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Research on Entrepreneurship Course Knowledge Recommendation System Combining Knowledge Graph and Clustering Technology

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ABSTRACT

This research works on creating a hybrid Knowledge Recommendation System (KRS) for an Entrepreneurship Course using the Knowledge Graph (KG) and Clustering Technologies (CTs). The system aims at improving students' learning experience by providing relevant learning materials and even focusing on learner preferences. These results are already part of the student profiles and advanced learning paths modules that aim to adapt to a certain student's learning style, tastes, and level of mastery of the subject. Additionally, the system creates feedback paths to hammer the recommendation algorithm in constant improvement and evolution as well. Upon the conclusion of tests and discussion, the effectiveness and utility factors put in place in our proposed KRS are assured. Moreover, the quick and efficient responsiveness of the system to adapt to students' changing needs and peculiar demands for individual learning support further improves learning outcomes and the satisfaction level of the course participants.

KEYWORDS

Entrepreneurship Education, Knowledge Recommendation System, Knowledge Graph, Clustering Technology, Personalized Learning, Machine Learning Algorithms

INTRODUCTION

Entrepreneurship education has recently gained sufficient traction to encourage innovation, economic growth, and new job creation worldwide. Fast-evolving technological innovation, globalization, and market dynamics have been recognized as the best reasons for providing individuals with entrepreneurial skills and mindsets to thrive and succeed in a modern business environment (Audretsch & Keilbach, 2007). A direct outcome of this is that educational institutions and policymakers try to include entrepreneurship courses and programs in their curricula more and more (Oosterbeek et al., 2010).

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Classical methods of educational entrepreneurship often adhere to a structured curriculum, concentrating on theory, business planning, and management (Piperopoulos & Dimov, 2015). Although these basic principles are necessary, more interactive and experiential learning practices are crucial to enabling students to experience the many obstacles and opportunities faced by entrepreneurs (Vargas-Hernandez & Vargas-Gonzàlez, 2025).

As the number of entrepreneurship courses increases in college, some problems emerge in teaching those courses effectively and interactively to students. Entrepreneurship curricula often face the challenge of heterogeneity in terms of students' backgrounds, learning styles, and ambitions (Nielsen et al., 2025). Students may be uninterested in the regular teaching methods, as they may not personalize the teaching approach to every student's needs (Rasmussen et al., 2014).

In addition, the overload of information and the complexity of the entrepreneurship field can confuse students and make them unable to absorb and understand the relevant knowledge, which slows the learning process (Neergård & Roald, 2025). Therefore, these emerging trends in business environments require innovative educational technologies and tools that can tailor the learning process, facilitate knowledge gain, and improve entrepreneurial skills (Caliskan & Oldac, 2025).

The foremost objective of this research is to resolve the abovementioned problems by producing and assessing a knowledge recommendation system (KRS) specifically intended to be used in entrepreneurship education. The primary objectives of this study are:

- To develop a KRS designed explicitly for an entrepreneurship course.
- To integrate knowledge graph (KG) technology to represent and organize entrepreneurship-related knowledge efficiently.
- To incorporate clustering technology (CT) to group similar learning materials and enhance personalized recommendation capabilities.
- To analyze students' interactions with the KRS using machine learning (ML) algorithms and create user profiles for personalized learning experiences.

LITERATURE REVIEW

Entrepreneurship Education

Entrepreneurship education has recently come a long way because it influences economic development and job creation and, most importantly, creates an environment conducive to innovation (Bauman & Lucy, 2021). Entrepreneurship courses and programs are arranged to prepare people with the skills, knowledge, and attitudes needed to detect business opportunities, take calculated risks, and create value. These plans typically cover a spectrum of subjects, encompassing the areas of business planning, market scrutiny, financial management, and leadership development.

Research shows that efficient entrepreneurship education can improve entrepreneurial intentions and the self-efficacy of its students. Moreover, entrepreneurial ideas and practice at the educational level improve entrepreneurial activity and entrepreneurial startups postgraduation (Stephens, 2020). Variables, like heterogeneous student backgrounds and learning styles, call for innovative strategies during course delivery.

Recommendation Systems

Recommendation systems are accepted as indispensable elements in trading, entertainment, and education (Rasmussen et al., 2014). Algorithms and user data drive these systems to show recommendable products and content that are similar, corresponding, and relevant to personal preferences, behavior, and interactions (Pohlmann et al., 2025). In education, recommendation systems are essential to customizing learning activities and increasing student engagement and retention.

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