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Research on the Construction of "Same Course with Different Structures" Curriculum Resources Based on Knowledge Graphs

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Abstract: This paper explores the construction methods of "Same Course with Different Structures" curriculum resources based on knowledge graphs and their applications in the field of education. By reviewing the theoretical foundations of knowledge graph technology, the "Same Course with Different Structures" teaching model, and curriculum resource construction, and integrating existing literature, the paper analyzes the methods for constructing curriculum resources using knowledge graphs. The research finds that knowledge graphs can effectively integrate multi-source data, support personalized teaching and precision education, and provide both a scientific foundation and technical support for the development of curriculum resources within the "Same Course with Different Structures" framework.

Keywords: Knowledge graph; Same Course with Different Structures; Resource construction

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1. Introduction

With the development of information technology and the advancement of educational reforms, modern education increasingly emphasizes personalization and diversification. Traditional teaching models often adopt a "one-size-fits-all" approach, making it difficult to meet the personalized needs of different students. To solve this problem, the education community has proposed the "Same Course with Different Structures" teaching mode, that is, the same course content is designed differently according to the different needs and characteristics of students to achieve individualized teaching. "Same Course with Different Structures" emphasizes the diversified implementation of the same course content in different teaching environments to better adapt to individual differences among students and promote their personalized development. However, how to effectively construct and implement the "Same Course with Different Structures" curriculum resources has become an important topic in current educational research. In recent years, artificial intelligence technology has achieved breakthroughs, mainly reflected in machine learning represented by deep learning and knowledge engineering represented by knowledge graphs [1]. As a

new artificial intelligence technology, knowledge graphs can enhance knowledge representation and bring new opportunities for personalized learning research [2]. Knowledge graphs can intuitively present scattered knowledge points in a graphical manner and form a rich knowledge network through the association of nodes and edges. This technology has gradually attracted attention and been applied in the field of education, especially showing great potential in curriculum resource construction and teaching method innovation. By constructing knowledge graphs, multi-source data can be integrated and associated to form a structured knowledge system, thereby supporting personalized teaching and precision education.

2. Significance of constructing "Same Course with Different Structures" teaching resources based on knowledge graphs

Applying knowledge graph technology to empower education and teaching is considered the basic and prerequisite work for the digital transformation of education [3]. In today's digital age, the field of education is undergoing profound changes, and educational informatization has become a powerful driving force for promoting educational innovation and development. The construction of "Same Course with Different Structures" teaching resources based on knowledge graphs is an inevitable trend in this wave, and its importance and inevitability are increasingly prominent. With the rapid development of information technology, the ways of obtaining and disseminating knowledge have undergone fundamental changes. Traditional teaching resources often have the characteristics of fragmentation and isolation, making it difficult to meet the increasingly diverse and personalized needs of learners. As a powerful knowledge organization and management tool, knowledge graphs can effectively integrate and associate various teaching resources, providing a solid foundation for "Same Course with Different Structures." "Same Course with Different Structures" itself emphasizes different teaching designs and implementation methods for the same course content by different teachers, aiming to stimulate teaching innovation and teachers' professional growth. However, to maximize the value of "Same Course with Different Structures," an efficient platform is needed to integrate and display these rich and diverse teaching ideas and practical results. Knowledge graphs, with their powerful semantic understanding and association capabilities, can clearly present the differences and commonalities among different teaching designs, helping teachers and learners to understand the diversity and flexibility of teaching more deeply. In addition, the development of educational informatization has driven education to pay more attention to student-centeredness, emphasizing personalized learning and independent exploration. The "Same Course with Different Structures" teaching resources based on knowledge graphs can push the most suitable teaching cases and learning paths for students according to their learning situations and interest preferences, truly achieving individualized teaching. Furthermore, from the perspective of sharing and dissemination of educational resources, knowledge graphs can break the limitations of region and time, enabling high-quality "Same Course with Different Structures" teaching resources to be shared and applied in a wider range, promoting educational equity and the overall improvement of educational quality.

In summary, the construction of "Same Course with Different Structures" teaching resources based on knowledge graphs is not only a positive response to the development of educational informatization but also an inevitable choice for improving educational quality and promoting educational innovation. It will bring new vitality and opportunities to the field of education and lead education toward a more intelligent, personalized, and efficient future.

3. Advantages of applying knowledge graphs to the development of "Same Course with Different Structures" teaching resources

In today's field of education, it is an important mission for educators to continuously explore innovative teaching methods and resource construction models to improve teaching quality and effectiveness. "Same Course with Different Structures," as an effective way to stimulate teachers' teaching creativity and promote teaching exchanges and improvements, combined with knowledge graphs, a powerful tool, has opened up new paths for the construction of teaching resources. As a structured knowledge representation method, knowledge graphs can clearly show the associations and hierarchical structures among knowledge. Applying it to the construction of "Same Course with Different Structures" teaching resources has many significant advantages.

Firstly, it can comprehensively and systematically integrate the "Same Course with Different Structures" teaching resources of different teachers, covering teaching designs, teaching methods, teaching cases, teaching reflections, etc., and construct them into an organic whole, which greatly facilitates comprehensive comparison and in-depth analysis. Secondly, knowledge graphs can clearly present the internal connections among various knowledge points and the corresponding associations between teaching methods and knowledge points, which is of great benefit to teachers and students in deeply understanding the structure and internal logic of knowledge and can effectively improve the efficiency of teaching and learning. Thirdly, based on students' learning characteristics and personalized needs, knowledge graphs can accurately recommend suitable "Same Course with Different Structures" resources and customize personalized learning paths to fully meet the differences in learning styles and learning progress requirements of different students.

At the same time, with the help of knowledge graphs, it is possible to intuitively compare the teaching methods and strategies of different teachers in the same course, facilitating teachers to learn from each other and absorb strengths, thereby optimizing their own teaching plans and vigorously promoting the innovation and improvement of teaching methods.

In addition, users can quickly retrieve the required specific teaching resources by relying on knowledge graphs and accurately locate specific knowledge points, teaching links, or teaching cases, thus saving time and energy. Knowledge graphs also facilitate the timely update and supplementation of new teaching contents, teaching methods, and related research results, ensuring that the "Same Course with Different Structures" resources always keep up with the times and continue to expand and enrich. It presents complex teaching resources and their interrelationships in a graphical and intuitive way, making the information clearer and helping teachers and students quickly grasp the overall structure and key points. More importantly, knowledge graphs provide teachers with a powerful tool for comprehensively examining the teaching process, helping teachers deeply reflect on the advantages and disadvantages of teaching and continuously improve teaching quality.

Finally, knowledge graphs are conducive to the long-term accumulation and proper preservation of high-quality "Same Course with Different Structures" teaching resources, promoting the sharing and inheritance of these resources among different regions and schools, and playing a positive role in promoting educational equity and the widespread popularization of high-quality educational resources.

4. Construction of "Same Course with Different Structures" teaching resources based on knowledge graphs

Firstly, knowledge graphs can systematically integrate various teaching elements in "Same Course with Different Structures." The rich and diverse resources such as teaching designs, teaching methods, and teaching cases of different teachers for the same course can be organized and classified in an orderly manner through

knowledge graphs. This enables learners and educators to find, compare, and analyze different teaching ideas and strategies more conveniently, thereby deeply understanding the core points of the course and various teaching possibilities.

4.1. Integration and visual presentation of teaching resources

Firstly, knowledge graphs will classify and label the collected various teaching elements. This includes detailed classification of elements such as teaching designs, teaching methods, teaching cases, teaching questions, and classroom interactions of different teachers, and assigning specific labels for subsequent identification and association. Through semantic analysis technology, they extract the key information and core concepts in these teaching elements. For example, extract teaching objectives, key and difficult points from teaching designs; summarize the characteristics and applicable scenarios of different methods such as lecturing, discussion, and practice from teaching methods; utilize the association ability of knowledge graphs to establish connections among these teaching elements. For example, connecting specific teaching methods with corresponding teaching objectives and teaching effects can show the differences in the effects of different teaching methods in achieving specific teaching objectives. Furthermore, the graphical display method of knowledge graphs intuitively presents the hierarchical structures and logical relationships among various teaching elements, which clearly presents complex teaching elements in an easy-to-understand way, facilitating observation and analysis by educators and learners. In addition, knowledge graphs can also integrate teaching elements from different sources and in various formats. Whether it is a teaching design document in text form or a teaching record in video form, they can all be incorporated into a unified knowledge system. By continuously updating and improving knowledge graphs and incorporating new "Same Course with Different Structures" teaching cases and teaching elements, it can always maintain a comprehensive reflection and effective integration of teaching practice. Knowledge graphs, by means of their powerful classification, association, and visualization capabilities, can systematically and efficiently integrate various teaching elements in "Same Course with Different Structures" and provide powerful support for teaching research and practice.

Secondly, with the help of the visualization characteristics of knowledge graphs, the knowledge dissemination paths and the evolution processes of teaching methods in "Same Course with Different Structures" can be intuitively presented. Teachers can clearly see the differences in the effects of different teaching strategies in the process of knowledge transfer, so as to better reflect on and improve their own teaching methods. Students can also understand the course content from multiple perspectives, broaden their thinking horizons, and cultivate their innovation ability and critical thinking. The following are several ways to intuitively present the knowledge dissemination paths and teaching methods in "Same Course with Different Structures" with the help of the visualization characteristics of knowledge graphs: (1) Using nodes and connections: Different teaching elements (such as knowledge points, teaching links, teaching activities, etc.) are set as nodes and connections are used to represent the relationships and sequences among them. For example, starting from the node of the course introduction link, it clearly points to the nodes of the explanations of various knowledge points through connections, and then connects to the nodes of practice and consolidation, summary and induction, etc., forming a complete knowledge dissemination path. (2) Using colors and icons: Specific colors or icons are assigned to different teaching methods. For example, blue is used to represent the lecturing method, yellow represents the group discussion method, and green represents the practical operation method, etc. In this way, in the knowledge graph, the teaching methods used in different teaching links and their distributions and changes in the entire teaching process can be seen at a glance. (3) Displaying in layers:

The knowledge graph is divided into layers according to different stages of the teaching process, such as preview, new teaching, and review. Each layer shows the knowledge dissemination path and the teaching methods adopted in that stage, making the structural hierarchy of the entire teaching process clearly visible. (4) Marking key nodes and important links: Key knowledge points in knowledge dissemination or important steps in teaching methods are highlighted by thickening lines, enlarging nodes, adding special marks, etc. to attract attention. (5) Displaying knowledge points dynamically: Animation or interactive functions are used to simulate the knowledge dissemination process and the application sequence of teaching methods, allowing users to feel the progress and changes of teaching more vividly. (6) Adding annotations and explanations: Text annotations and explanations are added on the relevant nodes and connections of the knowledge graph to explain the functions, purposes, and associations of each teaching element with other elements, helping users better understand the teaching design ideas. Through the above multiple ways, knowledge graphs can comprehensively present the knowledge dissemination paths and teaching methods in "Same Course with Different Structures" in an intuitive, clear, and easy-to-understand visual form, providing powerful support and inspiration for teaching research and practice.

4.2. Construction methods of teaching resources

Constructing "Same Course with Different Structures" teaching resources based on knowledge graphs requires carrying out multiple steps in sequence. Firstly, clarifying the construction purpose, such as helping teachers improve teaching, students' autonomous learning, or teaching research, and determine the disciplines, course contents, and teaching stages to be covered. Then, widely collecting relevant data, such as teaching designs, courseware, classroom records, reflections, and student feedback of different teachers, as well as textbooks, reference materials, and academic achievements. Then, it is necessary to clean and sort the data, remove duplicate, invalid, or incorrect information, and standardize and normalize it to unify the format and terms. Key knowledge elements such as knowledge points and teaching objectives are extracted from the preprocessed data and accurately defined and described. Based on the extracted elements, the model structure of the knowledge graph is constructed, determining the types of nodes and relationships. Associations among knowledge elements are established to form a network, such as connecting teaching methods with knowledge points and teaching objectives, and associating the teaching designs of different teachers with course contents. The knowledge from different data sources is integrated, eliminating conflicts and contradictions to ensure accuracy and completeness. Appropriate tools and technologies are used to transform the associated and integrated knowledge into a visual knowledge graph. Subsequently, quality assessment is conducted on the constructed graph, inviting experts, teachers, and students to try it out, give feedback, and check its accuracy, completeness, consistency, and usability. Finally, the knowledge graph is optimized and updated according to the assessment results and actual needs, continuously improving the teaching resources. Based on the above methods, a relatively complete and practical "Same Course with Different Structures" teaching resource based on knowledge graphs can be constructed.

4.3. Application mechanisms of teaching resources

To give full play to the role of "Same Course with Different Structures" teaching resources based on knowledge graphs, a series of application mechanisms need to be constructed. For example, the teacher training mechanism: carrying out training on the use methods of knowledge graphs and "Same Course with Different Structures" seminar activities to improve teachers' understanding and application abilities of diversified teaching methods; the teaching design guidance mechanism can provide teachers with teaching design templates and examples based on knowledge graphs, and guide teachers to carry out innovative designs according to their own

characteristics and students' needs. A special teaching design consultation service is set up, and teachers can get help and suggestions at any time when encountering problems in the design process; for the teaching evaluation and feedback mechanism, a teaching evaluation index system based on knowledge graphs is established to comprehensively and objectively evaluate teachers' teaching effects. Students are encouraged to give feedback on the "Same Course with Different Structures" teaching, collect opinions, and feed them back to teachers in time so that they can improve teaching; the resource sharing and exchange mechanism is also important, an online platform is built to facilitate teachers to share the "Same Course with Different Structures" teaching experiences and resources based on knowledge graphs. Inter-school teaching resource exchange activities are organized to promote cooperation and common development among different schools; according to students' learning situations and characteristics, knowledge graphs are used to recommend suitable "Same Course with Different Structures" teaching resources for them to meet personalized learning needs; it is also important to regularly update the teaching resources in the knowledge graph to ensure that they keep pace with the latest developments in education and teaching. A special person responsible for maintaining the knowledge graph is assigned to ensure its normal operation and the accuracy of data.

5. Conclusion

In conclusion, future research should continue to deepen the exploration of the "Same Course with Different Structures" teaching mode based on knowledge graphs. Continuously optimizing and improving relevant technologies and methods can better serve educational teaching practice and promote the development of the education cause, and further apply the results to practice to promote the development and progress of the education cause.

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Disclosure statement

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