

Empowering Education in Western China with AI Technology: A Case Study from Gansu Province

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Abstract. The present study is an exploratory case study of the role of artificial intelligence (AI) in the digital transformation of education throughout Western China, resulting from a summer 2025 social practice project with the No.3 Middle School in Zhenyuan County, Gansu Province. The study analyses AI-based personalized teaching, teacher development, and resource-sharing programmes to argue that these technologies will be critical for providing a relatively fair allocation of teaching resources in an area with extreme imbalances in teaching resources. Such technologies, it is argued, can fulfil a dual role by not only providing a direct interface with the students but also serving as a very effective tool for the professional development of teachers, thereby offering a further mechanism for teaching fairness. The study also discusses certain arising difficulties, such as infrastructural deficiencies, teacher training deficiencies, and a lack of locally specific instructional resources. It concludes with suggestions for addressing these findings.

Keywords: Artificial Intelligence; Educational Equity; Rural Education (China); Digital Transformation; Case Study.

1. Introduction

For a long time, Western China has been plagued by development problems related to a shortage of educational resources and teachers. However, the rapid development of technology in the field of artificial intelligence (AI) offers a new path for improving the quality of education and equalizing the education opportunities available to the different regions, such as Western China [1]. In the summer of 2025, an AI-based education system was installed at the No.3 Middle School of Zhenyuan County... during the "Angel Love Xingzhi Research and Study Camp" with the help of a volunteer team from the U.S. This system provided a different educational opportunity to the students. The digital education program in the city of Qingyang presents many valuable insights into applying AI to education in Western China.

Based on the practices observed in Zhenyuan No. 3 Middle School, combined with a review of similar case studies in other western regions, this paper discusses the pathways, achievements, and challenges of using AI to improve educational quality. Extant studies have confirmed that intelligent teaching systems, "dual-teacher" classes, and cloud-based professional development systems have positive effects on improving the quality and sustainability of education in various contexts [2, 3].

2. Background and Methodology

2.1. Literature Review: Digital Reform and Educational Equity

The interruption to teaching continuity during the COVID-19 epidemic, combined with physical distancing measures, highlighted structural deficiencies in the educational system. This situation exposed an urgent need for educational equity and a digital transformation of the educational sector, driven by the global digital wave [1]. Since the 1990's the socio-economic restructuring induced by the information technology revolution has radically changed the systems of production and the various systems of political organization, promoting the transformation of education from traditional systems to intelligent and personalized ones [4]. This digital transformation of the educational system was enormously accelerated during the COVID-19 epidemic, which forced the education systems and

institutions into digitalization and the use of online systems and platforms on a very wide scale to maintain continuity and the conditions for teaching [5].

The literature states that the impetus for digital reform stems not only from technological progress but also from the challenges of uneven... and the diverse needs of learners. Traditional education cannot meet the qualification needs in the global labor market [3]. For example, an OECD report emphasizes that digital means are used to bridge urban rural imbalances of education and to help in achieving the goals of sustainable development [6]. In this context, digital reform of education tends to alter educational paradigms, to intensify resource allocation by means of technologies such as big data, AI and cloud computing and improve educational effectiveness [7].

The importance of it manifests itself in several aspects. First, in regard to improving levels of learning, digital reforms promote interactive pedagogical methods. Research shows that the implementation of digital means increases student participation and improves retention of the contents of the lesson [8]. Second, there is an increase in equity in education. Distance education environments allow students living in distant geographical areas to take advantage of quality resources and thus contribute to the reduction of social stratification [9]. Thirdly, from the point of view of education, digital reforms produce digital literacy and usher in a professional evolution of educators. Literature data show that improvements in the digital sphere among teachers improve the internal dynamics of classes indirectly [10]. Furthermore, one may not underestimate the importance of this reform for education governance. It enables precise evaluation and policy optimization through data-driven decision-making and assists in the formation of a lifelong learning system [11]. However, its implementation is also imperiled by deficiencies in infrastructure, as well as the need for data privacy, for which corresponding policies are necessary for sustainability [12]. Thus, the metamorphosis produced by digital means in education is more than a use of technology; it is an innovation engine for equity in education, assisting the formation of a learning ecology amenable to the social reality emergent in the future [13].

2.2. Context: Educational Challenges in Western China

Education development in Western China is often hampered by a lack of teachers, underdevelopment, and poor infrastructure. Zhenyuan County exemplified the 'Three Hardships' spirit in its educational history but is presently struggling with limited resources and challenges in reform and quality assurance.

AI technology promises a revolution in academic development in western areas, by solving these problems through three main functions: individualized teaching support, increased teaching effectiveness, and joint use of resources for learning. AI can intelligently diagnose students' deficiencies in learning and prescribe remedial measures tailored for them. AI-based teaching aids can significantly reduce teachers' workload, leaving them free to devote more time to organizing their teaching and interacting with their students. Cloud-based technology can break down barriers of geography, thereby allowing students in western China access to high-quality teaching materials from eastern China.

National policies provide strong support for the informatization of education. In recent times, the Ministry of Education has issued documents such as the "Informatization of Education 2.0 Action Plan", clarifying the direction of informatization. In February 2024, it released 184 bases of AI education in primary and secondary schools to promote the application of AI and provide institutional support for the digitalization of education reform in western China.

2.3. Research Methodology

This paper uses a qualitative exploratory case study method. The primary case study is the No.3 Middle School of Zhenyuan County. It was chosen because it is a key school in a county in Western China that served as a pilot for schools adopting educational AI systems. Data was collected during a weeklong social practice of education in the summer of 2025. Data was gathered through: (1) Participatory Observation, where the researcher participated in the "Angel Love Xingzhi Research

and Study Camp” and observed AI tools being utilized in classrooms, and (2) Informal Discussions with student participants, instructors, teachers, local area workers and volunteers in order to get a qualitative understanding of the reactions to the program being implemented and the problems in its implementation. This approach enables access to the detailed information that is required in order to fully understand the phenomenon in its correct context.

3. Case Study Findings: AI Implementation in Zhenyuan

3.1. Project Overview

In the summer of 2025, Zhenyuan County No. 3 Middle School, in Qingyang City, Gansu Province, launched a one-week social practice activity, jointly organized by volunteers from the United States. This activity is aimed at improving... through diversified, AI-assisted teaching methods with the goal of developing a new model of learning and interaction for teachers and students. During the week of activity, the volunteers used the National Smart Education Platform for Primary and Secondary Schools and various intelligent teaching tools, carrying out a series of teaching activities.

The "Zhenyuan County No. 3 Middle School" is a local exemplary school for science and technology education that provides excellent supporting conditions for this kind of activity. In June 2025, it launched the "China Mobile Science and Technology Museum" traveling exhibition, which displayed its achievements in the education of science and technology. At the launch ceremony the principal of the school said that the activities of science and technology can cultivate interest in science on the part of the young people and stimulate their innovative thinking, thus supplying an excellent chance for both teachers and pupils to gain experience in science.

3.2. Application of AI Technology in Teaching

In this teaching practice, volunteers employed several forms of AI in teaching support roles.

3.2.1. Personalized Tutoring

Employing the model of "Jiuzhang Mathematics Intelligent Diagnosis" that is on National Smart Education Platform for primary and secondary schools, volunteers could realize diagnosis of pupils effectually. The system timely identified the students' weak points and provided targeted exercises and learning solutions, which raised self-learning effectiveness.

3.2.2. The “Dual-Teacher” Model

This model is an innovative practice that combines “online AI teachers + offline human teachers.” For instance, in English classes, volunteers combined the platform’s “point-and-read” function with quality teaching videos, capitalizing on the strengths of information transmission by the AI system while preserving the emotional teacher-student interaction facilitated by the offline teacher.

3.2.3. Project-Based Learning (PBL) and Scientific Practice

By making use of the "Science Experiment Teaching Scenario" on the Smart Education Cloud Platform's AI assistant, volunteers developed an action plan for PBL on "Ecological Issues in Zhenyuan County." Such an action plan helps to effectively inculcate hands-on skills, creativity, and a sense of social responsibility in the students.

3.3. Observed Results and Impacts

Following the one-week of AI collaborative teaching, both the teachers and students at Zhenyuan County No. 3 Middle School observed the effects of AI-supported educational assistance, and its initial findings are provided in Table 1.

Table 1. Main AI applications and effects of teaching activities in Zhenyuan No. 3 Middle School.

Application Areas	Specific technical tools	Implementation Method	Observed Effect
Personalized Learning	Jiuzhang Mathematical Intelligent Diagnostic Model	Identify weak points in knowledge + accurately push exercises	Students' learning efficiency appeared to improve
Dual-teacher classroom	National platform point reading function + high-quality teaching clips	Online AI teacher + offline human teacher collaboration	Optimize teaching effects and enhance classroom interactivity
Scientific Practice Faculty Development	Scientific Experiment AI Assistant + Project Learning AI teaching and research platform + cloud training	Field research + data analysis Online training + practical guidance	Improve students' scientific literacy and practical ability Improvement of teachers' professional abilities

3.3.1. Increased Student Engagement

The Introduction of AI technology in the learning session made this session much more colorful, interesting and stimulating on the part of the students and induced students' interest in acquiring experience and knowledge. Students attending the course showed immense interest and curiosity in gaining knowledge, particularly in the investigations and scientific experiments carried out during the teaching sessions.

3.3.2. Transforming Teaching Concepts for Teachers

By observing and taking part in teaching activities supported by AI technology, local teachers started to change their teaching philosophies and acquired new methods of teaching. Informal discussions revealed that some teachers discovered the importance of technology in education and were willing to look into the use of technology such as AI in the methods of their own teaching.

3.3.3. Library with Rich Education Resources

The event provided the school with a wide variety of online education resources, which included teaching software based on artificial intelligence, course modules, and scientific experiment software. These resources would even be able to help sustain longer-term teaching at the school.

4. Analysis of Challenges and Countermeasures

While AI technology has achieved significant results in supporting teaching at Zhenyuan No. 3 Middle School, the digital transformation of education in western China still faces numerous challenges. Based on field observations and research, the following key challenges were identified and proposed corresponding solutions (Table 2), drawing insights from emerging practices in data-driven educational reform [16].

Table 2. Challenges and coping strategies faced by digital education in western China.

Challenge Type	Specific manifestations	Coping strategies	Illustrative Strategies
Infrastructure	Insufficient network coverage and aging equipment	Government-led + corporate participation + school application	Data-driven infrastructure planning
Teacher Capacity	Low digital literacy and lack of application ability	Tiered training + backbone leadership + full staff improvement	Tiered, data-informed training models
Resource Adaptation	Out of touch with local needs and culture	Localized development + micro-topic research	Localized micro-topic development
Continuous Operations	Insufficient post-maintenance and difficult to sustain	Establish a special team + standardized management + assessment mechanism	Standardized assessment mechanisms

4.1. Insufficient Infrastructure Coverage

At this stage, various regions of western China have unstable network coverage and aging hardware, which make it difficult to meet the basic requirements of AI education applications. For example, it is observed that some rural schools in Zhenyuan County still have problems such as slow speed in the internet connection and delayed updating of their hardware, which severely obstructs their in-depth application of AI technology.

There is a need for increased investment in networks and hardware, as well as a co-construction mechanism which is led by government with participation from enterprises and applications in schools. Successful digital transformation requires a solid foundation of data empowerment, which links infrastructure enhancements with pedagogical applications.

4.2. Teachers' Lack of Digital Literacy and Application Capabilities

Many teaching staff in western China were found to have low digital literacy, were intimidated by the available AI tools, and were unable to perform sophisticated applications. Conversations with some teachers in Zhenyuan County suggested that they could only perform basic tasks and had little understanding of the possibilities of AI from the point of view of teachers.

In order to efficiently develop digital literacy and capabilities in the application of artificial intelligence, there is an imperative need to establish a teacher education system, which should have a multi-tiered approach. This approach, a core-led, all-staff-enhancement strategy, is based on a systematic process of using data-informed designs to meet the professional development needs of the institutions.

4.3. Insufficient Integration of High-Quality Resources and Localized Courses

The existing teaching resources for AI education appear to be mismatched with the requirements in western China in terms of relevancy and specificity. During the teaching stint at the Zhenyuan No. 3 Middle School, it was observed that a number of teaching resources required adaptation to be aligned with the local teaching environment.

Emphasis should be placed on the development of localized curriculum resources for AI, which can match their textbooks and culture in terms of the learning environment in western China. This aligns with data empowerment practices, which advocate for developing localized "micro-topics" and "case studies" to ensure relevancy.

4.4. Insufficient Continuous Operation and Maintenance Mechanisms

AI education projects are often difficult to sustain because of poor post-operation and maintenance; and schools in the western region generally lack funds and technical support. To solve this a regional cooperative operation and maintenance mechanism should be set in place and a professional technical support team should be established. This implies the establishment of a standardized management and assessment mechanism to carry through the transition plans from the possession of equipment' to its effective use; ensuring the long-term stability of operational effective use of the AI equipment types required.

5. Future Outlook

Based on the teaching support practices at Zhenyuan No. 3 Middle School and the digital education experience of western China, a path can be outlined for AI technology to empower the sustainable development of education in western China. In the future, the application of AI technology in western education will become more in-depth and extensive, forming a force for systemic transformation.

5.1. Deep Integration of Technological Evolution and Educational Scenarios

The integration between AI technology and education scenarios is anticipated to drive the formulation of intelligent and personalized education models. GenAI applications may also gain

prominence in areas such as the "human-machine dual-teacher teaching mode." Research on AIGC-supported "Dual-Teacher Classroom" collaborative learning paradigms helps build a cooperation mechanism (such as 'teach with teachers, aid with AI, and teach for students' that makes a significant impact on teaching efficiency and personalized teaching [17]. Intelligent teaching environments will also gain momentum. For example, Zhangye No. 1 Middle School's 'AI Smart Classroom' project symbolizes the rising penetration level within the local education industry for AI technology [18].

5.2. Ecosystem Construction and Multi-party Collaboration

In order to facilitate the application of artificial intelligence technology to educational work, it is essential that the government, schools, enterprises, higher education institutions and scientific research organizations jointly promote the cooperative education and promote the AI + education. For example, the Chongqing Municipal Education Commission issued a "Notice" on how to promote the development of "AI +" work in order to accelerate the construction of vocational schools and improve the key abilities of vocational schools, such as the situation of this region with collaboration pattern, which will have an important impact on the future development of education. [19]. In addition, disseminating research results can help achieve a balance between basic and higher education. For example, the 2023 Teacher Development Research Program project by the 'Shaanxi Teacher Development Research Institute' demonstrates the application of such research [20].

5.3. Policy support and institutional mechanism innovation

Policy support and innovative systems and mechanisms will be the key elements ensuring the sustainable development of AI-enabled education in western China. It is necessary to have good top-level design and good policy guidance. Zhenyuan has made reforms to the systems of the appointment of principals and teachers, the performance management systems, in order to lessen the bureaucracy, selecting outstanding talents and providing organizing support of digital education [21]. Funds and performance evaluation should also be strengthened; measures are being taken to establish special funds and a scientific evaluation system. Zhenyuan County has implemented these institutional reforms, which have created enthusiasm and improved the implementation of digital education [21].

6. Conclusion

The summer practice at the No.3 Middle School in Zhenyuan County, provided valuable insights into the pathways, accomplishments, and difficulties of education transformation in western China with the aid of AI technology. It was observed that AI can enhance education in the western China through personalized teaching support, dual-teacher class models, and project-based teaching. Despite the progress achieved in the digital transformation of education in western China, there remain challenges with regard to infrastructure coverage, teachers' digital literacy, the integration of local resources, as well as sustainable operation and maintenance. This study suggests a need for targeted strategies in infrastructural investment, teacher development, localization of resources, and operational capacity building, drawing from emerging principles of data-driven reform. In the coming years, the role of AI technology in education in western China will become even more paramount. By deeply integrating with educational scenarios, constructing a multi-stakeholder collaborative ecosystem, and providing supportive policies and innovations, the sustainable development of education in western China is achievable. Applying AI technology to empower education in western China is more than just a technical application; it is an education revolution that can usher in new ideas, theories, and opportunities for education in western China, empowering each student to achieve their potential.

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