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Original Paper

The Application of Knowledge Graph in the Curriculum Construction of College English Course

Guohui Rao[1]

[1] School of Foreign Languages, Chengdu University of Information Technology, Chengdu, Sichuan 610225, China

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Abstract

In the era of rapid information technology development, curriculum construction in education faces new challenges and opportunities. Knowledge graph, a sophisticated semantic network, can effectively integrate and present knowledge in a highly structured manner, which offers a new perspective to teaching reform and curriculum construction. Applying knowledge graph to curriculum construction caters to the need for systematic knowledge integration and requirements of personalized learning, and provides convenient means for dynamic curriculum content update. However,The knowledge graph of the College English course (General English course) also has its own characteristics. Taking the course "College English 1" in the author's university as an example, it demonstrates the design case of the knowledge graph construction, like multi-module integrated design, association of listening, speaking, reading, writing, and translation skills, incorporation of cultural background. The case also covers the relevance of the knowledge points, managing and operational details of the knowledge graph. Applying knowledge graph to English curriculum construction is beneficial for English learning and teaching, but it is still in the exploratory stage and has some limitations, so it's necessary to fully explore its potential in future.

Keywords

Knowledge Graph, Curriculum Construction, College English Course

1. Introduction

With the rapid development of information technology , the field of education is undergoing profound changes. Every aspect of education, from teaching methodologies to learning experiences, is being redefined. As a core part of educational reform, curriculum construction also faces new challenges and opportunities. Knowledge graph, an emerging technology capable of effectively integrating and

presenting knowledge, is gradually infiltrating into the educational field. A knowledge graph is a semantic network that describes concepts, entities, and their relationships in the objective world in a structured way. This structured representation not only offers a clear-cut visualization of knowledge but also enables more efficient knowledge retrieval and utilization, providing a new perspective for curriculum construction and teaching reform. Therefore, applying knowledge graph to College English (General English course) curriculum construction has the potential to break the barriers of traditional English teaching models, which often focus on rote-learning and fragmented knowledge dissemination. Instead, it can foster a more holistic and interconnected learning environment and personalized learning path, thus inject new vitality into the reform of College English teaching.

2. Necessity of Integrating Knowledge Graph and Curriculum Construction

2.1 Need for Systematic Integration of Knowledge

In traditional courses, knowledge is often presented sequentially according to textbook chapters or teaching syllabuses. During the learning process, students tend to focus only on isolated knowledge points and overlook the internal connections among them. The knowledge graph can integrate these fragmented pieces of knowledge into a complete knowledge network, which allows students to perceive the overall knowledge structure and interconnections within a course. In addition, with the increasing trend of interdisciplinary integration, curriculum construction also needs to establish connections between the knowledge of this discipline and other disciplines, thus helping students build a comprehensive knowledge framework. Therefore, the knowledge graph can serve as an effective tool for the systematic integration of subject-related knowledge.

2.2 Requirements of Personalized Learning

Students vary significantly in their learning capabilities and progress. In course learning, some students may quickly understand the knowledge points, but other students may need more time to digest. The knowledge graph can provide personalized learning paths based on students' learning progress. For students who have mastered the knowledge points, the knowledge graph can guide them to conduct in-depth and extended learning, while for students with learning difficulties, the graph can provide more learning resources for basic consolidation. Moreover, different students have different learning preferences. The knowledge graph can combine various learning resources to meet the diverse needs of different learning styles, enabling students to select resources according to their inclinations.

2.3 Means for Dynamic Curriculum Content Update

knowledge changes continuously with the development of the times and the deepening of research. In curriculum construction, on the one hand, teachers need to integrate these new contents into the curriculum system in a timely manner. On the other hand, they also need to adjust teaching content in response to students' cognitive levels and feedback. The knowledge graph can easily add new knowledge nodes and relationships, ensuring that the curriculum content remains in sync with the development of the discipline and teaching requirements. Besides the update of knowledge content, the

associated teaching resources, such as textbooks, courseware, auxiliary assessment, etc. also need to be updated regularly. The knowledge graph enables efficient management and update of these resources, guaranteeing that both teachers and students have timely access to the latest teaching materials. Therefore, the knowledge graph can help teachers adjust the knowledge content and curriculum resources promptly to keep pace with the evolving times and the update of subject knowledge.

3. Characteristics of the Knowledge Graph of College English Course (General English Course)

In addition to the common characteristics of knowledge graphs such as visualization, relevance, personalization, and dynamics, the College English course (General English course) also has some of its own characteristics:

3.1 Multi-module Presentation of the Course Language Knowledge System

The College English is a compulsory general basic course for non-English major undergraduate students in China, mainly focusing on the acquisition and enhancement of basic English language knowledge. The knowledge graph of this course integrates the comprehensive course knowledge system, covering multiple modules such as vocabulary, grammar, listening, speaking, reading, translation, and writing. These modules are interrelated and jointly form an integrated English language knowledge system, like a closely woven net, enabling students to comprehensively understand and master English language. The progression is from basic vocabulary and grammar to advanced language skills and thinking abilities. This hierarchical structure helps to provide targeted learning paths based on students' different learning stages and levels, just like building a pyramid, to construct students' English language abilities layer by layer.

3.2 Association of Listening, Speaking, Reading, Writing, and Translation Skills

Based on the learning of basic English language knowledge, the College English (General English course) emphasizes the comprehensive cultivation of basic skills in listening, speaking, reading, writing, and translation. The knowledge graph can systematically interrelate these language skills. For example, in terms of listening skills, the graph can link the types of listening materials (such as dialogues, passages) with the language knowledge (such as vocabulary, grammar) involved therein and the corresponding oral expressions, as well as how to use these words and sentence patterns in reading and writing. When reading an article, students can learn the structures, expressions, and language styles of various articles, and this knowledge can be directly applied to translation and writing. At the same time, grammar knowledge is also closely related to vocabulary usage, sentence construction, and text coherence, thus achieving the overall linkage of English listening, speaking, reading, writing, and translation skills.

3.3 Incorporation of Cultural Background Knowledge

The College English (General English course) also attaches great importance to the cultivation of humanistic qualities and cross-cultural communication abilities. The knowledge graph of the College English course can well expand and integrate the cultural background knowledge of other countries

while presenting language knowledge points. For example, in combination with listening and reading materials, the knowledge graph can introduce Western festivals, higher education, literary and film works, and world-famous people. At the same time, it can also link these cultural contents with relevant language expressions, enabling learners to understand the close relationship between language and culture. This helps learners better understand the underlying meaning of works, and enhance students' humanistic qualities and cross-cultural communication abilities.

4. Design Case of the Knowledge Graph Construction for College English Course

Take the College English 1 course in the author's university as an example to demonstrate the application of the knowledge graph in College English curriculum construction.

4.1 Overview of the Course Knowledge Graph

"College English 1" is a compulsory general basic course offered to first-year non- English major undergraduate students in the first semester. It consists of two types of courses: comprehensive course and listening-speaking course. The knowledge graph of this course integrates the resources from two textbooks, namely "New Target College English Integrated Course Book 1" and "College English 1 Listening and Speaking". It has organized 9 teaching themes, 36 sub-themes, and 129 knowledge-point attributes. It has constructed 131 knowledge relationships, covering 92 knowledge points and incorporating 402 teaching resources.

4.2 Design of the Course Knowledge Graph

4.2.1 Multi-module Integrated Design

The course knowledge graph adopts a multi-module design method, covering aspects of listening, speaking, reading, writing, and translation. The comprehensive course is divided into four units according to different themes. The four units are College Life, Pleasure of reading, Effective Communication, and Growing Pains. Each unit is structured with five sections: Warm-up, Reading, Translation, Writing, and Project. The listening-speaking course is also divided into four units, namely, A New Journey, Love Makes a Family, Heroes around Us and College Life in the Digital Age. Each unit is designed with four sections: Warm-up, Pronunciation Skills, Listening Skills, and Further Study. Each section of both the comprehensive and listening-speaking courses is associated with several knowledge points and relevant resources, and corresponding exercises are provided under key knowledge points.

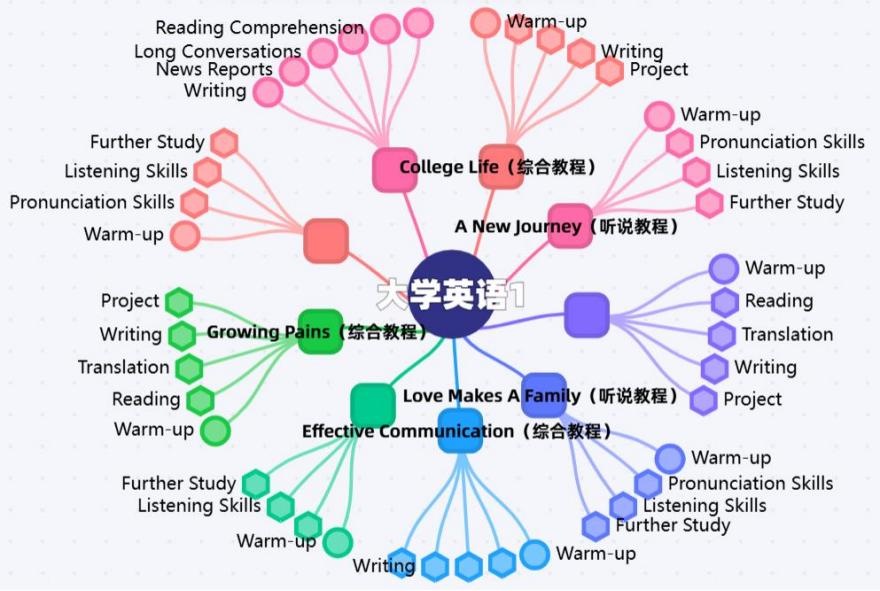

Figure 1. Modules of College English 1 Course knowledge Graph

4.2.2 Incorporation of Cultural Background

Besides language points, the course knowledge graph also incorporates diverse cultural information. For example, under the theme of the "College Life" unit, when the reading material mentions prestigious American universities, information about the "Ivy League" is supplemented. When "Fright Fest" is introduced, the cultural background and customs related to Halloween are added. When the American college entrance examination is mentioned in the listening material, details about the ACT (American College Test) and SAT (Scholastic Aptitude Test) are provided. Under the theme of "Effective communication" , the introduction of "Common Gestures in Different Countries" is included. When "untouchability" is mentioned in the reading material, the "Caste System in India" is explained. When talking about the hero a student admires in the oral material, "superheroes in Hollywood movies" are presented. When Shakespeare, Spenser, and Milton are mentioned in the reading and listening materials, their historical backgrounds and representative works are elaborated. This deep incorporation of course materials with cultural background not only enriches students' humanistic knowledge but also cultivates their global perspective and cross-cultural communication abilities.

4.2.3 Relevance of the Course Knowledge Graph

The following relationships are mainly defined within this course knowledge graph, forming an intricate knowledge connection network:

- **Part-Whole Relationship**: The relationship of inclusion and being included.
- **Dependency Relationship**: The formation of the previous knowledge depends on the subsequent knowledge, and the subsequent knowledge is a condition for learning the previous knowledge.

- **Progressive Relationship**: The subsequent knowledge represents a more advanced degree or broader scope compared to the previous one.
- **Symbiotic Relationship**: Two pieces of knowledge pertain to different aspects of the same theme.
- **Application Relationship**: The subsequent knowledge can be applied to the practical situation or used to solve problems of the previous knowledge.

4.3 Management and Operation of the Knowledge Graph

Once the teacher confirms and publishes the created or adjusted course version, the course can be launched. After creating a class and enrolling students, class management can be carried out. For a running class, information such as the number of students in the class, the average mastery degree of the class, the average progress of the class, and the running time can be viewed. Teachers can create different task types for different teaching scenarios: knowledge-point learning, resource-based learning, quizzes or exams, topic-related discussions and announcements. On the teaching observation page, teachers can monitor the overall class knowledge-point mastery and identify teaching key and difficult points. They can also conduct assessments based on students' learning situations. The detailed learning situation of each student can be examined on the detail pages. Teachers can view students' grades at the grade management section, adjust the "grade assessment standards" of their own classes, and export online grades. Additionally, the knowledge graph can be applied to classroom interactions, such as questionnaire, voting, quick-answer, sign-in, and roll-call. The platform is also equipped with an AI assistant to help teachers prepare lessons, set questions, collect students' learning data, and search for relevant resources.

Conclusion

Applying the knowledge graph to English curriculum construction can significantly contribute to the establishment of a more systematic and lucid English curriculum knowledge system. It enables students to effectively understand and master English knowledge points and their interrelationships across aspects of listening, speaking, reading, writing, and translation. Through visual presentation, it is convenient for students to plan different learning paths according to their own English proficiency and interests for personalized learning. English teachers can also dynamically adapt the curriculum knowledge content and learning resources in response to the changing times and students' learning feedback, thereby meeting the requirements of subject development and teaching needs. The incorporation of cultural background knowledge deepens students' understanding of the cultural connotations underlying the English language, fostering their cross-cultural communication awareness and global vision.

However, the application of knowledge graph in English curriculum construction is still in the exploratory stage. There are still certain limitations in knowledge construction, platform functions, and the depth of integration with teaching practice. In the future, it is necessary to further improve technical

means, enhance the quality of the knowledge graph, strengthen the close combination with teaching practice. In order to achieve higher-quality and more efficient English learning effect, the potential of knowledge graph in English curriculum construction should be fully explored.

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