognition, humanities and digital intelligence to form a complete competence chain; third, orientation, taking humanistic value as the core, clarifying the boundary of technical application and highlighting the unique characteristics of new liberal arts. The model accurately targets the three major fault lines, conforms to the student-centered philosophy, and provides solid support for the construction of curriculum system.

4. Curriculum System Framework of Humanities and Intelligence Integration for New Liberal Arts

To transform the “大-shaped” (Chinese character-inspired) model into an implementable teaching system, this paper constructs a dual-track integration framework of L-BEST (Liberal Arts-Basic-Early-Core-Senior-Terminal) liberal arts professional courses and AI-BEST (Artificial Intelligence-Basic-Early-Core-Senior-Terminal) digital-intelligent enabling courses by referring to the DP4SET digital teaching framework and relevant practical experience (Huang et al., 2024; Ruan et al., 2012; Zhan & Ren, 2010), following the student-centered logic to realize in-depth integration of humanities and technologies.

DP4SET is a classic digital teaching framework that provides the overall hierarchical design logic for curriculum construction. L-BEST refers to the liberal arts professional course system divided into four progressive levels: Basic, Core, Senior and Terminal, which takes humanistic literacy as the core orientation. AI-BEST is

the matching digital-intelligent course system with the same four-level structure, focusing on the cultivation of digital and technical capabilities. The three frameworks are closely connected with the “大-shaped” competence model: DP4SET lays the methodological foundation for the hierarchical design of the whole curriculum; L-BEST corresponds to the humanistic literacy chain on the left side of the model, adhering to humanistic values and professional logic; AI-BEST matches the digital-intelligent literacy chain on the right side of the model and undertakes technical training. The dual-track courses centered on DP4SET jointly operate around the central DIKWI cognitive chain of the “大-shaped” model, ultimately realizing the deep integration of humanities and digital intelligence.

4.1. Implementation Path of Dual-System Integration

Centering on “professional guidance, technological empowerment and value implementation”, the dual-track system adopts four progressive steps applicable to various liberal arts majors with replicability and popularizability.

1) Professional Problem Driving: Guided by L-BEST courses, raise real professional problems of liberal arts, drive the application of digital-intelligent technologies based on professional demands, and adhere to the bottom line of humanistic ethics.

2) Digital-Intelligent Tool Empowerment: Relying on AI-BEST courses, match appropriate digital-intelligent tools, integrate technologies into humanities research scenarios, and practice the logic of “technology serving humanities”.

3) Human-Machine Collaborative Analysis: Adopt the tripartite collaboration mode of “teacher-student-AI”. Teachers control the humanistic orientation, students lead scheme design, and AI provides technical support, conforming to the student-centered philosophy.

4) Practical Achievement Output: Take professional projects as the carrier to form deliverable and evaluable practical achievements, build a closed loop of “theory-practice-value”, and meet the requirement of intelligent implementation in the core cognitive chain.

4.2. Hierarchical Correspondence of Dual Systems

Based on the “大-shaped” (Chinese character-inspired) model, the dual-track system progresses linearly along four levels of B-E-S-T with precise correspondence. Level B (Basic) completes professional initiation and technical entry; Level E (Core) realizes information screening and transformative integration; Level S (Senior) promotes mutual reinforcement between liberal arts judgment and digital-intelligent thinking; Level T (Terminal) forms a closed loop of “competence-curriculum-application”. The hierarchical correspondence and integration objectives are summarized in **Table 1**.

This framework is applicable to liberal arts majors such as Chinese Language and Literature and Public Administration. The L-BEST module can be fine-tuned according to major demands, while the AI-BEST module can be directly reused.

Class hour allocation suggestion: Level B accounts for 15% (classroom teaching + online autonomous learning), Level E accounts for 25% (theory + case practice), Level S and Level T each account for 30% (project-driven + practical teaching). In terms of teaching staff, build an interdisciplinary team composed of liberal arts teachers, digital-intelligent teachers and industry experts to bridge the gap between humanities and technologies.

Table 1. Hierarchical correspondence and integration objectives of L-best and AI-best curriculum system.

Level	L-BEST Liberal Arts Professional Courses (Humanistic Guidance)	AI-BEST Digital-Intelligent Courses (Technological Empowerment)	Corresponding Competence Model	Core Integration Objective
B Basic	Introduction to Liberal Arts, Humanistic Ethics and Regulations, Liberal Arts Research Methods	AI Introduction, Big Data Foundation, Data Ethics	Perception of humanistic literacy chain; Acquisition of digital-intelligent literacy chain	Establish cognitive correlation between AI and liberal arts, consolidate basic knowledge
E Core	Professional Information Collection and Organization, Professional Basic Analysis	Data Collection, Text Processing	Understanding of humanistic literacy chain; Processing of digital-intelligent literacy chain	Guide technology application with professional demands, realize information transformation
S Senior	Intelligent Humanities Analysis, Professional Strategic Judgment	Structural Processing, Model Construction Thinking	Insight of humanistic literacy chain; Structuring of digital-intelligent literacy chain	Strengthen human-machine collaboration, realize preliminary integration of humanities and intelligence
T Terminal	Professional Ethical Risk Control, Professional Project Practice	AI System Deployment, Data Security, Project Management	Decision of humanistic literacy chain; Application of digital-intelligent literacy chain	Achieve in-depth integration of humanities and intelligence, implement practical application

5. Teaching Practice of Humanities and Intelligence Integrated Curriculum: A Case of Intelligent Text Processing

This paper takes the S-level AI course *Intelligent Text Processing* as the empirical carrier. Renovated from *Natural Language Processing*, this course adds modules of linguistics and liberal arts business scenarios to adapt to the S-level goal of “strengthening human-machine collaboration and realizing preliminary integration of humanities and intelligence”, and fully practices the student-centered teaching paradigm (Yin et al., 2026).

5.1. Implementation Process of Integrated Curriculum Teaching

1) Pre-class: Pre-set business scenarios to lay a thinking foundation

Teachers select cases of solving liberal arts business with digital-intelligent technologies (ancient book sorting, public opinion analysis, etc.) and design guiding questions to optimize key teaching points. AI pushes simplified similar cases, background resources and guiding prompts to stimulate students' inquiry interest. Students watch learning resources and record doubts to lay a foundation for in-class thinking transformation without prior learning of digital-intelligent technologies.

2) In-class: Focus on thinking transformation to realize preliminary integration of humanities and intelligence

Business dismantling link: Teachers guide students to discuss the difficulties of manual processing and humanistic considerations, and then abstract liberal arts business into computable problems to complete the thinking transformation from humanities to digital intelligence.

Model selection link: Teachers guide students to screen NLP technical modules and explain core logic; AI provides Q&A and process demonstration to build the mode of “teacher guidance—student leadership—AI assistance”.

Practical operation link: Students lead the whole process in groups; teachers control the humanistic orientation and emphasize ethical norms to realize the integration of technology and humanities.

3) Post-class: Form a closed loop of review and reflection to strengthen integrated competence

AI pushes expanded cases, application guidelines and feedback questionnaires, and generates students' practical reports. Teachers answer questions and make reviews in the next class, guiding students to reflect and optimize. Students fill in feedback forms and analyze expanded cases, strengthening human-machine collaboration and humanities-intelligence integration competence through the closed loop of “question-thinking-feedback”.

5.2. Evaluation Indicators and Measurement Methods of Integration Effect

Combined with S-level objectives and the requirements of the “大-shaped” (Chinese character-inspired) model, this paper carries out process + summative evaluation from four dimensions, and compares the improvement amplitude with pre-class baseline data. All evaluation indicators are measured via a self-designed questionnaire, which draws on relevant mature scales for interdisciplinary talent training and digital humanities education. The questionnaire adopts a dichotomous scoring rule: each item is judged as “Qualified” or “Unqualified”. The qualified rate is calculated as the number of students with qualified responses divided by the total number of participants ($n = 52$). All assessments are independently completed by participating students, and the final statistical results are sorted and verified by the research team.

- Knowledge Integration Degree: Assessed by corresponding questionnaire items focusing on students' mastery of integrated humanities and digital-intelligent knowledge. A response is regarded as qualified if students can correctly associate NLP technologies with computational communication professional scenarios.
- Competence Connection Degree: Measured by questionnaire items about the full professional working logic. Qualified respondents are those who can complete the whole chain of business analysis, thinking transformation and technical implementation.
- Value Compatibility Degree: Evaluated via questionnaire items on humanistic orientation and ethical awareness. Students who can recognize potential ethical risks in technical application are judged as qualified.
- Practical Implementation Degree: Tested by questionnaire items concerning the combination of technologies and professional practice. Qualified standard refers to the ability to apply learned technologies to real computational communication work.

5.3. Empirical Results and Analysis

This empirical research selected 52 third-year undergraduate students majoring in computational communication via whole-class sampling. All participants had completed three prerequisite courses: Introduction to Communication, Python Programming and Deep Learning. The tested course Intelligent Text Processing lasted for 48 class hours, including 28 class hours of theoretical teaching and 20 class hours of practical training, delivered mainly offline. The baseline measurement was conducted one week before the course started. Process evaluation, summative evaluation and questionnaire survey were all implemented right after the last class of the course.

This paper selects 52 liberal arts students for empirical research, adopting triple tests of process evaluation, summative evaluation and post-class questionnaire. The questionnaire recovery rate and effective rate both reach 100%, with Cronbach's α reliability coefficient of 0.83 and qualified validity. The core data are shown in **Table 2**.

Result analysis is as follows: First, the knowledge integration dimension increases by 50 percentage points, effectively breaking the separation dilemma and conforming to the collaborative requirement of dual chains in the “大-shaped” (Chinese character-inspired) model. Second, the competence connection dimension rises by 59.6 percentage points, verifying the effectiveness of curriculum teaching logic and solving the problem of competence disconnection. Third, the value compatibility dimension improves by 26.9 percentage points, showing remarkable effect of humanistic ethics guidance and solving the dilemma of ambiguous value orientation. Fourth, the practical implementation dimension increases by 53.8 percentage points, confirming the curriculum orientation of “technology serving liberal arts” and achieving the core goal of Level S.

Table 2. Summary of empirical core data.

Evaluation Dimension	Pre-class Baseline	Post-class Situation	Improvement Amplitude ¹
Knowledge Integration Degree	38.5% can understand NLP technology combined with professional scenarios	88.5% can interpret technical application logic, 51.9% can extract text information proficiently	50 percentage points
Competence Connection Degree	26.9% can complete simple competence closed loop	86.5% can complete complete closed loop, 76.9% can adjust technical application methods	59.6 percentage points
Value Compatibility Degree	73.1% can pay attention to technological ethical issues	100% reflect humanistic orientation, 75% can investigate and eliminate ethical hidden dangers	26.9 percentage points
Practical Implementation Degree	30.8% can combine technology with professional practice	84.6% of practical achievements can be directly applied	53.8 percentage points

¹Improvement Amplitude = Post-class qualified rate – Pre-class baseline qualified rate (calculated based on the primary index of each dimension).

Overall, the empirical research verifies the integration effect of Level S in the dual-track curriculum system, improves students' humanities-intelligence integration ability and human-machine collaboration awareness, and effectively alleviates the three major fault lines. This empirical research has limitations: the sample size is only 52 students, covering only one S-level course without long-term follow-up. Future research can expand the sample size, cover more courses and carry out long-term research to optimize the integration path.

6. Conclusion

The core of new liberal arts talent training in the digital-intelligent era is to alleviate the three major fault lines and realize the organic integration of humanistic and digital-intelligent literacy. Guided by the student-centered philosophy and closely following the new liberal arts construction concept, this paper constructs the “大-shaped” (Chinese character-inspired) competence model and designs the L-BEST + AI-BEST dual-track curriculum system referring to relevant digital teaching frameworks, attempting to solve the disconnection between humanities and technologies and respond to national policy guidelines. Taking *Intelligent Text Processing* as the empirical carrier, this paper initially verifies the integration effect of the system at Level S. The model has practical value in alleviating the three major fault lines.

Based on research limitations and practical results, the construction of new liberal arts can refer to the research ideas in this paper, strengthen the depth of curriculum integration, promote the connection between theory and practice relying on training platforms, facilitate the transformation of teaching staff into inte-

grated talents, and adhere to the student-centered philosophy and ethical bottom line. The proposed talent training mode has certain universality, which can provide limited theoretical and practical reference for the transformation of liberal arts majors, and offer beneficial enlightenment for the high-quality development of liberal arts education and the in-depth integration of humanities and intelligence.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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