

# Cultivation Strategies of Digital Intelligence Literacy Among Pre-Service English Teachers at Local Universities

CHEN Lijuan

Zhoukou Normal University, Zhoukou, China

Educational digitalization and artificial intelligence (AI) development in China have created new demands for pre-service English teacher education. Focusing on local universities, this paper clarifies the basic meaning of digital intelligence literacy, identifies five major problems in its cultivation, and proposes five corresponding strategies. It argues that digital intelligence literacy should be developed as an integrated professional capacity rather than as isolated tool skills.

*Keywords:* digital intelligence literacy, pre-service English teachers, local universities

## Introduction

Digital transformation is reshaping language education. Online platforms, speech recognition tools, corpus technologies, learning analytics, and generative artificial intelligence (AI) are changing not just what English teachers do, but also what they need to understand and handle ethically. In China, policies, such as Education Informatization 2.0, the Teacher Digital Literacy Standard, and the “AI + Education” Action Plan have made digital competence a priority for institutions. These trends and policies pose substantial pressure on local universities—which cultivate many English teachers for basic education. Yet, these universities often struggle with insufficient resources, uneven faculty expertise, and weak interdisciplinary support. Existing frameworks, such as technological pedagogical content knowledge (TPACK) and DigCompEdu are helpful, but they do not fully capture the subject-specific demands of English teaching or the actual conditions of local universities. This paper addresses two questions:

1. What problems hinder the cultivation of digital intelligence literacy at local universities?
2. What strategies can effectively foster such literacy of pre-service English teachers at these institutions?

## Core Components of Digital Intelligence Literacy

Digital intelligence literacy among pre-service English teachers refers to “an integrated professional competence that enables future English teachers to understand, evaluate, apply, and regulate digital and intelligent technologies in language education.” In the context of local universities, this literacy should not be regarded as a set of isolated tool-operation skills. Rather, it provides a conceptual basis for understanding how pre-service

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CHEN Lijuan, M.A., associate professor, College of Foreign Languages, Zhoukou Normal University, Zhoukou, China.

English teachers can adapt to educational digitalization and AI-supported teaching while maintaining pedagogical judgment and ethical responsibility (Mishra & Koehler, 2006; Mandinach & Gummer, 2016; Ng et al., 2021).

Specifically, digital intelligence literacy can be understood through five interrelated dimensions.

The first is digital-intelligence awareness, which means recognizing the influence of digitalization and artificial intelligence on English teaching, learning interaction, assessment, and teacher roles. Such awareness helps pre-service teachers view technology critically and humanistically instead of using it only for convenience.

The second is technological application competence, referring to “The ability to select and use digital platforms, online resources, AI tools, and multimodal technologies according to teaching needs.” This competence emphasizes appropriate and critical use rather than mechanical operation (Groff, 2013).

The third is data literacy, which involves the ability to interpret learning-related data, such as online participation, test results, writing records, or platform-generated feedback, and to use such evidence to support instructional decisions. However, data should be combined with contextual understanding rather than treated as a complete representation of language learning (Mandinach & Gummer, 2016).

The fourth dimension is pedagogical integration competence. It concerns the ability to connect digital and intelligent technologies with English teaching objectives, classroom tasks, learner differences, assessment, and reflection. For pre-service English teachers, this dimension is especially important, because the value of technology depends on whether it can support meaningful language learning. This view is consistent with the TPACK framework, which emphasizes the integration of technological, pedagogical, and content knowledge in effective teaching (Mishra & Koehler, 2006).

The fifth dimension is digital ethics and responsibility, including privacy protection, copyright awareness, academic integrity, responsible AI use, fairness, and sensitivity to algorithmic bias. These ethical concerns are essential in English teaching, because students’ texts, voices, images, and learning data may all be involved in digital environments.

In summary, these five dimensions, which clarify what digital intelligence literacy means and constitute the core components of this concept, provide a concrete conceptual foundation that can be directly applied to examining practical situations. Based on this foundation, the following section will further analyze the problems existing in local universities and propose feasible strategies for cultivating digital intelligence literacy among pre-service teachers at local universities.

## **Problems in Cultivating Digital Intelligence Literacy Among**

### **Pre-service Teachers at Local Universities**

Having outlined the core components of digital intelligence literacy, this section further examines why its cultivation remains challenging in local universities. These difficulties are not simply caused by insufficient technical training, but are closely related to curriculum design, pedagogical understanding, practical training, faculty readiness, and institutional support. Based on this understanding, the following discussion analyzes these problems from five aspects.

#### **Curriculum Fragmentation and Weak Systematic Design**

The first and perhaps most fundamental challenge concerns curriculum design. In many local universities, the curriculum remains fragmented: courses on educational technology, computer applications, or online teaching are offered as separate modules, while English teaching methodology, language skills courses, assessment, and

practicum continue along conventional lines. As a result, pre-service teachers may learn how to use certain platforms or software, but they rarely develop the ability to transform those tools into language teaching resources, communicative tasks, formative assessments, or learner support. Consequently, digital intelligence literacy becomes something students acquire incidentally—if at all—rather than something they build systematically.

This fragmentation also extends to the treatment of AI literacy, data literacy, and digital ethics. Students may use generative AI informally, yet they often receive little guidance on prompt design, output verification, bias recognition, privacy protection, or pedagogical adaptation. Their engagement with AI tends to be spontaneous rather than professionally informed. What local universities ultimately need, therefore, is curriculum coherence—not simply the addition of more technical content.

### **Tool-Oriented Technology Use and Weak Pedagogical Transformation**

Closely related to fragmentation is the tendency to conceptualize digital competence in narrow, instrumental terms. In some programs, technology integration means making attractive slides, using online quizzes, uploading assignments, or demonstrating platform features. Unobjectionable as these skills are, they are far from sufficient to improve language learning. The critical question is not whether a tool is used, but whether it deepens input, interaction, output, feedback, learner autonomy, or intercultural awareness.

This issue holds particular significance for pre-service English teachers. Effective English teaching requires authentic communication, contextualized practice, cultural interpretation, and emotional support. AI-generated materials, for instance, require scrutiny for accuracy, cultural appropriateness, and consistency with learners' proficiency levels. The real challenge lies in moving from tool use to pedagogical transformation—shifting from showcasing technical features to designing meaningful instruction, and from adopting technology, because it is efficient to integrating it in order to help students learn.

### **Limited Practice Opportunities and Weak Contextual Adaptability**

A third prominent challenge is the lack of sustained, AI-integrated teaching practice. Digital intelligence literacy cannot be fostered through lecture-based instruction alone. It requires iterative, hands-on teaching experience. Pre-service teachers must engage in continuous cycles of lesson design, digital and AI tool application, feedback collection, learning analysis, instructional revision, and pedagogical reflection to build solid practical competence. However, many local universities lack consistent access to well-equipped smart classrooms, updated language laboratories, learning analytics platforms, and advanced AI teaching systems. Even when such facilities are available, they are predominantly used for demonstration rather than repeated, interactive practice, failing to nurture students' practical teaching skills.

The inconsistent quality of practicum environments further aggravates this problem. Partner schools differ substantially in digital infrastructure, teachers' technical capabilities, and receptiveness to pedagogical innovation. Since university training typically adopts idealized teaching settings, pre-service teachers often struggle to adapt to the constraints and complexities of real classroom scenarios. Meanwhile, the limited willingness to innovate among some cooperating schools deprives pre-service teachers of valuable opportunities to practice and refine their digital intelligence skills. In essence, the challenge extends far beyond the shortage of practice opportunities. It fundamentally stems from inadequate targeted training that fails to prepare pre-service teachers to apply AI-assisted teaching flexibly across diverse, non-ideal educational contexts, leading to their weak contextual adaptability in digital teaching.

### **Uneven Faculty Readiness and Inadequate Institutional Support**

The fourth problem concerns teacher educators themselves and the institutional support they receive from their institutions. Many English teacher educators possess strong backgrounds in linguistics, literature, translation, and traditional pedagogy, yet some have limited experience with generative AI, corpus-based instruction, multimodal resource design, learning analytics, or digital assessment. Others are willing to innovate but lack time, training opportunities, interdisciplinary collaboration, or recognition within workload and promotion systems. When teacher educators rarely model responsible AI use or data-informed instruction, students struggle to internalize these practices.

Faculty readiness is also shaped by teacher educators' beliefs about AI. Some remain cautious, concerned that AI may weaken students' language reasoning, increase plagiarism, or diminish teachers' professional authority. These concerns are understandable, given the genuine risks related to academic integrity and learner dependence. Yet, avoiding AI cannot prepare future teachers for classrooms where such technologies are already in use. Local universities therefore need to enhance teacher educators' technical and pedagogical competence while also helping them develop a critical and responsible understanding of AI-mediated English teaching.

### **Weak Collaboration, Ethical Guidance, and Assessment**

The final problem concerns weak collaboration and evaluation. Local universities tend to collaborate with basic education institutions primarily through student teaching placements. Deeper forms of partnership—such as joint curriculum design, lesson study, digital resource development, co-supervision, or classroom-based research—are far less common. Without such engagement, teacher education programs may lack an authentic understanding of what local schools need, while schools themselves may not fully benefit from the research and training resources that universities can offer.

Ethical guidance and assessment are also underdeveloped. Generative AI brings new challenges related to privacy, copyright, academic integrity, bias, and disclosure of AI use. Yet, ethics is often treated as an afterthought. Traditional exams and lesson plans also cannot fully capture whether students can select appropriate technologies, design AI-supported tasks, analyze learning data, revise instructional resources, or respond to ethical dilemmas.

In short, these five problems indicate that digital intelligence literacy cannot be cultivated through isolated tool-based training or occasional digital activities. Rather, they reflect broader structural challenges that demand a coordinated and sustained response. Building on this analysis, the following section proposes five corresponding strategies to address them.

## **Strategies for Cultivating Digital Intelligence Literacy Among Pre-service Teachers at Local Universities**

Cultivating digital intelligence literacy is a long-term professional endeavor. For local universities, this means integrating curriculum reform, pedagogical innovation, practice design, faculty development, school collaboration, ethical governance, and assessment into a coherent system. The five strategies proposed below are closely interconnected to guide pre-service teachers from initial awareness and basic application toward reflective and responsible practice.

### **Building an Integrated Spiral Curriculum**

To address curriculum fragmentation, local universities should organize digital intelligence literacy through an integrated spiral curriculum rather than a set of disconnected technical training sessions. A spiral curriculum

emphasizes the gradual return to key ideas at increasing levels of depth and complexity (Bruner, 1960). In the context of pre-service English teacher education, this means that digital literacy, basic AI concepts, data awareness, and digital ethics should be introduced at the foundational stage. At the professional stage, these elements should be embedded into core courses, such as English listening, speaking, reading, writing, translation, language assessment, and English teaching methodology. At the advanced stage, students can engage in integrated projects, including AI-supported English lesson design, digital teaching resource development, learning data analysis, and blended English teaching practice.

Such a curriculum emphasizes progressive and cumulative development. It also reflects the view that technology integration should be understood as part of teachers' professional knowledge structure, rather than as an isolated technical skill (Mishra & Koehler, 2006). For instance, an English writing course may incorporate AI-assisted revision while guiding students to critically evaluate automated feedback. An oral English course may use speech recognition tools, alongside discussions of accent bias, intelligibility, and communicative effectiveness. An English reading course may draw on AI-generated materials and require students to examine their factual accuracy, cultural appropriateness, and pedagogical value. A language assessment course may introduce digital portfolios and learning analytics as tools for understanding students' learning processes. In this way, digital intelligence literacy can become a continuous thread throughout the English teacher education program, rather than a separate technical component added to existing courses.

However, a coherent curriculum provides only the overall structure. To make digital intelligence literacy meaningful, pre-service teachers also need to learn how to apply these ideas in concrete teaching situations. This requires a shift from tool familiarization to scenario-based pedagogical design.

### **Shifting From Tool Training to Scenario-Based Design**

To move beyond superficial technology use, local universities should shift their focus from isolated tool training to scenario-based pedagogical design. Rather than asking pre-service teachers to merely demonstrate what a digital tool can do, teacher educators should guide them to address authentic English teaching problems with appropriate digital and intelligent support. This shift aligns with recent Chinese research, which argues that AI integration into teacher development must be grounded in concrete teaching scenarios, feedback mechanisms, and practical tasks—not decontextualized technical drills (Liu & Yin, 2024).

In this design-oriented approach, pedagogical suitability—rather than technological novelty—becomes the central criterion for evaluation. Pre-service teachers are expected to justify their technological choices, explain how these choices serve specific language objectives, identify potential risks, and reflect on how to revise their design based on feedback. Such a process cultivates professional judgment rather than mere operational skill. However, design ability is not developed through planning alone. It must be tested, adjusted, and reinforced through repeated practice. For this reason, scenario-based design should be closely linked with microteaching, practicum, and the development of locally usable teaching resources.

### **Expanding AI-Supported Practice and Building Local Resources**

To strengthen practical competence, local universities should transform microteaching and practicum into a cycle of design, teaching, feedback, and revision. Pre-service English teachers start by setting clear language objectives, selecting appropriate digital or AI tools, and conducting microteaching. They then gather feedback from peers and instructors and revise their lesson plans accordingly. Through repeated cycles, they learn to judge whether technology truly supports language learning or merely makes a lesson appear innovative. Reflection

should center on concrete questions: What did the tool contribute? What problems did it cause? How did learners respond? Would the task work in a different school context? This approach aligns with experiential learning, in which competence is developed through action, reflection, feedback, and sustained practice (Kolb, 1984).

Local universities should also build resource banks that tailored to local teaching contexts. Useful materials include lesson plans, AI prompt templates, reading materials, pronunciation resources, digital storytelling samples, assessment rubrics, ethical AI-use guidelines, and classroom cases. By creating and revising these resources, pre-service teachers move from passive users to active designers, learning to connect English teaching with regional culture, learner needs, and the real conditions of local schools.

### **Strengthening Teacher Educators' Capacity and Institutional Support**

The professional development of teacher educators is essential to cultivating digital intelligence literacy among pre-service English teachers. Local universities should provide scenario-based training rather than isolated tool demonstrations. Effective professional development must relate to teachers' actual practice and promote sustained changes in teaching beliefs and classroom behavior (Guskey, 2002). Therefore, training on generative AI, corpus tools, learning analytics, digital assessment, multimodal composition, and privacy protection should be grounded in concrete English teaching tasks.

Institutional support is equally important. Local universities should encourage professional learning communities where teacher educators share classroom cases, reflect on unsuccessful attempts, co-design lessons, and conduct action research. Teacher digital literacy development should be supported by standards, evaluation mechanisms, and continuous professional growth systems rather than relying solely on individual teachers' technical interests (Wu et al., 2023). Accordingly, digital teaching innovation, resource development, university-school collaboration, and AI-related teaching research should be recognized in workload calculation, teaching awards, and promotion criteria. Foreign language departments can also collaborate with educational technology, computer science, psychology, and data science departments to provide interdisciplinary support.

### **Establishing Collaboration, Ethical Governance and Multidimensional Assessment**

Local universities should build collaborative mechanisms with partner schools, education bureaus, and relevant technology providers. Such cooperation can support classroom observation, joint lesson study, teaching experiments, resource development, and co-supervision. In this process, school teachers can identify real problems in English classrooms, while university faculty and pre-service teachers can transform these problems into teaching projects enabled by digital and intelligent technologies.

At the same time, ethical governance should be embedded in the cultivation process. Universities need clear guidelines on responsible AI use, data protection, copyright, academic integrity, and the disclosure of AI assistance. This is consistent with international AI competency frameworks, which emphasize human-centered use, ethical awareness, AI pedagogy, and teachers' continuing professional learning (Miao & Cukurova, 2024). It also resonates with Chinese discussions on AIGC-enabled higher education transformation, which stress digital ethics, human-machine collaboration, and educational wisdom (Zhu et al., 2023).

Assessment should also be multidimensional and process-oriented. It should cover not only technical application, but also pedagogical integration, data literacy, ethical responsibility, and foreign language teaching competence. Digital portfolios may be used to document AI-supported lesson plans, revised materials, data analysis reports, teaching videos, peer feedback, and ethical reflections. In this way, digital intelligence literacy can be cultivated and assessed as an integral part of pre-service English teacher education.

## Conclusion

Digital intelligence literacy has become an essential professional competence for pre-service English teachers in the context of educational digitalization and AI-supported teaching in China. For local universities, cultivating this literacy does not simply mean adding more technology-related courses or training students to use digital tools. Rather, it requires a shift toward integrated, ethical, and context-sensitive teacher education. This paper has clarified the basic meaning of digital intelligence literacy and analyzed the main problems in its cultivation at local universities, including fragmented curriculum design, tool-oriented technology use, limited practice opportunities, uneven faculty readiness, and insufficient collaboration and assessment support. In response, local universities should build a more systematic curriculum, strengthen scenario-based pedagogical design, expand AI-supported teaching practice, enhance teacher educators' capacity, and establish collaborative and ethical support mechanisms. These strategies aim to help pre-service English teachers move beyond mechanical technology use and develop the ability to select, adapt, evaluate, and integrate digital and intelligent technologies in English teaching. In this way, local universities can better prepare future English teachers who can use technology critically, creatively, responsibly to serve authentic language learning.

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