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How Rural Teachers Navigate Generative AI: A Narrative Inquiry with Two Primary School Educators in Guangdong, China

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Abstract

Against the backdrop of the technological wave and the strategic push for a "Digital Strong Province", generative artificial intelligence (Gen AI) is profoundly impacting educational practice, presenting new challenges, particularly to the professional competence of rural teachers. This study employs a narrative research approach, using in-depth interviews to delineate the complete journey of "encounter" and "adaptation" with Gen AI experienced by two rural primary school mathematics teachers. The findings reveal that teachers' technology integration is not a linear process of adoption but rather a highly contextualized, continuously evolving practice of "self-adaptation". Specifically, Teacher A exemplifies a path of "internally-driven exploration and pedagogical innovation", proactively integrating technology into teaching to stimulate students' higher-order thinking while simultaneously engaging in ethical reflection. In contrast, Teacher B follows a path of "externally-triggered pragmatism and efficiency optimization", guided by the aim to solve specific teaching pain points, and carefully weighs technological barriers against efficiency gains. Despite their divergent paths and foci, both teachers face the tension between individual agency and insufficient structural support, exposing the existing "fractures" in the current teacher support system regarding its precision, continuity, and systematic nature. Consequently, this study argues that fostering the digital literacy of rural teachers urgently requires a shift from providing standardized training towards constructing an ecological support system capable of responding to differentiated needs, offering sustained, scenario-based support, and ultimately empowering teachers' professional growth.

Keywords

Rural Teachers; Digital Literacy; Generative Artificial Intelligence; Narrative Research; Chinese Case.

1. Introduction

Amidst the tide of technology reshaping society, generative artificial intelligence has emerged as a pivotal force driving educational transformation. From ChatGPT to DeepSeek, these technologies not only herald a shift in educational paradigms but also impose new demands on teacher competencies. At the policy level, "digital education" continues to advance; however, at the practical level, the question of how technology can be genuinely integrated into classrooms—particularly in resource-constrained rural schools—remains an issue requiring in-depth exploration.

Existing research predominantly focuses on generalized patterns of technology application, often overlooking the individual experiential worlds of teachers. Shifting the perspective from "whether to apply" to "how to experience" leads to deeper inquiries: How do teachers in specific rural educational contexts "encounter" generative AI? How do they engage in "self-adaptation"

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throughout this process? "Encounter" emphasizes the interactive experience between teachers as professional agents and new technologies, while "adaptation" refers to the proactive adjustments they make in response to emerging challenges. These two concepts are central to understanding the dynamic process of teachers' technology integration.

This study adopts a narrative research approach. Through in-depth interviews with two rural primary school mathematics teachers, it aims to: first, present the complete trajectory of their engagement with, understanding of, and application of generative AI; second, analyze the concrete manifestations of their "self-adaptation" and its interaction with their professional identities; and third, based on these micro-level experiences, provide an empirical foundation for understanding the authentic developmental patterns of rural teachers' digital literacy and for constructing an effective support system.

2. Research Design and Methods: Listening to and Presenting Stories

2.1. Methodological Choice: Investigating Teacher Technology Integration through Narrative Inquiry

To deeply understand the complex process of teachers' "encounter" and "self-adaptation" with generative artificial intelligence, this study employs a narrative research approach. This method does not view teachers as passive recipients of technology. Instead, by listening to their personal accounts, it seeks to enter their experiential world, capturing the meaning-making, emotional shifts, and identity negotiation behind their actions. Narrative inquiry emphasizes the temporal and plot-based nature of experience, enabling a vivid portrayal of the dynamic process of teachers' technology integration. It addresses a gap in existing educational technology research, which often focuses on macro-level factors while neglecting the deep-seated experiences of individuals, thereby establishing its unique methodological appropriateness for this study.

2.2. Research Participants and Data: In-depth Narratives of Two Rural Teachers

Through purposive sampling, two representative rural primary school mathematics teachers were selected. Teacher A, male, holds a bachelor's degree and has two years of teaching experience. He encountered the technology through self-directed exploration, positioning him as an "internally driven explorer." Teacher B, female, also holds a bachelor's degree but has one year of teaching experience. Her initial exposure to the technology occurred primarily through training, and she maintains the stance of an "externally prompted practitioner." The contrast between these two individuals aids in revealing the diversity of teacher technology acceptance.

Data were primarily collected through semi-structured in-depth interviews (each lasting 40-60 minutes), centered around dimensions of cognition, application, and challenges. The interviews were audio-recorded, transcribed verbatim, and supplemented with relevant teaching materials. During analysis, the researcher first immersed in the text to grasp the holistic narrative, then identified key events and turning points. Subsequently, the narratives were reconstructed according to chronological and experiential logic, culminating in thematic extraction. Throughout this process, emphasis was placed on preserving and foregrounding the teachers' own words.

2.3. Research Quality and Ethics: Rigor and Reflexivity

To ensure research quality, detailed documentation was maintained to guarantee the traceability of the research process. Additionally, "member checking" was employed by returning preliminary interpretations to the teachers for verification, thereby enhancing validity. This study does not seek statistical generalizability; rather, it aims to achieve

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"interpretive generalization" through thick description, fostering resonance and deep understanding among readers.

Regarding ethics, the principles of informed consent were strictly followed. Pseudonyms are used to protect participant identities, and all data are handled confidentially. The researcher maintained a reflexive stance throughout, keeping a research journal and engaging in discussions with peers to clarify how personal preconceptions might influence the interpretation process. Consequently, while approaching the teachers' stories with due prudence and respect, this study aims to use these two concrete and profound cases to open a window into understanding the complexities of rural teachers' digital practices.

3. Teacher A's Narrative: Active Exploration, Innovation, and Reflection

Teacher A's story begins with proactive inquiry. As a mathematics teacher holding a bachelor's degree from a metropolitan university and with two years of teaching experience in a rural primary school, he relied on his own information literacy to actively follow developments in generative artificial intelligence through online news and educational public accounts. "My first impression was that it felt truly magical," he recalled. "It was as if a whole new world of knowledge and creativity had opened up." This sense of "wonder," rooted in self-directed exploration, framed the technology as a "gateway to a new world" full of possibilities, setting a positive and open tone for his subsequent engagement with it.

3.1. Encounter: Generative AI as a "Gateway to a New World"

Teacher A's encounter followed a path of "self-directed exploration/ cognitive construction/ attitude formation." He learned about the technology through self-guided study and, drawing on his identity as an educator, constructed its meaning as an enabling tool capable of "rapidly generating various types of content" and stimulating "creativity" He expressed clear "support" for its application and optimistically likened it to an educational "revolutionary" force, similar to multimedia devices. This proactive and positive cognitive framing laid the psychological groundwork for his subsequent integration of the technology into his teaching.

3.2. Application: Integrating Technology from Problem-Solving Approaches to Themed Class Meetings

Teacher A's application of the technology was closely aligned with core teaching needs, demonstrating a distinct "problem-oriented" characteristic. In mathematics problem-solving instruction, he utilized AI to generate diverse problem-solving approaches and steps, designing a teaching process of "students think first → then compare with AI-generated solutions" to stimulate students' critical thinking and creativity. For instance, when facing a challenging problem, he would present multiple AI-generated solution methods, guiding students to find an approach suitable for them through comparison, thereby enlivening the classroom atmosphere. Furthermore, when preparing for an environmental protection-themed class meeting, he used AI to source case studies and activity suggestions as material, which, after professional integration, achieved positive educational outcomes. The underlying logic of his application remained consistent: guided by teaching objectives, AI provided material and ideas, which the teacher then professionally designed into deep learning activities. Throughout this process, the technology consistently served pedagogical innovation.

3.3. Adaptation: Balancing Efficiency Gains with Ethical Concerns

After a period of deep engagement, Teacher A underwent an adaptation from "enthusiastic application" to "reflective equilibrium." He encountered technical challenges such as unfriendly user interfaces and the need for additional time to familiarize himself with the tools. More significantly, he had to "screen and modify" the AI-generated content for accuracy and

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appropriateness, which demanded a higher level of subject-specific knowledge. The most profound adaptation, however, occurred at the level of pedagogical ethics. He expressed concern about how to guide students to avoid "plagiarism or over-reliance" and to protect their capacity for "independent thinking" In response, he strengthened guidance and supervision, designing activities such as comparative analysis to transform technological risks into opportunities for fostering critical thinking. Thus, he evolved from a technology user into an examiner of educational ethics and a manager of its boundaries, continuously seeking a balance between efficiency and ethical considerations.

3.4. Aspiration: A Call for Systematic Professional Development

Drawing from his firsthand experience, Teacher A offered critiques and expectations regarding the existing support system. While acknowledging the benefits of school-organized training, he pointed out its shortcomings: the content lacked depth and practical relevance, was deficient in scenario-based cases and hands-on guidance, and the sessions were too brief for genuine mastery. Most critically, he noted the absence of "follow-up and support after training."

He advocated for a "systematic professional development" support system, which would include: more classroom-relevant, case-based, and workshop-style training; sustainable communities of practice or channels for expert support; and institutional accommodation and incentives from the school in terms of time and resources. His narrative highlights both individual agency and innovative courage, while simultaneously reflecting the transformative pressure facing teacher professional development systems in the technological era. Effectively supporting teachers in leveraging technology necessitates the construction of an ecosystem capable of responding to their complex needs and fostering their continuous growth.

4. Teacher B’s Narrative: Pragmatic Trial and Negotiation

In contrast to Teacher A’s internally driven exploration, Teacher B’s encounter with generative AI began from a more common and passive starting point. As a mathematics teacher with only one year of experience in a township primary school, her daily routine was filled with the myriad tasks of teaching and classroom management. Regarding the forefront of educational technology, she frankly admitted she “knew relatively little.” Her initial understanding came from “some training sessions organized by the school,” which gave her a “superficial” grasp of the term but left her feeling it was “somewhat unfamiliar” and “seldom used in current teaching.” This sense of “unfamiliarity” and “detachment” formed the backdrop of her technological awareness.

For her, generative AI was not a “door” she actively sought to open, but rather resembled a “new type of tool” presented in training lectures, its functions still ambiguous. While “novel,” it seemed separated by an invisible barrier from the familiar daily rhythm of lesson preparation, teaching, and grading. Her story represents a more prevalent condition within the broader teaching community: encountering new technology driven by external systems (school, policy), approaching it with a mix of curiosity and doubt, and cautiously weighing the pace of experimentation against concrete work demands and real competency thresholds.

4.1. Encounter: Generative AI as an "Unfamiliar Assistant"

Teacher B's technological cognition stemmed from passive input. Her initial exposure through school training left her feeling both "unfamiliar" and "novel." She pragmatically defined the role of the technology as a context-dependent "assistant," forming a stark contrast to Teacher A's vision of it as an "innovator." Underlying her stance of "pragmatic neutrality" was a cost-benefit analysis grounded in her established workflow. Only when the technology could directly address high-value pain points would this "unfamiliar assistant" be genuinely activated.

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4.2. Application: Addressing Specific Pain Points in Geometry Teaching and Classroom Management

Teacher B's application strictly followed a "pain-point-driven" logic. She focused on two core scenarios: in geometry instruction, she used visualization tools to generate rotatable 3D graphics, solving the difficulty of traditional blackboard writing in conveying spatial dimensionality, which significantly enhanced teaching intuitiveness; in classroom management, she employed a programmatic roll-call system to improve efficiency, while its perceived "sophistication" increased student engagement. These "point-based" applications exhibited clear problem-solving characteristics. The technology, serving as an "efficiency tool," was precisely embedded into existing teaching workflows, achieving localized optimization with minimal cognitive cost. This reflects the pragmatic choices of a novice teacher.

4.3. Adaptation: Navigating Between Technical Barriers and Efficiency Gains

The application process was accompanied by significant "adaptation" challenges. Teacher B faced fundamental "technology access" barriers: a lack of guidance, complex operations, and frequent hardware/software compatibility issues. Greater pressure stemmed from the ongoing trade-off between learning costs and benefits—mastering new tools "required a considerable amount of time," increasing her lesson preparation burden. Consequently, her application was highly selective; she was only willing to invest effort when the benefits were substantial (e.g., geometry visualization). She repeatedly weighed the desire to use the technology against its difficulty, adopting a "goal-oriented, limited investment" strategy. This resulted in a fragmented and uneven integration of technology, with varying depths of application across different areas.

4.4. Expectation: A Call for a "Ready-to-Use" Support System

Based on her own difficulties, Teacher B advocated for establishing a "ready-to-use" support system. She pointed out that current training involves "many lectures but little hands-on practice," has low alignment with actual teaching scenarios, and suffers from insufficient equipment support, resulting in an "ad hoc" acquisition of skills. She proposed a key suggestion: integrate digital literacy support into pre-service education, enabling teachers to become familiar with available tools before entering the profession. This would help them develop a "teaching toolkit" awareness, allowing for quick matching and application in their work rather than starting "from scratch." This demand reveals a "supply-demand mismatch" in the current support system—there is a disconnect between what the system provides and the real, granular needs of frontline teachers. Effective support must act as precise, timely, and low-cognitive-load "scaffolding" to transform the "unfamiliar assistant" into a genuine "teaching partner."

5. Discussion: The Dilemmas and Essence of Digital Literacy Development from Dual Perspectives

The narratives of Teacher A and Teacher B reveal that the essence of teachers' digital literacy is a tension-filled process of "adaptation in practice." Through comparison, we can gain a deeper understanding of the professional development challenges faced by rural teachers in the digital age.

5.1. Two Encounters: Internally Driven Exploration vs. Externally Triggered Paths to Technological Cognition

The "encounter" stories of the two teachers represent two distinct paths of technological cognition formation. Teacher A's path is one of internally driven exploration. He proactively seeks information and engages in meaning-making, developing an emotional commitment to the technology. In contrast, Teacher B's path is one of externally triggered engagement. Her understanding stems from passive training, and she maintains a stance of "pragmatic

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neutrality" towards the technology. This divergence significantly influences the depth of their subsequent practices, suggesting that promoting technology integration must move beyond singular training sessions to focus on nurturing teachers' intrinsic motivation for exploration.

5.2. Two Adaptations: Diverging Practical Logics of Pedagogical Innovation and Efficiency Optimization

The foci of the two teachers' adaptations are markedly different. Teacher A's adaptation centers on pedagogical innovation and ethical reflection. He assumes the role of a "designer," committed to transforming AI-generated content into activities that foster students' higher-order thinking. In contrast, Teacher B's adaptation concentrates on technological access and efficiency optimization. Acting as a "strategic user," her decisions are guided by a core consideration of "cost-effectiveness." This divergence reveals the multi-layered nature of digital literacy development: while Teacher B grapples with the challenges of "functional literacy," Teacher A's practice points toward "transformative literacy" and "critical literacy".

5.3. Shared Dilemma: The Tension Between Individual Agency and Insufficient Structural Support

Despite their different paths, both teachers experience the tension between their individual agency and insufficient structural support. This tension manifests in several ways: a misalignment between the training provided and actual needs, fragmented and unsustainable support systems, and constraints imposed by inadequate infrastructure and resources. The current support system exhibits significant "gaps," often leaving teachers in a state of "solitary exploration."

Research indicates that teachers' journey toward technology integration depends not only on personal capability but also on an ecosystem capable of providing sustained and targeted support. When such a system is absent, teachers' agency becomes consumed in overcoming basic obstacles, hindering progress toward pedagogical innovation. This structural deficit in support constitutes a critical bottleneck constraining the enhancement of digital literacy among rural teachers.

6. Conclusion

This study, through narrative inquiry, provides an in-depth portrayal of the complete journey of two rural teachers' interaction with generative artificial intelligence. The findings reveal that teachers' integration of technology constitutes a highly contextualized practice of "self-adaptation," manifested across three dimensions. At the cognitive level, it involves developing distinct paths ranging from "internally driven exploration" to "externally prompted pragmatism." At the practical level, it entails employing differentiated strategies from "pedagogical innovation" to "efficiency optimization." At the professional level, it encompasses continuous reflection on the profound tensions—such as those between ethics and efficiency—provoked by technology. The core of digital literacy lies precisely in this dynamic "wisdom of adaptation" for confronting challenges.

However, the experiences of both teachers collectively reveal significant "fissures" in the support system: standardized training misaligns with teachers' evolving needs, one-off initiatives lack sustainability, and barriers in accessing basic resources deplete enthusiasm for exploration. This indicates that the development of teachers' digital literacy fundamentally depends on a professional ecosystem capable of responding to complex demands and supporting sustained growth.

Therefore, future support for rural teachers' professional development should shift towards constructing a precise and sustainable support ecosystem. This requires: providing tiered and categorized support strategies to meet the distinct needs of "explorers" for innovation and

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"practitioners" for workload reduction; transforming teacher development from a "lecture-based transfusion" model to a "collaborative regeneration" approach grounded in communities of practice; deeply integrating digital literacy cultivation into pre-service teacher education to establish a "technology-pedagogy" integration mindset; and redirecting policy focus from hardware provision to fostering an institutional and cultural environment that encourages exploration and provides safeguards.

Through the in-depth narratives of these two teachers, this study offers a valuable interpretive perspective for understanding the complexity of rural teachers' practices in the AI era. Only by constructing a support ecosystem centered on teachers and their complex practices can technology be transformed from a potential "burden" into a widespread source of "empowerment," thereby better safeguarding and nurturing the field of rural education in the digital age.

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