Education, Language and Sociology Research
ISSN 2690-3644 (Print) ISSN 2690-3652 (Online)
Vol. 7, No. 1, 2026
www.scholink.org/ojs/index.php/elsr

Original Paper

Construction and Application of Knowledge Graph-Empowered POA Teaching Model

Ju Liu[1]

[1] Chongqing College of Mobile Communication, Hechuan, Chongqing, China

Received: January 14, 2026 Accepted: January 27, 2026 Online Published: February 6, 2026

doi:10.22158/elsr.v7n1p77 URL: http://dx.doi.org/10.22158/elsr.v7n1p77

Abstract

The digital transformation of education, propelled by technologies like AI and big data, has led to a proliferation of online learning platforms. However, abundant digital resources has arouse the challenges of low learning engagement and insufficient personalized learning. To address the challenges, this study proposes the construction and application of knowledge graph empowered POA (Production-Oriented Approach) teaching model to provide personalized learning for English listening course. By constructing knowledge graph empowered POA teaching model and and apply it into empirical study, it is to provide students with knowledge they need and optimize their personalized learning paths so as to ensure their learning engagement. Specifically, in this study, knowledge graph about English numbers in listening teaching is constructed, by implementing POA model embedded in UMOOCs and Chaoxing Xue Xitong, learning data are collected in pre-class, in-class, and post-class activities. Relying on the collection and analysis of dynamic data, students' learning profiles are generated to reflect their learning status and ability levels. In the knowledge graph-empowered POA teaching model, students can personalize their learning according to their status by choosing the knowledge they need, thus improving learning engagement. This approach optimizes the allocation of teaching resources, drives personalized learning, and effectively improves teaching quality.

Keywords

Knowledge Graph, POA,Construction, Application, Personalized Learning

1. Introduction

Knowledge graph, a structured and semantic knowledge representation method, provide a revolutionary tool to solve the challenges of precise diagnosis and path planning by revealing intrinsic relationships between knowledge elements. Some domestic universities and institutions have conducted research on the design and application of course knowledge graphs and personalized learning. However, few studies

have integrated knowledge graph into POA (Production-Oriented Approach) teaching model to promote personalized learning in English courses. Foreign language knowledge graph encompasses knowledge system defined by the subject's teaching syllabus and the reference materials required during the teaching process. It can effectively integrate knowledge, accurately analyze learning conditions, and formulate personalized learning paths. With the rapid advancement of language intelligence, constructing an in-depth, precise, and professional foreign language knowledge graph can not only enhance the accuracy of learning recommendations but also provide learners with intuitive support for knowledge construction and feedback regulation, thereby promoting personalized learning. This study aims to explore the construction and application of knowledge graph empowered POA teaching model so as to facilitate personalized learning for English courses, thereby promoting the transformation of education from a product production model to a learner-centered customized model.

2. Literature Review

2.1 Production-Oriented Approach (POA)

POA, a foreign language teaching theory established by Professor Wen Qiufang, has both local characteristics and international perspective. The theory emphasizes output as the starting point and the goal. It not only attaches importance to the input learning of language, but also highlights its productive application (Wen Qiufang, 2017). POA is mainly composed of three parts: teaching philosophy, teaching assumptions and teaching processes. Since the theory was put forward, empirical research related to POA has become increasingly abundant. In terms of teaching effectiveness, Zhang Wenjuan (2016) and Qiu Lin (2017) confirmed that POA model can effectively improve students' oral English fluency, writing logic, learning motivation and autonomous learning ability through teaching experiment and case studies. In terms of application in different courses and skills, POA has been widely used in academic English writing, oral communication, translation, business English and other courses. Studies have shown that the "task-driven" and "input-facilitated" of POA can effectively target different courses. In terms of teacher development, POA puts forward higher requirements for teachers, requiring teachers to change from knowledge imparters to learning designer and organizer. In terms of integration research, scholars have begun to explore how to use online platforms, corpora, knowledge graph and artificial intelligence to empower POA. For example, using knowledge graph to provide a more realistic and rich context for motivating, or to recommend personalized and precise input material for enabling, integration research represents an important direction for the future development of POA.

2.2 Knowledge Graph

Knowledge graph originated from the Semantic Web and was pushed mainstream by Google in 2012. It is a technical method that uses graph models to describe knowledge and model the interrelationships among all things in the world. It possesses three key characteristics: visualization, structured organization and semantic enrichment. Composed of a series of knowledge units, each unit not only includes the content of the knowledge but also encompasses related learning resources and learning activities, thereby

meeting the personalized learning needs of learners. Knowledge graph realizes the precision of teaching intervention and personalization of learning paths by structuring knowledge system and digitizing cognitive state of learners. Fan Jiarong and Zhong Shaochun (2022) proposed that knowledge graph can promote students' deep learning and personalized learning, help cultivate students' interdisciplinary vision, and enhance students' problem-solving ability. Based on learner model and cognitive diagnosis results, the system can automatically calculate and recommend optimal learning path from the current knowledge state to the target ability on knowledge graph. When students encounter difficulties at a certain node on the path, the system can dynamically go back to the advanced knowledge point for remediation, or provide an alternative learning path, and truly realize teaching according to knowledge. Yang Wenxia et al. (2023) confirmed the effectiveness of knowledge graph in promoting students' personalized learning by building and applying knowledge graph for smart education in Linear Algebra courses. With Self-determination Theory, Liu Fengjuan et al. (2022) built a personalized learning and support mechanism based on knowledge graph and proposed that knowledge graph have strong expressive capabilities, which can not only establish non-linear semantic connections between different knowledge points, but also solve personalized learning support problems such as recommendation, monitoring, evaluation, and feedback in online learning. Fu Gangshan and Wang Qianhua (2014) proposed that there is a direct relationship between online learning behavior and learning performance, and learning behavior sequence, as an important learning data, has been used for personalized learning path recommendation. Shi Yafei, Peng Hongchao, Tong Mingwen (2019) proposed that the learning portrait model can show learner's online learning process and better serve precise and personalized learning by recording data such as learning behavior and learning trajectory.

2.3 Personalized Learning

Traditional foreign language teaching models often face the challenge of a one-size-fits-all approach due to a large number of students and significant proficiency disparities. Such approach struggles to meet the diverse needs, learning styles, and paces of individual learners, leading to phenomena like high scores but low practical ability. Personalized learning, an educational philosophy and practice, centers on acknowledging and respecting students' differences. Through systematic design, it provides each learner with the most suitable learning path, resources, and support for their development, thereby maximizing teaching efficiency. The theory of personalized learning emphasizes guidance tailored to learners' unique characteristics, which can be traced back to Confucius's teaching according to individual aptitude and Socrates's midwifery method. In the early 20th century, John Dewey (1916) systematically proposed the child-centered approach and learning by doing in Democracy and Education, placing learners' experience and interest at the core of the educational process and providing a solid philosophical foundation for modern personalized learning. Vygotsky's Zone of Proximal Development theory (Vygotsky, 1978) indicates that instruction should occur between a student's current level and their potential level, offering a crucial operational concept for personalized learning. Gardner's Theory of Multiple Intelligence (Gardner, 1983) challenged the notion of a single intelligence, highlighting that students possess diverse

intellectual strengths and that teaching should diversify accordingly. Tomlinson's differentiated instruction (Tomlinson, 1999) emerged as a pioneering approach for implementing personalized learning in classrooms, emphasizing teachers' targeted adjustments to content, process, products, and learning environments.

The rise of smart education marks a new phase in educational informationization, shifting the focus to learners and making personalized learning in large scale available. Under such circumstances, data is clearly shown throughout teaching process, shifting teaching from uniform delivery to precision-tailored provision. Learners are granted full autonomy, enabling them not only to control the learning pace but also to select the most suitable paths and content from diverse learning contexts based on their interest and preference. This transformation aims to return the learning initiative to students, empowering them to become true masters of their own learning and maximizing learning effectiveness. The fundamental purpose of personalized learning lies in cultivating lifelong learners who can adapt to and shape future society. Empowered by knowledge graph, personalized learning seeks to fully stimulate learners' initiative, strengthen their acute awareness of personal learning needs and precise judgment of knowledge capabilities, thereby guiding them toward genuine, comprehensive self-development.

3. Research Design

3.1 Research Method

Questionnaire and in-depth interview are adopted in this paper to collect qualitative data on students' and teachers' experience and attitudes towards KG-POA teaching model in Chongqing College of Mobile Communication. In the questionnaire, Likert Scale was used to investigate students' learning satisfaction, self-efficacy, learning interest and psychological feelings, and teachers' feedback about using KG-POA teaching model. In the interview, 25 students and 10 teachers will be asked questions so as to deeply understand their experience, difficulties encountered and achievement gained.

3.2 Data Collection

Participants in the research are 265 English major freshmen who have English Listening class in Chongqing College of Mobile Communication and ten English teachers who use knowledge graph in teaching. The questionnaire is produced through questionnaire star distributed through QQ. The questionnaire is filled in anonymously and does not involve personal privacy issues. After preliminary sorting and checking, as for the students' questionnaire, 13 invalid questionnaires were deleted, and 252 valid questionnaires were obtained, then the data were analyzed in detail. Among the survey samples, 29 students were male and 223 students were female. As for the teachers' questionnaire, 10 valid questionnaires were obtained and the data were analyzed in detail. Besides, interview method is added in which both teachers and students are asked certain questions so as to deeply understand their experience, difficulties encountered and achievement gained. To sum up, this paper uses questionnaire and interview to provide valuable data and reveals students' and teachers' experience and attitudes toward KG-POA teaching model in a comprehensive way, so as to provide references for future research.

3.3 Teaching Design

English listening teaching team in Chongqing College of Mobile Communication put forward KG-POA model, that is POA teaching model embedded in UMOOCs and Xuexitong in which knowledge graph is used to ensure students' personalized learning. In this paper, knowledge graph about English numbers in listening teaching is specifically emphasized so as to get a profound research result. To be more specific, before class, in the motivating and diagnosing part, initial data about students understanding of English numbers will be generated, teachers release preview tasks online, and students use learning resources to learn independently and complete pre-class self-tests. During this process, knowledge graph intelligently generates primary portraits of learners, and teachers conclude key and difficult knowledge based on the primary images of students to formulate offline teaching plans. During in-class enabling section, teachers explain new knowledge, organize classroom learning, answer questions and solve doubts, and students listen carefully, discuss in groups, listen to teachers' feedback and conduct inter-group evaluations. Knowledge graph will accurately feedback students' learning situation based on real-time data and intelligently generates intermediate portraits of learners with which teachers adjust teaching in time so as to meet personalized learning needs. As for after-class evaluation, teachers recommend personalized after-class homework according to students' intermediate portraits and expand learning resources on Xue Xitong. Students complete after-class homework, correct wrong answers and choose learning resources from Xue Xitong according to their learning status. Knowledge graph provides personalized learning paths and intelligently generates advanced portraits of learners, while teachers conduct one-to-one communication with students based on advanced portraits of students as as to provide personalized tutoring.

3.4 Results and Discussion

3.4.1 Analysis of Students' Attitudes towards KG-POA Teaching Model

Survey data indicate that students provided positive feedback on the three phases of the KG-POA teaching model. In the motivating phase, 78.12% students agree or strongly agree that KG-POA model can provide them with clear learning task objectives, with an average score of 4.3 points; 71.34% students agree or strongly agree that KG-POA model can stimulate their learning interest, with an average score of 4.1 points; 65.45% students think the tasks in KG-POA model well-suited to their proficiency level, with an average score of 3.9 points, and it is shown that students with stronger English foundations report higher satisfaction. In the enabling phase, 81.76% students think in-class activities and pre-class tasks are coherent and well-connected, with an average score of 4.5 points. 72.76% students state that they can effectively apply pre-class learning in collaborative settings, that is to say knowledge application in group collaboration is effective. In the assessing phase, 71.54% students agree that teacher feedback can accurately identify their learning issues, and feedback precision receives an average score of 4.1 points. 82.97% students think the improvement recommendations given by knowledge graph helpful, and it is largely due to the dynamic diagnosis of students' cognitive states and real-time adjustment of learning paths enabled by the knowledge graph.

3.4.2 Analysis of Students' Experience towards KG-POA Teaching Model

Regarding the comprehensibility of the learning profile, 66.36% students agree that KG-POA model helps them understand how much knowledge they have mastered clearly, and 65.45% students report that learning path suggested by knowledge graph made their learning more goal-oriented. 71.69% students indicate that KG-POA teaching model save time spent searching for learning materials independently, and 68.54% students feel that the profile feature enhanced their learning autonomy and sense of direction. From the results, it can be concluded that knowledge graph can provide precise diagnosis and path planning, making learning clear and targeted.

Compared with the conventional POA teaching model, KG-POA teaching model demonstrated clear advantages across multiple dimensions. 68.12% students think their learning behaviors were effectively recorded and fed back to them, and the personalized learning resources recommended were helpful, such results indicate that KG-POA model can optimize the allocation of teaching resources. Particularly in terms of personalized support, the introduction of knowledge graph transforms teaching feedback from generic suggestions to precise diagnostics, 82.86% students state that the system can show them knowledge gaps they don't know. This data-driven teaching intervention enables students of varying English proficiency levels to receive guidance tailored to their current cognitive states, achieving truly differentiated instruction. Status show that students' interest in learning English is increased under the KG-POA model and they feel more capable of completing English learning tasks. Increased interest and self-efficacy are indicators to verify the model is motivating students' learning, a core goal of POA and the overall KG-POA framework. Nearly 67.87% students are satisfied with their learning progress and outcomes after using this model, and 73.17% of students consider KG-POA model helped improve their comprehensive English application skills.

3.4.3 Analysis of Open-ended Questions for Students

To collect rich and qualitative data that explains the reasons behind Likert scale scores and uncovers unanticipated issues, open-ended questions are asked. Q1 (challenges) uncovers practical barriers when implementing KG-POA teaching model, students with weaker English foundations report difficulties understanding some of the data visualization charts in the learning profile, and 56.86% students express a desire for clearer explanations of the knowledge graph's recommendation logic. Q2 (Improvements) provides actionable feedback for refining the model and technological implementation in future iterations, 14 out of 25 students show interest in the inclusion of anonymous peer comparison features, believing it would help them better gauge their learning progress.

3.4.4 Analysis of Teachers' Perceived Effectiveness of the KG-POA Teaching Model

Data indicate that 78.45% teachers agree or strongly agree that the integration between Xuexitong and MOOC platforms is very smooth. Nearly 65.78% teachers agree KG-POA model helps them diagnose students' learning difficulties precisely and 56.52% teachers think knowledge graph assists them in better designing teaching tasks and activities. 81.36% teachers consider the reports valuable for setting precise teaching objectives. Regarding the reduction of lesson preparation workload, 72.96% teachers report a

reduction in preparation time, and 80.12% believe the system's suggestions could effectively accommodate the learning needs of students with varying English proficiency levels, demonstrating strong differentiated support capabilities. Such results show that KG-POA model can provide precise analysis of learning situations to enable differentiated teaching. It is shown that students' learning profiles generated by the system can provide teachers with a more comprehensive understanding of students and this model can enhance teachers' teaching decision-making efficiency before, during, and after class. 73.76% teachers say that they can modify classroom activity difficulty based on real-time learning status, with 62.53% making adjustments at least twice per unit. 76.54% teachers agree that the real-time learning data provided by the system significantly enhanced the objectivity of formative assessment. Compared to traditional methods, teachers' average assessment time was reduced by 31.56%. 81.45% teachers are able to offer targeted guidance based on system-identified learning weaknesses after which the proportion of students showing timely improvement increased by an average of 38.45%.

3.4.5 Analysis of Open-ended Questions for Teachers

To gather in-depth, experiential knowledge from the teacher's perspective, teachers are asked open-ended questions. 8 out of 10 interviewed teachers explicitly mention the difficulty of designing motivating tasks that fully leverage knowledge graph's diagnostic data. Teachers with less than 5 years of experience were more likely to report technical challenges compared to their more experienced colleagues. 9 interviewed teachers note that traditional judgment based on experience has been replaced by data-driven, precise diagnosis. 7 teachers report that students' learning goal setting shift from vague to precise. A more profound impact is self-directed learning ability, 6 teachers report that most students have reached an advanced stage, actively using the knowledge graph to build their own knowledge connections, with the complexity of their knowledge networks expanding by an average of 13.65% over one semester. Compared with traditional teaching methods, KG-POA teaching model demonstrates advantages in multiple areas. 8 teachers mention that their assessment accuracy improved and 7 observe measurable increases in students' learning engagement. Novice teachers reported to be more confident in differentiating instruction for students, while experienced teachers emphasize that the model helps them allocate more time to high-value teaching activities.

The findings of this survey indicate that the KG-POA teaching model, by integrating knowledge graph into the three phases of the POA teaching method, can addresses some problems in large-scale English teaching, such as insufficient personalized support, delayed feedback and inadequate diagnosis of learning conditions. Quantitative data show that three teaching phases score high both for teachers and students, and qualitative feedback frequently highlight terms such as clear objectives and targeted improvement, demonstrating the model's significant advantages in enhancing teaching precision, stimulating learning autonomy, and optimizing learning paths. Through visualization and intelligent recommendations, the introduction of knowledge graph into POA makes complex learning processes clear and manageable, providing a practical and feasible technology-enabled solution for reforming college English teaching.

4. Conclusion

This study set out to investigate the integration of knowledge graph with the Production-Oriented Approach (POA) to address the persistent challenges of low student engagement and insufficient personalized learning in English language teaching. The proposed KG-POA teaching model, implemented through UMOOCs and Xuexitong, was empirically evaluated to assess its impact on optimizing learning paths and enhancing the overall teaching and learning experience. The findings from both quantitative and qualitative data demonstrate the model's significant potential. From the student perspective, the KG-POA framework can provided clear learning goals, more personalized pathways, and increased engagement, as evidenced by high ratings in learning satisfaction, self-efficacy and interest. The dynamic learning portraits and tailored resource recommendations empower students to take a more active role in learning. From the teacher perspective, the model served as a powerful tool for precise learning diagnosis and data-driven instructional design, enabling them to move from a one-size-fits-all approach to a more differentiated, student-centered pedagogy.

However, the study also identified notable challenges, primarily related to the technical and interpretive hurdles of using knowledge graph. Such limitation points to the necessity of comprehensive teacher training and ongoing technical support for the successful implementation of technology-enhanced models. Long-term studies are needed to examine the sustained impact of the KG-POA model on language acquisition and the model should be tested across a wider range of courses to validate its applicability. In conclusion, the KG-POA model represents a promising and innovative pathway for the future of personalized language education.

Project Fund

This paper is the research result of Chongqing Higher Education Association 2025-2026 Annual Higher Education Scientific Research Project (Project No.: cqgj25196C). (重庆市高等教育学会2025-2026年度高等教育科学研究课题，项目编号： cqgj25196C)

References

Dewey, J. (1916). *Democracy and education: An introduction to the philosophy of education*. The Free Press.

Fan, J., & Zhong, S. (2022). Research on subject knowledge graph: From knowledge learning to thinking development. *e-Education Research*, *43*(1), 32-38.

Fu, G., & Wang, G. (2014). Research on online learning behavior and learning outcome based on data mining. *e-Education Research*, *35*(9), 53-57.

Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. Basic Books.

Liu, F., Zhao, W., Jiang, Q., & Wang, L. (2022). Research on personalized learning model and support mechanism based on knowledge graph. *China Educational Technology*, *5*, 75-90.

Qiu, L. (2017). The step-by-step design of language activities in the production-oriented approach. *Modern Foreign Languages*, *40*(3), 386-396.

Shi, Y., Peng, H., & Tong, M. (2019). Research on the generative recommendation strategy of precise personalized learning path based on learning profile. *China Educational Technology*, *5*, 84-91.

Tomlinson, C. A. (1999). *The differentiated classroom: Responding to the needs of all learners*. ASCD.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes* (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, Eds.). Harvard University Press. (Original work published 1930s)

Wen, Q. (2017). The theoretical framework for the use and evaluation of teaching materials in the Production-Oriented Approach. *China Foreign Language Education*, *10*(2), 17-23.

Yang, W., Wang, W., He, L., & Han, H. (2023). Research and practice of knowledge graph empowering smart education: A case study of the “Linear Algebra” course at Wuhan University of Technology. *Research in Higher Education of Engineering*, *6*, 111-117.

Zhang, W. (2016). An empirical study on the application of POA in college English classrooms. *Foreign Language Teaching and Research*, *48*(2), 234-245.