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Professional Development of Foreign Language Teachers in the Era of Digital Intelligence

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Abstract

This paper explores the empowerment mechanisms and practical pathways for foreign language teacher professional development in the digital-intelligence era. With the rapid advancement of artificial intelligence (AI) technology, the field of foreign language education is undergoing profound transformations, presenting new demands on the professional competencies of foreign language teachers. The study examines how digital-intelligence technologies facilitate teachers' professional growth through cognitive, affective, and behavioral empowerment mechanisms, analyzed from both "internal" and "external" dimensions. The endogenous-driven pathway emphasizes the transformation of teachers' professional cognition and the advancement of their competencies, including the integration of technology, human-machine collaboration, and educational creativity. The exogenous-collaborative pathway focuses on policy support, resource optimization, and the establishment of systematic training systems to build a new digital-intelligence education ecosystem. This research not only enriches the theoretical framework of teacher professional development but also provides practical guidance for foreign language teachers to enhance their capabilities in the digital-intelligence era, contributing significantly to the innovative development of foreign language education in China.

Keywords

Artificial intelligence, teacher professional development, practical pathways, digital-intelligence empowerment.

1. Introduction

The Action Plan for Revitalizing Teacher Education (2018-2022) explicitly states the need to fully leverage emerging technologies such as cloud computing, big data, virtual reality, and artificial intelligence to accelerate the construction and application of an information-based teaching service platform for teacher education. This aims to drive a shift in teaching methods towards a model centered on autonomy, collaboration, and inquiry, thereby imposing new requirements on teachers' professional competencies and capabilities. With the continuous advancement of educational informatization, in November 2022, the Ministry of Education issued the "Educational Industry Standard for Teachers' Digital Literacy." This standard elaborates on teachers' digital literacy from five dimensions: digital awareness, digital technology knowledge and skills, digital application, digital social responsibility, and professional development. This signifies that China's teacher professional development has entered a new phase, reflecting a profound understanding and timely update of the competency requirements for teachers in the new era.

In recent years, artificial intelligence (AI) technology has developed rapidly, and its application in the field of education has become a pivotal force driving educational innovation and transformation. Globally, the integration of AI and education has emerged as an inevitable trend, reshaping educational paradigms and bringing about profound changes in teachers' roles,

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thinking modes, and teaching methods. Against this backdrop, foreign language teachers, serving as bridges connecting different cultures and languages, play a crucial role in educational transformation. However, with the rapid development of AI technology, the foreign language teaching faculty has encountered numerous challenges, such as inadequate AI capabilities, outdated development concepts, and anxiety over technological adaptation. These issues have, to some extent, constrained the professional growth of foreign language teachers and the improvement of educational and teaching quality.

Given this background, conducting research on the mechanisms and pathways for empowering foreign language teachers' professional development through digital intelligence (numerical and intelligent technologies) holds significant theoretical value and urgent practical significance. From a theoretical perspective, this study aims to elucidate how digital intelligence technologies, through mechanisms such as cognitive empowerment, emotional empowerment, and behavioral empowerment, can promote the professional growth of foreign language teachers, thereby enriching and developing the theoretical framework of teacher professional development. From a practical standpoint, the internal and external practical pathways proposed in this study—namely, internally driven career transformation and professional capability advancement, as well as externally collaborative efforts to build a new ecosystem for digital intelligence education—can provide foreign language teachers in the AI era with actionable strategies to achieve self-improvement and comprehensive development amidst the progress of basic education reform.

This study focuses on the dual dimensions of digital intelligence empowerment for foreign language teachers' professional development: mechanisms and challenges. It delves into how digital intelligence technologies reshape foreign language teachers' cognitive schemas, emotional structures, and practical wisdom, while also exploring the challenges and countermeasures in their practical applications. Through systematic analysis, this study constructs internal and external pathways for foreign language teachers' professional development that align with the needs of the digital intelligence era, offering valuable references and impetus for the advancement of China's foreign language education.

2. The Contemporary Demands for the Professional Development of Foreign Language Teachers in the Era of Digital Intelligence

With the rapid development of artificial intelligence (AI) technology, the field of foreign language education is undergoing profound transformations. The advent of the digital intelligence era has provided new tools and platforms for foreign language teaching, while also posing novel requirements for teachers' professional development. To adapt to these changes, foreign language teachers must enhance their digital intelligence education literacy, teaching innovation capabilities, and interdisciplinary integration abilities, thereby addressing the challenges and opportunities brought about by the digital intelligence era.

2.1. The Digital Transformation of Educational Concepts

The digital intelligence era has ushered in significant changes in foreign language educational concepts. Traditional educational concepts largely relied on teachers' personal experiences to guide and unidirectionally impart knowledge. However, the digital transformation emphasizes the use of data-driven and intelligent technologies as support to achieve personalized and precise teaching (Zhang Xueling & Long Baoxin, 2025). This shift towards digital educational concepts requires teachers to transition from "experience-led" to "data-driven" approaches. By leveraging AI technologies, teachers can obtain real-time learning data on students, analyze their learning behaviors, mastery of knowledge, and difficulties encountered during the learning process, thereby providing teaching plans tailored to students' individual needs (Li

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Weiwei, 2025). This data-driven teaching model not only enhances the precision of teaching but also improves students' learning outcomes.

In the digital intelligence-driven educational transformation, the role of foreign language teachers is evolving from a mere transmitter of knowledge to a multifaceted facilitator of diverse abilities. This role transformation involves three key shifts: from knowledge transmitters to learning guides, utilizing AI assistance to achieve personalized instruction; from independent educators to collaborative co-creators, forming cross-disciplinary collaborative communities with technology developers and learning scientists; and from curriculum implementers to teaching innovators, iteratively refining teaching designs based on data feedback. This paradigm shift requires foreign language teachers to reconstruct their capabilities, establish an educational philosophy of human-machine symbiosis, and reshape their professional values in the intelligent era. Zhou Gui (2025) points out that traditional teacher roles are facing an identity crisis, with intelligent technologies prompting teachers to transition from individual experience-led to pluralistic development, that is, reconstructing their professional identities through technological integration. This transformation necessitates foreign language teachers to transcend disciplinary boundaries, become designers of learning ecosystems, master not only the core knowledge of language teaching but also cross-disciplinary skills such as data analysis and the application of intelligent tools.

2.2. Multidimensional Advancement of Professional Competencies

The digital transformation urges teachers to construct a three-dimensional capability system encompassing technological mastery, data literacy, and interdisciplinary integration. Regarding technological mastery, teachers need to grasp the three levels of tool usage: basic operations, such as the use of intelligent correction tools; data analysis, including the construction of learning profiles; and systemic innovation, such as the development of adaptive learning resources. Zhang Xueling (2023) proposed leveraging "technological practice communities" to drive teachers from being mere users to co-creators, such as through the joint development of school-based AI teaching modules.

The advancement of data literacy requires the construction of a closed-loop capability chain involving data collection, analysis, decision-making, and optimization. Peng Jing & Wu Nanzhong (2024) emphasize that teachers must master data cleaning and visualization skills, as well as cultivate data-driven critical thinking. For instance, by analyzing the error distribution in students' online exercises, teachers can dynamically adjust teaching priorities, and by utilizing affective computing technologies to identify learning anxiety, they can implement precise interventions. Such capabilities enable the transformation of teaching experiences into quantifiable decision-making bases.

Interdisciplinary integration abilities necessitate breaking down disciplinary boundaries and establishing a composite knowledge framework of "foreign languages plus educational technology and cognitive science." In the digital intelligence era, foreign language education is no longer confined to the cultivation of language skills but increasingly emphasizes interdisciplinary integration and application. Teachers should possess a cross-disciplinary knowledge background, integrating foreign language teaching with other disciplines such as computer science, data science, and international communication to cultivate compound talents with global perspectives and cross-cultural communication abilities (Wang Xin, 2025). For example, teachers can design interdisciplinary course content using the "foreign languages plus technology" model to help students improve their application and cross-cultural communication abilities while mastering language skills.

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2.3. Deepening of Cross-Cultural Interpretation Abilities

The continuous advancement of AI translation technologies has lowered the barriers to language conversion but may have weakened learners' sensitivity to cultural connotations (Chung & Ahn, 2022). In the digital intelligence era, the core proposition for the professional development of foreign language teachers is to strengthen their cross-cultural interpretation abilities, which essentially involve transcending the superficial transformation of linguistic symbols to reveal the cultural logic and cognitive schemas underlying linguistic behaviors. This ability requires teachers to possess three analytical dimensions: cultural decoding abilities, which involve analyzing the value systems, social norms, and thinking patterns embedded in linguistic phenomena such as vocabulary, grammar, and discourse. For instance, by analyzing the hierarchical structure of the Japanese honorific system, teachers can reveal the construction mechanism of "vertical" interpersonal relationships in Japanese society. Cultural comparison abilities refer to the systematic comparison of expression patterns in different cultures within similar contexts, such as comparing the strategic differences in "refusal" speech acts between Chinese and English to uncover the pragmatic features of collectivist and individualist cultures. Cultural creation abilities involve guiding learners to maintain awareness of their native cultural identity while creatively constructing new cultural dialogue modes in cross-contextual exchanges.

In practice, teachers should establish technology-enabled cross-cultural cognitive workshops, leveraging AI to generate multimodal cultural scenarios, such as using virtual reality technology to recreate cross-cultural conflict cases, leading students to analyze the roots of cultural misunderstandings through role-playing, employing corpus linguistic methods to compare language use patterns in different cultural communities to cultivate cultural sensitivity, and designing cultural hybridization experimental projects, such as having students create digital stories using mixed languages to explore the possibilities of cultural innovation in the "third space." This teaching model requires teachers to possess a global competence perspective, elevating language teaching to a process of cultural cognition construction, safeguarding the warmth of humanistic education in the technologically integrated cultural realm, and cultivating foreign language talents who are proficient in the "art of language" and well-versed in the "way of culture" (Zheng Yanhong et al., 2025).

3. Practical Pathways for the Professional Development of Foreign Language Teachers in the Digital Intelligence Era

To align with the practical needs of foreign language teachers' professional development in the era driven by digital intelligence, and fully consider the motivating mechanisms and potential crises brought about by digital intelligence empowerment for their professional growth, this study systematically analyzes specific pathways for teachers' professional development from both "internal" and "external" dimensions.

The "internal" dimension focuses on teachers' own professional cognition, prompting them to generate a willingness to enhance work quality while fulfilling their basic duties, and take proactive actions to improve skills, enhance professional identity, and ultimately achieve conceptual transformation and capability advancement (Chen Xiaohui et al., 2022). The "external" dimension relies on external support mechanisms such as learning communities, training, and feedback to construct a systematic development framework, optimize the educational ecosystem, and integrate the staged and fragmented development of teachers' careers into a coherent and unified whole.

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3.1. Endogenous Drive: Transformation of Professional Cognition and Advancement of Professional Competencies

In the process of educational transformation brought about by the digital intelligence era, the professional development of foreign language teachers should regard endogenous drive as a core and pivotal element to promote the transformation of professional cognition and the advancement of professional competencies. First and foremost, foreign language teachers need to strengthen their professional identity and conceptual transformation. This requires teachers to deeply recognize their critical missions and values in the digital intelligence era, transcend their traditional roles as mere transmitters of knowledge, and become guides and facilitators of students' learning and development. Teachers should actively engage in educational reforms and practical activities, proactively explore new models and methods of foreign language teaching that adapt to the digital intelligence era, and thus achieve a comprehensive transformation of their educational concepts. In this process, teachers should construct a new tripartite capability system encompassing technological integration ability, human-machine collaboration ability, and educative creativity.

3.1.1. Deep Construction of Technological Integration Ability

In the digital intelligence era, technological integration ability has become a crucial part of foreign language teachers' professional literacy. It is not merely about introducing AI tools into the classroom but achieving a profound integration of technology and foreign language teaching (Lin Xinhai, 2023). This process requires foreign language teachers to deeply understand and master the principles and characteristics of various AI technologies, fully leveraging their advantages to enhance teaching effectiveness.

Firstly, foreign language teachers need to conduct in-depth research on natural language processing (NLP) technology. This technology has the capability to accurately analyze students' language errors and provide personalized feedback and suggestions, effectively helping students correct language mistakes and improve language accuracy. For instance, by utilizing NLP software, teachers can swiftly identify grammatical errors, inappropriate vocabulary usage, and other issues in students' compositions, while also offering specific revision suggestions. Such an immediate feedback mechanism not only enhances students' learning efficiency but also cultivates their autonomous learning abilities.

The application of machine learning algorithms in foreign language teaching cannot be overlooked. These algorithms can predict students' learning progress and potential difficulties based on their learning data, providing teachers with scientific teaching guidance. By leveraging machine learning algorithms, teachers can more accurately grasp students' learning conditions and formulate more targeted teaching plans. For example, in listening teaching, teachers can employ machine learning algorithms to analyze students' listening test data, discern differences in their performance across various listening tasks, and then adjust teaching content and difficulty to align with students' individualized needs.

After understanding and mastering these technological characteristics, foreign language teachers should design more targeted and effective teaching activities based on the goals and content of foreign language teaching. Taking oral language teaching as an example, teachers can utilize speech recognition and evaluation technologies to provide students with real-time pronunciation correction and fluency assessment. Combined with virtual scenario simulation technologies, teachers can create a nearly authentic language environment for students to practice oral language skills, thereby improving their language proficiency. Such technology-integrated teaching activities can stimulate students' learning interests and effectively enhance their oral expression abilities.

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3.1.2. Effective Cultivation of Human-Machine Collaboration Ability

Human-machine collaboration is an indispensable and critical feature of foreign language teaching in the digital intelligence era, profoundly transforming the educational ecosystem and teaching models. Foreign language teachers should clearly recognize that the role of AI is not to replace teachers' core positions but to serve as an efficient teaching assistant, forming a complementary and synergistic partnership with teachers. In this new educational model, foreign language teachers should not only embrace technological changes but also master methods and strategies for effective collaboration with AI, reasonably planning and allocating teaching tasks to maximize teaching effectiveness and learning experiences.

In the foundational yet crucial aspect of vocabulary teaching, teachers can fully leverage the efficiency and precision of AI tools to swiftly generate a variety of rich vocabulary learning materials. These materials encompass accurate pronunciations, vivid example sentences, as well as relevant synonyms and antonyms, providing students with comprehensive and personalized learning resources. However, teachers' roles are not diminished but rather require a greater focus on guiding students to deeply comprehend the cultural connotations and pragmatic contexts behind vocabulary. Through meticulously designed teacher-student interactions and group discussion activities, teachers can guide students to integrate vocabulary learning into real-life contexts, deepening their understanding and memory of vocabulary meanings and usages, and cultivating their cross-cultural communication abilities in language practice.

Foreign language teachers should actively utilize the data analysis functions of AI to achieve scientific and refined teaching decision-making (Long & Lin, 2023). By collecting and analyzing students' learning data and behavioral patterns, teachers can accurately understand students' learning progress, difficulties, and needs, flexibly adjusting teaching strategies and methods. For instance, if data analysis indicates that students are struggling with listening comprehension, teachers can design a series of listening training activities that skillfully integrate diverse listening materials and personalized training modes provided by AI. Such data-driven precise interventions can effectively enhance the effectiveness and efficiency of listening training, stimulating students' learning interests and motivations, and promoting the comprehensive development of their language skills (Peng Zeping & Feng Cheng, 2024).

3.1.3. Continuous Stimulation of Educative Creativity

Educative creativity constitutes a key component of foreign language teachers' professional cognition reconstruction. In the context of the digital intelligence era, foreign language teachers should not only shoulder the traditional responsibility of imparting language knowledge but also emphasize the cultivation of students' cross-cultural communication abilities, critical thinking, and innovation capabilities to meet the requirements of a globalized and information-driven society. In this process, foreign language teachers need to boldly break through traditional teaching mindsets and actively explore and innovate teaching methods and means to effectively stimulate students' educative creativity.

Specifically, foreign language teachers can fully leverage advanced technologies such as Virtual Reality (VR) and Augmented Reality (AR) to create immersive language learning environments for students (Zhang Xueling & Long Baoxin, 2025). By simulating authentic cultural scenarios, students can personally experience the customs, habits, and social cultures of different countries in virtual environments, deeply understanding the cultural connotations behind languages, and effectively improving their cross-cultural communication abilities. Such teaching approaches not only enrich teaching methods but also enhance students' learning interests and participation, laying a solid foundation for cultivating their global perspectives and cross-cultural exchange capabilities.

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Foreign language teachers need to actively guide students to engage in autonomous learning and analytical learning using AI tools, stimulating their critical thinking and innovation capabilities. For example, teachers can encourage students to utilize AI translation tools to analyze different versions of translations, evaluate the strengths and weaknesses of translations, and propose their own improvement ideas. This not only exercises students' language appreciation abilities but also cultivates their critical thinking and innovation capabilities. During the analytical process, students learn to think independently, dare to question, and propose more creative solutions, laying a solid foundation for their future academic research and career development.

In the wave of educational transformation brought about by the digital intelligence era, the professional development of foreign language teachers should prioritize endogenous drive as a core element, prompting profound transformations in professional cognition and comprehensive advancements in professional competencies. By strengthening professional identity and conceptual transformation, foreign language teachers can successfully break free from the constraints of their traditional roles as mere transmitters of knowledge and become guides and facilitators in students' learning and development processes. On this basis, teachers construct a new tripartite capability system encompassing technological integration ability, human-machine collaboration ability, and educative creativity to adapt to the new requirements of foreign language teaching in the digital intelligence era.

3.2. Exogenous Synergy: Building a Systemic Support System for Teacher Development

In the face of constant changes in the era, governments and society must collaborate to create a favorable external environment and strive to build a new ecosystem for digital and intelligent education. In this process, exogenous synergy plays a crucial role. Exogenous synergy refers to the integration of external resources from governments, enterprises, research institutions, social organizations, and other stakeholders to collaboratively drive the digital transformation and intelligent upgrading of the educational ecosystem. Its core lies in breaking the traditional closed-off nature of the education system and establishing an open and shared educational resource platform. This platform facilitates the flow and sharing of resources across different regions and fields, providing support for teachers' professional growth and development in the intelligent era.

3.2.1. Establishing a Comprehensive Policy System

A sound policy and legal framework related to teacher professional development must be constructed to fully leverage the incentivizing and guiding functions of policies, encouraging teachers to integrate artificial intelligence (AI) into education and teaching.

On one hand, governments and relevant departments should conduct in-depth research and, based on the varying conditions of different regions and schools, formulate targeted institutional norms for teacher professional development. Additionally, they should develop reasonable and scientifically grounded policies for intelligent technology support to promote teacher growth. During the process of teachers applying AI in educational practices, effective monitoring and feedback mechanisms should be implemented. The effectiveness of policy implementation and existing issues should be thoroughly analyzed, with timely adjustments and optimizations made to ensure alignment with the needs of educational reform and development.

On the other hand, the incentivizing and guiding role of policies should be fully utilized. Government bodies, social educational organizations, schools, and other stakeholders should proactively clarify teacher evaluation and promotion mechanisms, encouraging and facilitating teachers' active use of intelligent technologies to enhance their professional capabilities and overall competence.

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3.2.2. Enriching and Optimizing Educational Resources

In the context of the digital-intelligent era, the richness and optimization of educational resources are directly linked to the professional development outcomes of foreign language teachers. Governments and society should work together to create high-quality educational resource databases, providing foreign language teachers with diverse and personalized learning resources to continuously improve their professional skills.

On one hand, governments should leverage their macro-control and resource integration advantages to strengthen the consolidation and sharing of educational resources, promoting the digitization and networking of high-quality resources. Specifically, governments can establish a national smart education service platform as a central hub for aggregating high-quality educational resources, creating a centralized and convenient learning resource repository for foreign language teachers. This platform should include a wide range of foreign language teaching resources, such as the latest teaching methods, case studies, courseware, online courses, and more, to meet the diverse learning needs of foreign language teachers. Governments should also introduce policies encouraging regions and schools to upload their unique educational resources to the platform, enabling resource sharing and complementarity and forming a nationwide educational resource alliance.

Meanwhile, society should actively participate in educational resource development, establishing a diversified construction framework led by the government with broad societal involvement (Peng Zeping, 2024). Enterprises can utilize their technological strengths to collaborate with educational institutions in developing educational software and learning tools tailored to the professional development needs of foreign language teachers, such as intelligent grading systems and online interactive teaching platforms, thereby improving teaching efficiency and effectiveness. Universities and research institutions can leverage their academic resources and research capabilities to explore foreign language education theories and teaching methodologies, providing teachers with cutting-edge educational concepts and strategies. Promoting industry-academia-research collaboration is also a key pathway to enhancing the quality of educational resources. Through deep cooperation among enterprises, universities, and research institutions, more market-aligned foreign language education products and services can be developed, driving innovation in the foreign language education sector.

3.2.3. Establishing a Systematic Training System

Against the backdrop of the digital-intelligent era, foreign language teachers face unprecedented challenges, making the continuous improvement of their professional competence and technical skills critical to ensuring educational quality. In response, governments and society should collaborate to build a systematic training system for foreign language teachers, comprehensively addressing the new demands of the digital-intelligent era.

Governments should take the lead in establishing a training mechanism covering the entire career cycle of foreign language teachers—pre-service, induction, and in-service—ensuring that teachers receive necessary support and resources at all stages of their professional development (Zhang Xueling & Long Baoxin, 2025). Specifically, governments can organize specialized training programs, develop online courses, and host workshops to provide systematic training in digital literacy and technical application skills for foreign language teachers. These training sessions should cover areas such as AI fundamentals, big data analysis, and the application of intelligent teaching tools, equipping teachers with essential technical skills and enhancing their teaching efficiency and effectiveness in digital-intelligent environments (Yang Fan et al., 2024).

All sectors of society should actively participate in building the foreign language teacher training system, forming a diversified collaborative effort (Lin Min et al., 2024). As key drivers

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of technological innovation, enterprises can provide advanced technical support and practical training platforms, enabling teachers to apply intelligent technologies in real teaching scenarios and thereby improving their practical skills. Schools, with their rich academic resources and research capabilities, can offer theoretical guidance and academic research support, helping teachers integrate theory and practice and deepen their understanding of digital-intelligent education. Research institutions should also contribute by sharing cutting-edge research findings and practical case studies, providing teachers with innovative ideas and methods to inspire their creative potential (Feng Xiaoying et al., 2021).

When constructing a systematic training system for foreign language teachers, emphasis should be placed on the relevance and effectiveness of training content. For teachers at different career stages (Li Yang & Zeng Xiangyi, 2022), differentiated training content and methods should be designed. For example, pre-service teachers should focus on developing digital literacy and basic teaching skills, early-career teachers should prioritize the application of intelligent teaching tools and the improvement of practical abilities, while experienced teachers should concentrate on updating teaching philosophies and innovating teaching methods.

4. Conclusion

The digital-intelligent era presents both opportunities and challenges for the professional development of foreign language teachers. Through systematic analysis, this study reveals the enabling mechanisms of digital-intelligent technologies in empowering foreign language teachers at cognitive, affective, and practical levels, proposing a dual-path approach integrating internal and external dimensions. The endogenous-driven path requires teachers to proactively adapt to technological transformations, achieving professional cognitive shifts and competency advancement, while the exogenous-synergistic path necessitates collaborative efforts among governments, enterprises, and society to construct supportive policy and resource systems. Moving forward, foreign language teachers must strike a balance between technological integration and humanistic education to cultivate interdisciplinary talents equipped with both linguistic competence and cultural sensitivity. This study provides a theoretical framework and practical strategies for foreign language teachers to navigate the challenges of the digital-intelligent era, contributing to the high-quality development of foreign language education in China.

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