

# Research on Optimization of Teaching Resource Push Based on Adaptive Learning Path

Rongyi He\*  
Information Work Office  
Shandong University (Weihai)  
Weihai, Shandong, 264209, China

Xiaoqun Wang  
Information Work Office  
Shandong University (Weihai)  
Weihai, Shandong, 264209, China

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**Abstract:** The research on optimization of teaching resource push based on adaptive learning path explored the implementation method of personalized learning in the intelligent education environment. The study proposed a learning path feature framework with "how to learn" and "what to learn" as the core, and designed a resource recommendation and knowledge point matching model by combining static and dynamic features. In terms of "how to learn", the accuracy of recommendation is improved through the diversification of multimedia resources and learning preference analysis; in terms of "what to learn", dynamic feature analysis supports real-time adjustment of learning content to achieve the optimal matching of knowledge points. In addition, the study also explored the application of digital technology in the lifelong education system to provide flexible and efficient learning solutions for individuals at different learning stages. Finally, this study constructed a teaching resource push model that integrates resource push, path optimization and learning behavior feedback, providing theoretical and technical support for personalized education practice.

**Keywords:** Teaching resource push, study optimization, adaptive learning path

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## 1. INTRODUCTION

As a learning method, autonomous learning has received extensive attention and application in the field of education in recent years. Its theoretical basis is rooted in human creativity and intrinsic motivation, emphasizing the active role played by individuals in the learning process. Autonomous learning is not only a reflection of learners' subjective initiative, but also an important way to cultivate innovation, problem-solving and independent thinking abilities. The core of the autonomous learning is to promote students' transformation from passive acceptance of knowledge to active acquisition and construction of knowledge. This transformation can not only improve learning efficiency, but also enhance students' sense of control and sense of achievement over the content they have learned, thereby enhancing their learning motivation. In the "Opinions on Comprehensively Deepening Curriculum Reform to Implement the Fundamental Task of Moral Education and Cultivation" issued by the Ministry of Education, the requirements for the development of core literacy of Chinese students are proposed, among which "autonomous development" is clearly listed as an important component. This core literacy emphasizes that autonomous learning ability is one of the key abilities that students should possess, and is an important foundation for adapting to future lifelong learning and social development. In this era of rapid development of informatization and globalization, the continuous changes in society and technology have placed higher and higher demands on talents, and the mastery of a

single knowledge can no longer meet the needs of future society. Only students with autonomous learning ability can continuously update and deepen their knowledge structure and adapt to the ever-changing social environment.

The implementation of autonomous learning is not achieved overnight. It requires the joint efforts of the education system, teachers and students. The education system should provide students with a good environment for autonomous learning, including innovative curriculum design, rich learning resources and appropriate technical support. Teachers should provide guidance and support to students in teaching, but should not interfere too much in students' autonomous choices and decisions, and help students develop the ability and habit of self-learning. Students themselves also need to have good self-management skills and be able to make effective learning plans and adjustments based on personal interests, learning goals and social needs. Specifically in practice, there are many forms of the autonomous learning. For example, the popularity of online education platforms provides students with a more flexible way of learning. Students can choose the corresponding course content according to their own learning progress and interests. At the same time, the rise of teaching methods such as problem-oriented learning and project-based learning has further promoted the application of autonomous learning and cultivated students' teamwork ability, innovative thinking and practical ability. In the Figure 1, the key aspects of the autonomous learning are illustrated.

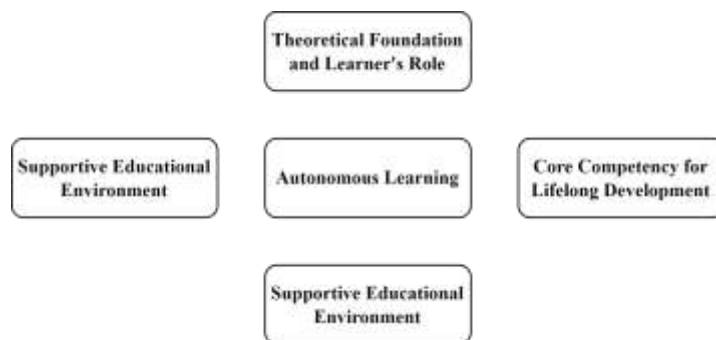


Figure. 1 The Key Aspects of the Autonomous Learning

## 2. THE PROPOSED METHODOLOGY

### 2.1 Analysis of the teacher's role in the context of adaptive learning

In the era of smart education, the rapid development of artificial intelligence technology is reshaping the traditional education model, and the role of teachers and the way students learn have undergone profound changes. Teachers are no longer the only controllers of learning content. Students can obtain learning resources through a variety of channels, including traditional offline classrooms, online virtual teachers, and adaptive learning platforms. This transformation not only expands the boundaries of learning, but also greatly improves the personalization and flexibility of learning.

Smart education creates a learning space that combines the real and the virtual, deeply integrating the physical environment with the digital virtual environment. Students can communicate face-to-face with teachers and classmates in the school's physical classroom, or interact with artificial intelligence through knowledge graphs in the virtual classroom. Such a learning space has the following characteristics:

**Multi-functional integration:** The learning space integrates functions such as resource acquisition, information push, data recording, result evaluation, and analysis and judgment, and builds an intelligent service chain throughout the entire learning process.

**Personalized learning support:** Through data collection and analysis of students' learning behavior, the system can accurately grasp students' learning preferences and weak links, thereby providing customized learning resources and paths.

**Seamless connection:** The physical and virtual environments can complement each other to achieve a learning experience anytime, anywhere, and fully meet students' needs for the fragmented learning.

With the support of smart education, students become the leaders of learning. They can choose the learning resources and paths that best suit them, and arrange their learning time and progress independently through the platform. This learning method not only cultivates students' self-discipline and independent thinking ability, but also improves the efficiency and effectiveness of learning.

### 2.2 Construction of digital lifelong learning education system

As a transformative force driven by digitalization, the power of digital is profoundly affecting the model and connotation of lifelong learning education. From the perspective of

technological innovation, human civilization has always evolved along with the development of technology, and breakthroughs in digital technology have brought new possibilities to education, especially in the acquisition, transmission and application of knowledge. The power of digital not only promotes innovation in educational forms, but also reshapes the overall structure of the education system, becoming an important engine for promoting changes in the lifelong learning system.

The digital lifelong education system covers a variety of people, including the first age (children and adolescents), the second age (adults) and the third age (elderly). The differences in cognitive ability, learning goals and learning methods among different groups determine the diversity of educational content and technology applications. For example, the first age emphasizes fun and exploration, the second age focuses more on skill improvement and career development, and the third age focuses on the combination of health, interest and social participation.

Digital technology allows education to present a diversified form, including online courses, virtual laboratories, adaptive learning platforms and personalized learning paths. Behind these types of characteristics is the flexibility and dynamism that digital technology has injected into education. Students can choose the appropriate learning mode according to their personal needs.

The implementation of digitalization runs through all aspects of education, such as analyzing student learning data through artificial intelligence to optimize the distribution of learning content; using knowledge graphs to build the systematic knowledge framework; and recording and verifying learning outcomes through big data and blockchain technology. These means make lifelong learning more efficient, transparent and sustainable.

### 2.3 Adaptive learning path recommendation

The core features of learning paths can be expanded from two dimensions: "how to learn" and "what to learn", covering the personalized needs of resource recommendation and knowledge point matching respectively.

**How to learn:** accuracy and diversity of resource recommendation

"How to learn" is mainly based on the characteristics of recommended resource types for learners, including but not limited to learning style, learning preference, media format, interaction method and knowledge granularity. For example, different learners have different acceptance of media such as text, audio, and video. Learning paths need to provide diversified learning resources according to learners'

preferences. At the same time, with the advancement of technology, the addition of emerging media such as virtual reality (VR) and augmented reality (AR) has also brought more possibilities for resource recommendation of learning paths. The selection of these resources should not only meet the current learning needs of learners, but also take into account their future learning potential.

What to learn: knowledge point matching driven by dynamic features

"What to learn" focuses on domain knowledge features, especially the introduction of dynamic features. Dynamic features play a vital role in learning recommendations. They can dynamically adjust recommended content according to learners' real-time learning performance. For example, by analyzing the learner's answer record, learning speed, knowledge mastery and other data, the system can update the difficulty level of the learning path in real time to ensure that the learner is always in the "optimal challenge zone" (Zone of Proximal Development, ZPD). In addition, dynamic features also support the cross-chapter knowledge point correlation analysis to help learners build a more systematic knowledge network.

### 3. CONCLUSIONS

This study aims to optimize the push of teaching resources in the context of intelligent education and proposes a push model based on adaptive learning paths. By analyzing the characteristics of learning paths, the study emphasizes the importance of two key dimensions: "how to learn" and "what to learn":

In terms of the accuracy and diversity of resource recommendations, by combining the learners' static characteristics (such as media format, interaction mode) and dynamic characteristics (such as learning difficulty, real-time feedback), targeted resource push is achieved, which improves the personalization level of learning experience.

In terms of knowledge point matching and dynamic adjustment of learning paths, through real-time analysis of learning behavior and performance data, the learning path is dynamically optimized, so that learners are always in a suitable challenge range, which promotes the systematic construction of the knowledge system.

In addition, this study emphasizes the key role of digital technology in lifelong education, including the application of multimedia resources, knowledge graphs and blockchain technology in the diversification of educational forms, transparency of results and efficiency of processes. The research results provide innovative ideas for the development of personalized education and promote the improvement of the teaching resource push model in the era of intelligent education. Future research can further combine more complex learning scenarios and large-scale learning data to explore more efficient push mechanisms and evaluation methods.

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