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Exploration of the Construction Model of Financial Professional Course System based on Knowledge Map

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Abstract

The current era of social development, industrial transformation, and knowledge renewal has established new requirements for talent cultivation, driving the upgrading and restructuring of education systems. In this context, the development of financial education curricula must closely align with the latest competency demands from specialized sectors like banking, securities, and insurance, enabling dynamic adjustments and refinements. To address this practical need, this study explores a knowledge graph-based continuous improvement model for financial education. Leveraging the inherent advantages of knowledge graph technology, this model accurately identifies core competencies required by the financial industry while intelligently and automatically matching them with existing course content in financial programs. Ultimately, we have established a curriculum optimization system that facilitates bidirectional evaluation and iterative refinement between "industry demand" and "educational outcomes."

Keywords

Knowledge Graph; Finance; Continuous Improvement.

1. Introduction

The advancement of next-generation AI technologies like knowledge graphs and deep learning is propelling "Internet + Education" into the era of "Smart Education". As the core driving force behind AI development, knowledge graphs provide new empowerment capabilities for teaching and learning in the Education Informatization 2.0 era. Knowledge graphs represent the evolution of symbolic research paradigms in the big data and AI era, serving as a crucial foundation for AI's transition from "perceptual intelligence" to "cognitive intelligence" [1]. Currently, many finance courses focus primarily on textbook theories rather than practical problem-solving skills. The financial industry evolves rapidly, with fintech innovations advancing at an unprecedented pace, while traditional teaching methods often fall short. Moreover, there is a notable lack of knowledge graph construction for core finance courses, and the application of deep learning technologies during this process remains insufficient, hindering the efficiency and intelligence level of knowledge graph development.

The financial sector's talent demands have evolved from basic course knowledge to a dual focus on "theory and industry expertise," particularly in emerging interdisciplinary fields like fintech and quantitative analysis, where traditional curricula fall short. Knowledge graphs provide a systematic modeling tool for financial education, effectively aligning course content with industry needs while establishing explicit, traceable mappings between "knowledge, skills, and roles." This approach drives the development of curriculum systems. Thus, leveraging financial knowledge graphs is pivotal to advancing curriculum development.

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2. Analysis of the Current Situation of the Financial Professional Curriculum System

2.1. Professional Features and Positioning

The finance discipline is a comprehensive field integrating theory, practice, and innovation. Its key characteristics include: (1)Interdisciplinarity. Modern finance has transcended traditional boundaries by synthesizing knowledge from economics, mathematics, statistics, and information technology, emphasizing the integration of quantitative analysis skills with macro-level perspectives. (2)Practicality and dynamism. The real-time evolution of financial markets and continuous innovation in financial products require financial education to stay aligned with market trends and industry demands. (3)Global vision. With deepening international financial cooperation, capital flows, exchange rate markets, and cross-border investments demand a global perspective, necessitating mastery of international rules (e.g., international settlements and cross-border regulation). The training objective of finance programs is to cultivate high-caliber professionals with interdisciplinary knowledge, a focus on empirical research and mathematical modeling, and capabilities in data analysis, risk assessment, and decision-making [2].

2.2. The Problems of the Continuous Improvement of the Curriculum System

2.2.1. Education Lags Behind Industry Changes

Emerging fields like fintech and big data applications are advancing rapidly. Technologies such as artificial intelligence and big data analytics have been deeply integrated into business scenarios including risk management and investment advisory. However, curriculum adjustments remain slow, still lingering within traditional financial frameworks. Moreover, courses tend to focus excessively on theoretical models, lacking in-depth integration with real market operations and insufficient incorporation of various modeling tools. This creates a disconnect between students' learning and the actual needs of enterprises.

2.2.2. The Evaluation of Course Effect is Single

The current evaluation system for course effectiveness and student competencies, as shown in Figure 1, primarily assesses students' theoretical mastery and practical performance, but lacks an industry-aligned framework. Students may excel academically yet lack resilience in uncertain environments.

2.2.3. The Teaching Resources are Scattered and the Interdisciplinary Integration is Insufficient

The financial knowledge system is complex and highly interdisciplinary, with modern financial issues often involving cross-disciplinary fields such as law, economics, and computer science. However, traditional curricula maintain rigid departmental boundaries, lacking systematic interdisciplinary course design. This makes it difficult for students to independently construct learning pathways and leaves teachers without targeted teaching resources [3].

2.2.4. Rigid Curriculum System

The traditional curriculum system has a long revision cycle, making it difficult to keep pace with the real-time changes in financial markets. The updating of course content is also relatively slow, and cutting-edge emerging knowledge and technologies are hard to integrate into teaching in a timely manner, resulting in a time lag between courses and practical applications.

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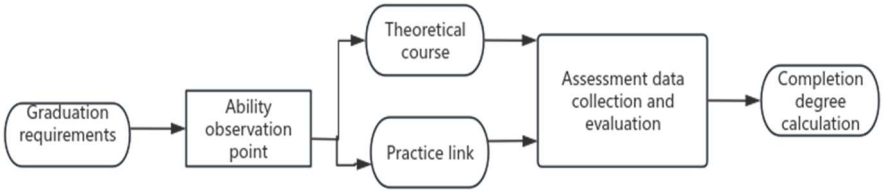

Figure 1. Achievement Evaluation Mechanism of "Curriculum System-Knowledge Points-Competency Observation Points-Graduation Requirements"

3. Curriculum System Construction based on Knowledge Map

To address the challenges in the current financial education curriculum system-including outdated objectives, monolithic assessments, fragmented resources, and rigid frameworks-this study proposes a knowledge graph-based continuous improvement model. Centered on the "competency-course-knowledge" framework, the model establishes a dynamic, visualized knowledge graph to align industry demands with pedagogical systems and facilitate ongoing optimization [4]. The specific methodology is outlined below.

3.1. Framework Design of Curriculum System based on Knowledge Map

The knowledge graph serves as the central hub in this model, with its framework comprising three key components as illustrated in Figure 2.

3.1.1. Data Layer

Integrate multi-source data, including corporate job postings, industry competency standards, policy reports, course syllabi, teaching materials, and student learning behaviors.

3.1.2. Map Layer

Create a multidimensional relationship map connecting 'competencies, knowledge points, courses, teaching resources, and job positions.' The competency nodes are derived from real-time industry-derived competency tags, the knowledge point nodes correspond to the theoretical and practical components of the courses, and the course nodes encompass all courses in the finance program.

3.1.3. Application Layer

It has the functions of dynamic adjustment of curriculum, personalized learning recommendation, teaching effect evaluation and so on.

3.2. The Specific Application of Knowledge Map in the Construction of Curriculum System

3.2.1. Dynamic Acquisition of Financial Industry Capability Demand

As shown in Figure 3, the system collects job descriptions from recruitment websites, industry reports, and policy documents. By employing natural language processing for entity recognition and relation extraction, it identifies key competency tags such as fintech, risk management, and blockchain applications, forming a competency tag repository. The knowledge graph, through a continuous update mechanism, ensures these tags remain synchronized with industry developments, providing real-time references for curriculum goal formulation.

3.2.2. Constructing the Mapping Map of Ability-Knowledge Point-Course

As shown in Figure 4, the competencies required by industry enterprises are mapped to key knowledge points in financial professional courses, enabling educators to prioritize and select key teaching elements. Furthermore, a quantifiable competency achievement evaluation model

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is established based on industry demands, allowing teachers to optimize teaching content more effectively.

3.2.3. Diagnosis and Optimization of Curriculum System

Knowledge graphs enable comprehensive diagnostics of existing curricula, as illustrated in Figure 5. Coverage analysis evaluates the integration of competency tags across courses to identify knowledge gaps, while overlap analysis detects redundant instruction of the same concepts. The cutting-edge assessment compares industry standards with course content to eliminate outdated material. Structural evaluation assesses curriculum coherence through network density analysis. Based on these diagnostic findings, administrators can dynamically adjust course offerings and sequencing.

3.2.4. Student Competency Profile and Personalized Learning Recommendation

As shown in Figure 6, competencies are developed through course knowledge points and related teaching components [5]. Based on students 'learning records and knowledge mastery, a personalized competency profile is generated. Tailored to each student's unique competency profile, the system recommends customized solutions including relevant courses, practical training projects, and internship positions.

3.2.5. Visualize Teaching Effectiveness

Provide teachers and administrators with visual dashboards for course achievement and competency alignment, as shown in Figure 7. These visualization tools serve as decision-making references for continuous course improvement, establishing an optimization mechanism of 'observation-evaluation-adjustment-reobservation'.

3.3. Key Technical Processes

(1)Atlas Construction and Storage.Store data in a graph database like Neo4j, which is naturally suited for storing and querying relational data with intuitive query statements [6].

(2) Update on schedule.Combined with the industry data and teaching feedback data, the map is updated automatically to form timeliness.

(3)Enable visualization.Open the map query and edit page to lower the usage threshold.

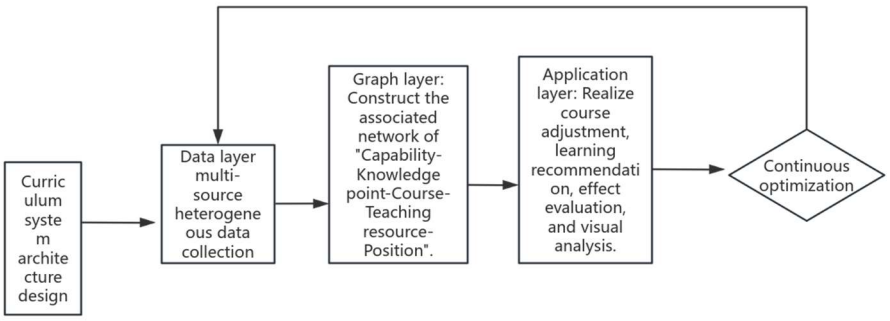

Figure 2. Knowledge Map Architecture

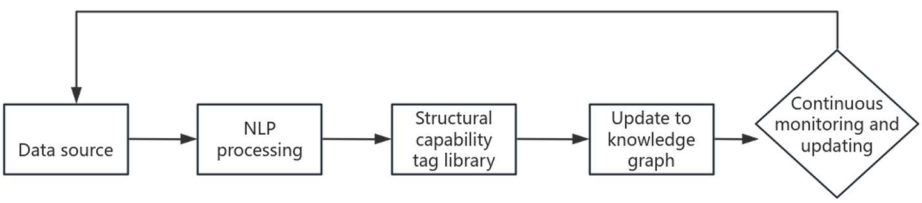

Figure 3. Label Extraction

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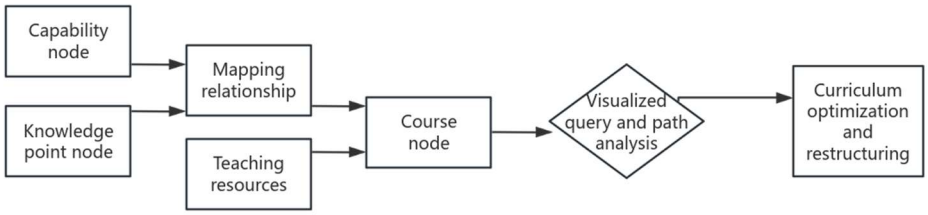

Figure 4. Mapping Diagram of "Competency-Knowledge Point-Course"

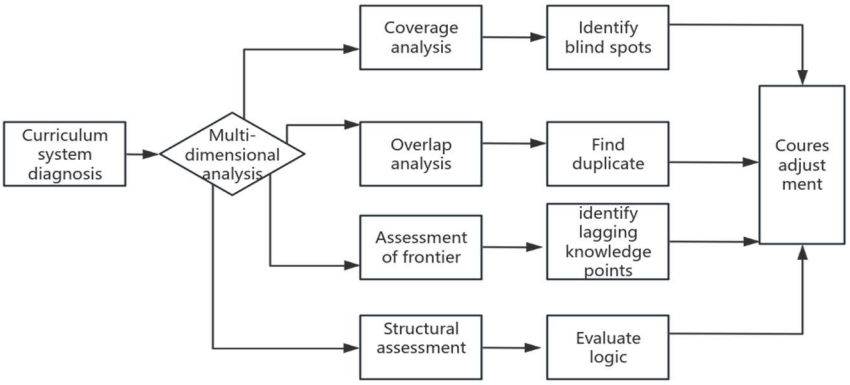

Figure 5. Diagnosis and Optimization of Curriculum System Based on Atlas

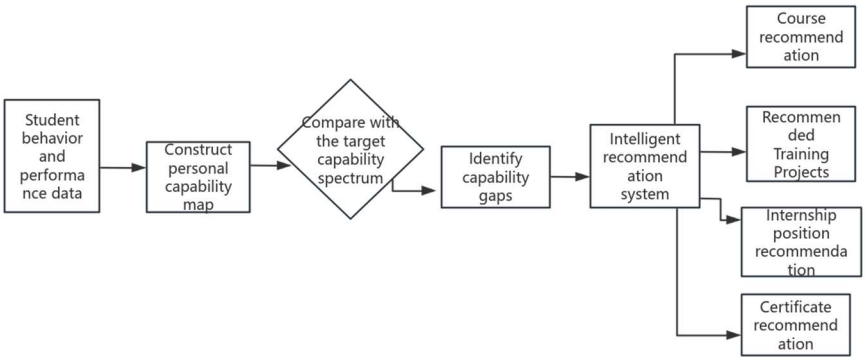

Figure 6. Student Competency Profile and Learning Path Recommendation

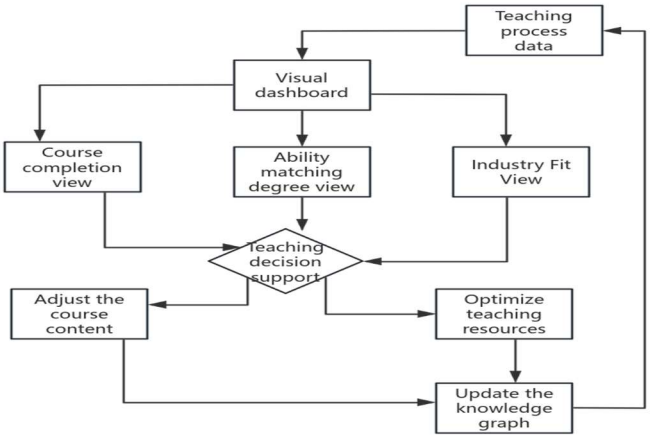

Figure 7. Visualization of Teaching Outcomes and Closed-loop Feedback Mechanism

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4. Conclusion

The knowledge graph-based curriculum framework for finance majors proposed in this study is not a rigid solution, but a dynamic system with evolving characteristics. Its core value lies in: leveraging a unified knowledge graph framework to precisely map and synchronize "industry demand data flows" with "educational process flows," fundamentally addressing issues like outdated methodologies, closed systems, and monolithic evaluation approaches in traditional curricula. The successful implementation of this model relies on two critical technological pillars: First, an efficient structured graph storage system that serves as a "digital neural network" in financial education, enabling the structuring, retrieval, and logical reasoning of complex knowledge relationships and competency frameworks. Second, a continuously updated intelligent graph mechanism that endows the system with dynamic growth capabilities, allowing it to promptly incorporate industry advancements and teaching feedback, thereby ensuring the timeliness and accuracy of its instructional guidance.

Acknowledgments

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