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The Exploration of the Triple Logic of Digital Transformation in International Chinese Education from an Artificial Intelligence Perspective

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Abstract: As China's "Belt and Road" gains momentum, international Chinese education popularity soars. Understanding digital transformation's rationale and trajectory is crucial for high-quality development. Resource-sharing and collaboration are key in digital transformation, enriching curricula, ensuring teacher training, and supporting instruction. Teaching assessment and quality oversight are vital for instructional efficacy and student achievements. China remains committed to advancing the Belt and Road Initiative and fostering Chinese international education.

1. Introduction

1.1 Research Background

Minister Huai Jinpeng emphasized that digital education connects youth worldwide, fostering cross-cultural understanding and trust. This transformation aids the Party's and nation's strategic goals, advancing international Chinese education. Recent changes and the pandemic have fueled digital adoption in education, notably ChatGPT's impact. International Chinese education now strides towards "data-driven and intelligent empowerment." This paper delves into "why, where, and how" of this transformation, examining its drivers, nature, and direction [1]. Technical support plans are provided, offering actionable strategies for high-quality development in international Chinese education.

1.2 Research Significance

Firstly, AI technology offers teachers new theories, methods, cases, and tools to enhance their teaching and digital literacy. It serves as a companion, aiding in teaching design, research, and career development.

Secondly, AI technology uncovers fundamental laws of teaching, learning, and professional development through in-depth research. This guides teaching practice and professional growth. Improving the educational value and effectiveness of AI tools can empower teachers' transformation [2].

Lastly, this research addresses issues in teacher development in China. AI-assisted transformation

promotes balanced teacher team development, enhances training quality, and supports teachers in acquiring new skills and adapting to new requirements.

This paper aims to strengthen theoretical methods and tools for teacher improvement; deepen basic laws research and enhance educational value of tools; address teacher development issues and foster comprehensive teacher growth. These studies are crucial for guiding digital transformation in international Chinese education.

2. Why Change: The driving logic of the digital transformation of International Chinese Education

2.1 External impetus: external thrust of technological change

Chinese teaching innovation. Digital tech like speech synthesis, handwriting recognition, and corpus boost teaching effectiveness. Meta-cosmic, Chat-GPT spur new digital education ecosystem. Chat-GPT, as an AI tool, poses both opportunities and challenges to international Chinese education.

A 2023 survey of 140 teachers and 125 learners on "Chat-GPT's Use in International Chinese Education" found limited adoption (23.57% teachers, 17.6% learners). Key barriers: product inaccessibility (47%) and technical difficulty (12%). Integration issues (24%) also hindered adoption. However, 87.85% teachers and 77.67% learners not using Chat-GPT expressed willingness to do so, indicating its vast potential [3], as detailed in Figure 1.

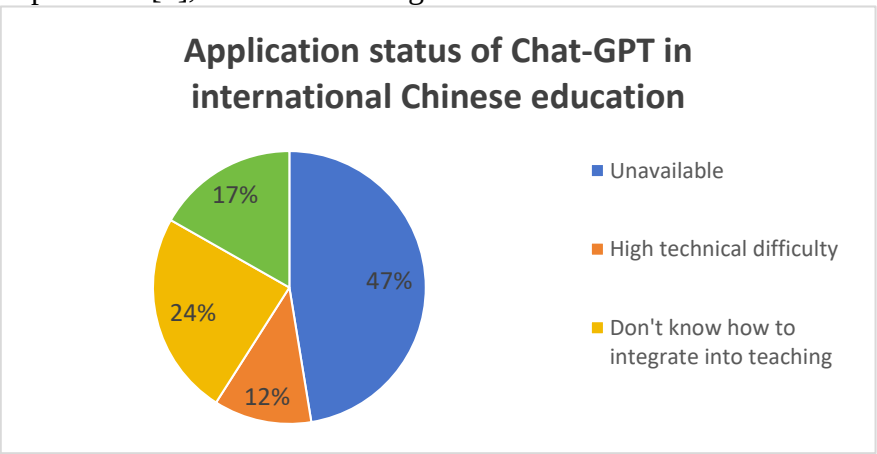

Figure 1: Application status of Chat-GPT in international Chinese education

In the course of the survey, the following conclusions were also drawn: 72.73% of teachers and 68.18% of learners think ChatGPT is more convenient than other Chinese teaching platforms. The teacher employs ChatGPT for: 35% generating example sentences, 29% translating text, 19% providing teaching assistance, 17% facilitating subject research, 10% creating self-assessment problems, 10% preparing teaching plans, 10% writing assignments or course materials, 10% reviewing and finalizing texts, 15.15% composite photo editing, and 12.12% simulating classroom dynamics as detailed in Figure 2.

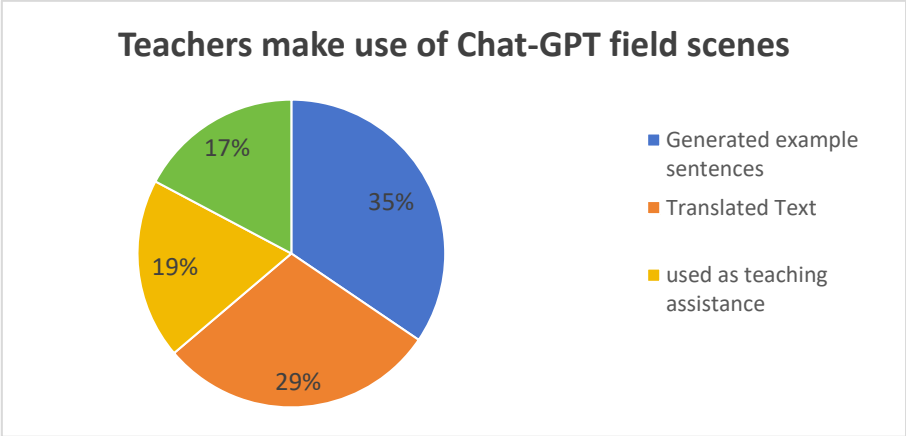

Figure 2: Teachers Make use of Chat-GPT field Scenes

At the same time, the teacher expressed his own concern that the teaching application of Chat-GPT may lead to various problems, including plagiarism and cheating (30%), incorrect knowledge and information (30%), excessive dependence on both teachers and students (28%), as well as bias and violence in the generated texts (12%), the details are shown in Figure 3.

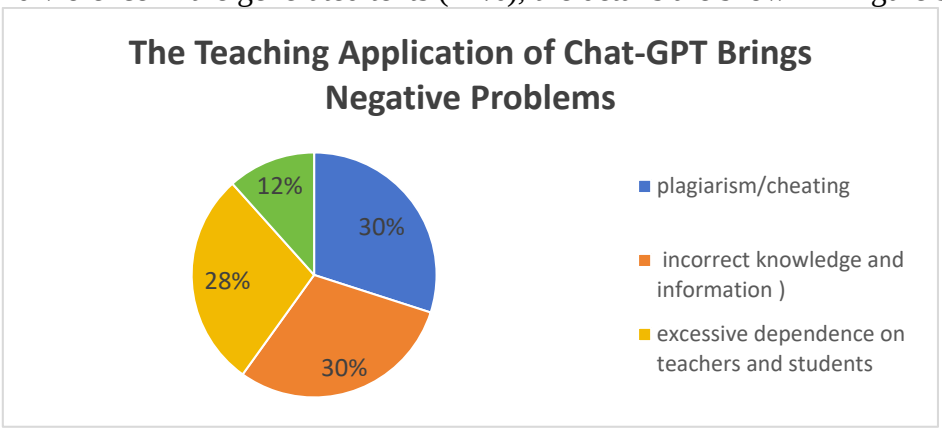

Figure 3: The Teaching Application of Chat-GPT Brings Negative Problems

Scenarios in which learners use ChatGPT are as follows: Grammar correction (29%), translation of chapters (27%), practice of oral language (24%), search for example sentences (20%), as indicated in Figure 4.

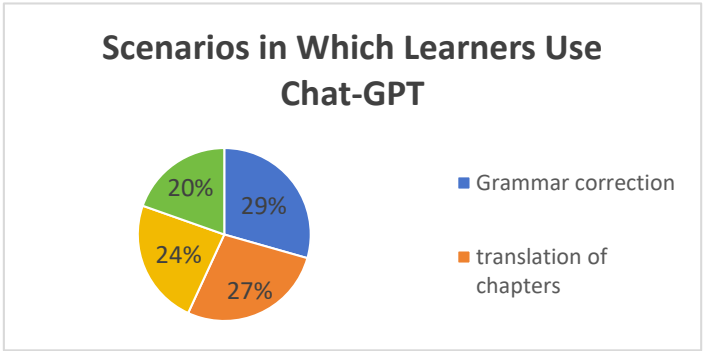

Figure 4: Scenarios in Which Learners Use Chat-GPT

Inquire words (36.36%), search materials (36.36%), read chapters (27.27%), practice listening (22.73%). ChatGPT supports Chinese teaching, reduces teachers' burden, and supports learners' personalized learning, but has problems with truthfulness, academic integrity, and privacy

disclosure. ChatGPT's case study shows the need to adapt to new technology. International Chinese education should seize digital transformation opportunities, integrate digital technologies, adjust goals, optimize models, change teacher roles, reform evaluation methods, and reshape the education system.

2.2 Internal power: the internal pull of educational development

International Chinese education should be diverse, dynamic, and sustainable. A "normal-long-term" intelligent education mechanism enables swift response to external shifts, risk mitigation, and transcendence of time-space barriers, maximizing teaching outcomes from high-quality resources.

Moreover, a more open stance is necessary. With 180+ countries engaging in Chinese education, disparities exist due to various factors. Digital technology bridges this gap, especially in developing nations and "Belt and Road" countries. Online and smart classrooms expand coverage, foster equity and inclusivity, and propel Chinese towards global status.

Adaptability is also crucial. Firstly, it should meet learners' individual needs, transcend "nationalization" demands, and offer personalized knowledge. Big data and AI aid in comprehending learners' unique needs for tailored, precise language education. Secondly, it must align with societal and technological advancements. The 4th Industrial Revolution reshapes knowledge and education, necessitating reassessment of international Chinese education's core value and aim. Future talents should possess 21st-century competencies, cultural interaction, and digital learning skills, becoming adept global citizens in the digital and smart society.

3. Where to turn: the goal logic of the digital transformation of international Chinese education

3.1 Essence Deconstruction

By leveraging technology to revolutionize education, we aim to promote the integration of humans and machines. Digital transformation is an ongoing process that encompasses the development of infrastructure and tools for a new educational ecosystem, as well as the establishment of a high-quality system that is compatible with modern socio-economic development. Our ultimate goal is to progress from digital to smart education.

International Chinese education's digital transformation aligns with China's plan, incorporating modern learning and international Chinese education theories. Digital technology enables systematic changes, supporting high-quality development. Goal is to build a new Chinese smart education model, integrating technology into all aspects of Chinese teaching. Ultimately, the goal is to cultivate intelligent Chinese talents who possess strong intercultural skills, a deep understanding of Chinese culture, and a global vision.

3.2 Feature Perspective

Multimedia courseware and language lab tools for Chinese learning have emerged.

Secondly, the digital upgradation era (2001-2019) emphasizes tech's role in Chinese teaching, learning, admin, and assessment in international Chinese education. Online Chinese teaching boomed, leading to platforms like Beijing Language and Culture University's initiatives and the Online Confucius Institute. Digital methods like flipped classrooms and blended learning matured, with MOOCs and educational apps proliferating [4]. The details are shown in Table 1.

Thirdly, the digital transformation phase (2020-present) is marked by a technological revolution in

Chinese language teaching. The COVID-19 pandemic drove a shift to proactive and intelligent education. Intelligent technologies have infiltrated Chinese language instruction, producing innovative products like smart classrooms and learning platforms. Digital resource utilization accelerates the digital transformation of international Chinese education. This transformation, driven by tech advancements, presents opportunities and challenges for its growth and development [5].

Table 1: The digital transformation stage of international Chinese education

Year	Transformation period	Main feature	Tool
1940-2000	Digital transformation phase	Technology-assisted Chinese teaching	Audio and video tapes and later radio and television
2001-2019	Digital upgrade stage	Technical support for Chinese teaching	Online Beijing Language and Culture University, online Confucius Institute, Flipped Classroom, MOOCs and international Chinese learning APP
2020-2023	Digital transformation phase	Technology changes Chinese teaching	Chinese smart classroom, smart learning platform

International Chinese education's nature and function remain unchanged despite technology updates. Its core goal is to enhance intercultural communication skills and foster China-friendly individuals. Digital transformation brings opportunities and challenges. Digital technology facilitates cross-cultural communication, expands learning resources, and offers customized content. Teachers benefit from innovative methods and tools, enhancing education quality. While technology alters forms and means, international Chinese education's focus on cultivating intercultural skills and fostering China-learner relations remains unchanged. This is its digital transformation's core and eternal mission.

3.3 The Road Will be Chosen

To broaden international Chinese education while adhering to learner-centric and educational values, we should utilize intelligent technology.

Success in digital transformation requires technology and education integration. Despite AI advancements, teachers remain crucial. Learners' needs are paramount in modern international Chinese education. Cultivating Chinese talents and global citizens is our goal. "+ digital" goes beyond mere technology assistance. We need to avoid technology overreliance; integrate it into educational standards. Reject simplistic "addition" thinking, which hinders digital transformation. Addressing gaps in technology, theory, hardware, and software is crucial. To drive digital transformation, it is imperative to overcome challenges, solve pain points, and effectively leverage technology within the processes and elements of international Chinese education.

4. How to Transform: The practical logic of digital transformation of International Chinese Education

4.1 Forecasting Methods

Strategies cover flipped classroom and mobile learning. The survey selects 20 projects from 15 alternatives among key technologies from 2013 to 2022. 'Learning Analysis' is revised to 'Multimodal Learning Analysis' with novel technologies added. A questionnaire on 20 technologies is sent to 18

experts from Beijing Language and Culture University and Harvard University. The panel includes 6 in modern educational technology and 12 in international Chinese education. The 2022 Report evaluates 6 technologies across 6 dimensions using a five-degree scale[6].

Different. The six dimensions are: The potential of technology to influence learning effect; Cost input of technical practice; The quality requirements of technology for teachers and students; Technology acceptance of teachers and students; Risks of technology application; The effectiveness of technology in promoting educational equity. Through this survey, we can comprehensively examine the role of technology in the digital transformation of international Chinese education.

4.2 Forecast Results

First, an expert poll was conducted to determine the importance of the 20 candidate technologies (see Figure 2). The top six technologies are:

Artificial Intelligence (17), educational robots (15), multimodal learning analysis (13), adaptive learning (12), Extended reality (8), and blended learning Spaces (8). Secondly, reliability test was conducted on the survey results of the scale questions, Cronbach.α coefficient is 0.876 (> 0.8), indicating that the reliability of the questionnaire is good. The expert evaluation results are shown in the figure 5, figure 6 below.

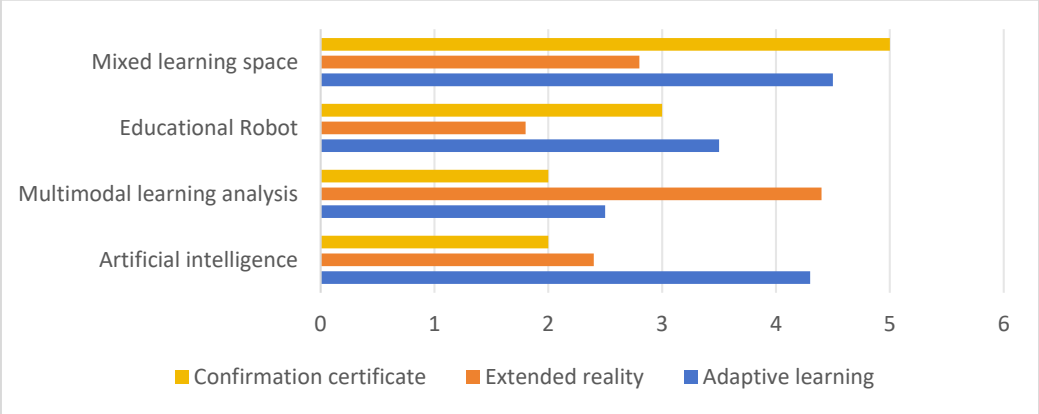

Figure 5: Voting data for candidate technologies

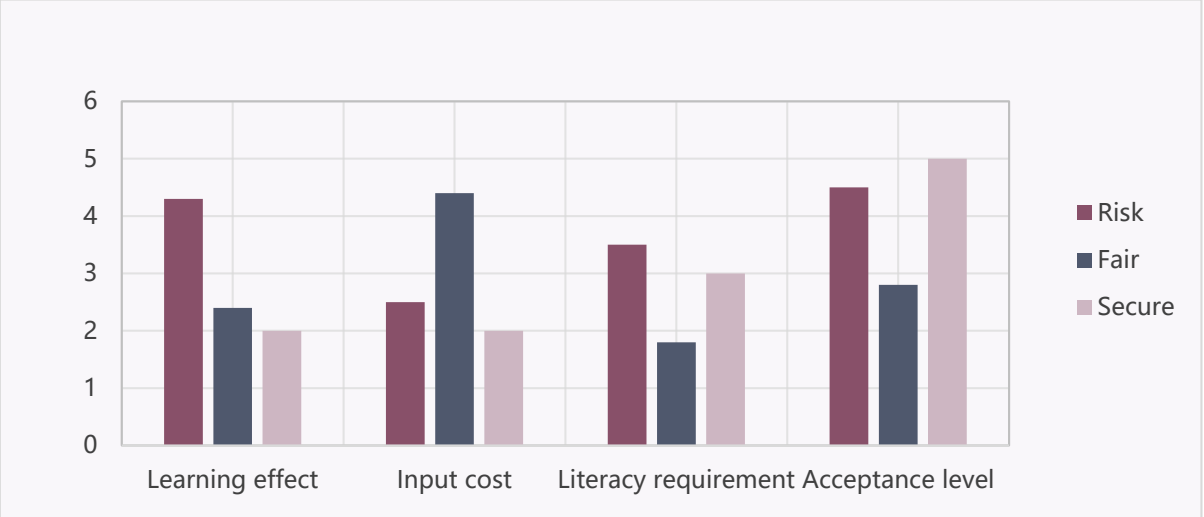

Figure 6: Trends in digital transformation

4.3 Analysis and discussion

4.3.1 Artificial intelligence enables international Chinese education

"Improves learning experience. Speech synthesis, handwriting recognition, and machine translation are widely used in Chinese classrooms. As technology matures, schools need less R&D investment, and AI promotes fairness. Two key smart technologies are:

1). Educational knowledge graph technology: Creates a subject knowledge map covering elements, skills, and culture. Structures knowledge and recommends resources for personalized teaching. Automatically generates definitions, examples, and exercises for vocabulary learning.

2). Intelligent evaluation technology addresses gaps in Chinese language education, especially with regards to pronunciation feedback and error correction.

4.3.2 Educational robots enable international Chinese education

Students face risks with educational robots, including doubts about knowledge and teacher status weakening. Their role in promoting equity is limited.

The academic community can develop two types of Chinese education robots: virtual or materialized. Virtual robots are low-cost and prioritized. However, all robots need rigorous evaluation to ensure effectiveness and avoid risks.

Chat-GPT's technical route and API can improve robots' accuracy in answering questions about international Chinese education. Materialized robots can use smart devices to reduce costs. In future classrooms, robots can assist teachers and learners in dialogue, cultural exploration, and more [7].

4.3.3 Multi-modal learning analysis enables international Chinese education

To improve learning effectiveness, big data from smart classrooms is utilized for multimodal learning. Data annotation tools like ELAN are available, but teachers need digital literacy to analyze and use data effectively. Acceptance of this technology is low among teachers and students, and privacy risks limit educational equity. Multimodal learning analysis technology can collect and analyze learning data for precision teaching. The four types of data are learning performance, human-computer interaction, learning behavior, and physical data. These data types include automatic statistics on accuracy, pronunciation, time, participation, platform evaluations, classroom recordings, and cognitive processes.

4.3.4 Adaptive learning enables international Chinese education

The 2020 report focuses on adaptive learning in higher education worldwide, emphasizing integration with active learning and instructional design. However, in international Chinese education, there's a lack of mature adaptive systems. Experts praise its effectiveness, citing automatic recommendations, low complexity, and high acceptance. It also requires minimal investment and promotes educational equity [8].

To bridge this gap, institutions are urged to develop adaptive systems or integrate them into existing platforms. For example, the "Chinese Alliance" could use adaptive learning to reduce cognitive load and help learners find suitable courses. Developing adaptive systems requires careful consideration of domain-specific and strategic models to provide tailored knowledge and exercises for diverse learners.

4.3.5 Expanding reality empowers international Chinese education

Technology limitations hinder Chinese communication improvement. Teachers and students

require high digital literacy and face acceptance issues. Physical discomforts like dizziness and visual strain occur. High costs burden developing countries.

To expand reality tech in international Chinese education, deepen its application. Mobile communication and somatosensory advancements solve past issues. To expand reality technology in international Chinese education and deepen its application, mobile communication and somatosensory advancements have addressed past issues. We should develop digital resources such as XR textbooks, MOOCs, and virtual simulations. Furthermore, promoting the international Chinese education meta-universe by leveraging digital twins allows learners to enter immersive 3D Chinese environments with personalized avatars, enabling virtual interactions. This enhances the social learning experience, making Chinese learning both focused and enjoyable. Let's boost XR and visual immersion technology in international Chinese education.

4.3.6 Mixed learning Spaces enable international Chinese education

Teachers and students should utilize teaching space effectively. Hybrid learning spaces require significant investment in hardware like smart screens and terminals. In Chinese education transformation, mixed learning spaces like smart classrooms, reading rooms, and writing centers are needed to address challenges like sending teachers overseas and weak online teacher-student interaction. Mixed spaces change the Chinese teaching environment with features: rich media devices for 3D teaching, collaborative teaching by domestic and overseas teachers, open classroom space for cultural activities, and built-in Chinese learning resources for interactive teaching games and cognitive support.

5. Conclusion

From the perspective of "why, where and how to turn", this paper analyzes the driving force, goals and practical logic of the digital transformation of international Chinese education. At the same time, the internal and external factors brought about by technological change and educational development are deeply analyzed, and the nature, characteristics and development direction of the digital transformation of international Chinese education are revealed. In addition, the paper also predicts six key technologies that will have an important impact on the digital transformation of international Chinese education and their potential impact. In the process of digital transformation, education ecology and order are gradually taking shape, and online and offline education are integrating with each other. In the future, international Chinese education should keep up with the global trend of digital transformation, make full use of the potential of digital technology, promote systematic and deep-level innovation and change, make digital transformation become a powerful driving force leading the high-quality development of international Chinese education, and provide Chinese wisdom and solutions for global language education.

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