

# A Review of Teachers' Information Technology Teaching Abilities in China

Jing Zhang\*, Jesse Balinas

Graduate School, Angeles University Foundation, Angeles City, Philippines

\* Corresponding author: zhang.jing@student.auf.edu.ph

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**Abstract:** The integration of information technology (IT) into teaching has become a cornerstone of educational reform in China. National strategies such as the “Internet+ Education” initiative have emphasized the importance of equipping teachers with digital competencies to enhance teaching quality and reduce regional disparities. This paper examines the current state of teachers' IT teaching abilities in China, highlighting the role of professional development, resource accessibility, and institutional support. Drawing from large-scale surveys and empirical studies, the paper identifies persistent challenges such as uneven access to professional development, digital divides between urban and rural schools, and cultural barriers to pedagogical innovation. Future directions include expanding disciplinary ICT integration, strengthening long-term professional development, addressing systemic inequalities, and aligning ICT pedagogy with China's unique cultural and educational traditions. By synthesizing contemporary literature, this study underscores the need for context-sensitive and sustainable models of ICT integration that enhance both teaching practices and student learning outcomes.

**Keywords:** ICT, Teacher Competence, Teaching Abilities, China, Educational Technology.

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## 1. Introduction

The digital transformation of education has become a defining feature of 21st-century teaching and learning worldwide. In China, the advancement of IT has intersected with national priorities in educational reform, positioning teachers' IT teaching abilities as a critical determinant of both educational quality and equity. Teachers' ability to effectively integrate information and communication technologies (ICT) into their pedagogical practices is now viewed not only as a matter of professional competence but also as a key pathway toward fostering innovation-driven human capital development [1].

National initiatives, most notably the “Internet+ Education” strategy, provide a policy framework for developing digital competencies among teachers while addressing structural inequities in education [2]. These reforms are aligned with broader socio-economic goals, including narrowing the urban-rural educational gap and preparing students for participation in a technology-intensive global economy. At the same time, empirical studies show that teachers' digital competencies are not uniform. They are shaped by factors such as access to professional development, school-level resource availability, institutional support, and cultural traditions that influence classroom practices [3][4].

This paper synthesizes existing literature on teachers' ICT teaching abilities in China. It first explores the role of professional development in strengthening teacher competence, then examines the impact of resource availability and digital divides. It also analyzes challenges in implementation, including pedagogical traditions and institutional pressures, before outlining future directions for research and practice.

## 2. Policy and Reform Context

China's commitment to ICT integration is evident in its national policy directives. The “Education Informatization

2.0 Action Plan” (2018) set ambitious goals for achieving “three-level connectivity” across schools and emphasized teacher training in digital literacy [5]. Similarly, the “Smart Education of China” initiative launched in 2021 sought to expand access to digital educational resources, particularly in underserved regions [6]. These initiatives underscore that ICT competence is not simply a technical skill but a central component of teachers' professional identity.

## 3. Professional Development and Teacher Competence

Professional development (PD) programs play a pivotal role in shaping teachers' ICT abilities. Large-scale surveys confirm that structured PD enhances teachers' digital self-efficacy, pedagogical innovation, and classroom integration of ICT [3]. Importantly, context-sensitive PD is vital in rural areas where teachers often face limited training opportunities [4].

In addition, blended learning-based PD models significantly improved teachers' adoption of student-centered digital pedagogy [7]. Mentorship-based training, where digitally proficient teachers mentor less experienced colleagues, has also been shown to accelerate ICT adoption and foster collaborative learning communities [8]. These findings suggest that PD should not be limited to technical training but must also build reflective, pedagogically oriented ICT use.

## 4. Resource Availability and the Digital Divide

Resource inequality continues to shape ICT competencies across China's education system. Studies highlight persistent gaps in digital infrastructure and institutional investment between urban and rural schools [6]. Rural teachers frequently report low confidence in integrating ICT due to limited access to stable internet, devices, and technical support [4].

Disparities are also evident in vocational education, where teachers in well-funded institutions demonstrate stronger ICT competence compared to their counterparts in resource-poor schools [9]. Research further shows that such inequalities reinforce educational gaps, as students in under-resourced contexts have fewer opportunities to benefit from ICT-enhanced learning [10]. Bridging the digital divide, therefore, remains both a technological and social justice priority.

## 5. Implications for Student Learning Outcomes

Teachers' ICT competence is directly linked to student performance. Effective ICT integration has been shown to improve student outcomes in secondary schools, particularly in science and mathematics [11]. Similar findings demonstrate that ICT use promotes critical thinking, problem-solving, and collaborative learning among vocational students [12].

Developing hierarchical ICT competencies-ranging from basic digital literacy to advanced integration-requires continuous support from pre-service to in-service training [13]. Without sustained capacity building, teachers may plateau at surface-level ICT adoption, limiting its pedagogical impact.

## 6. Challenges in Implementation

Despite significant progress, barriers persist in the effective implementation of ICT teaching abilities in China. First, professional development remains inconsistent, with variations in quality and accessibility, particularly in rural and under-resourced regions [3][4]. Second, technological inequality continues to pose challenges, as urban schools often benefit from advanced infrastructure, while rural schools struggle with systemic limitations [6]. Third, cultural and pedagogical traditions, such as the exam-oriented education system and hierarchical teacher-student relationships, may conflict with the collaborative ethos of ICT pedagogy [9]. Fourth, many teachers experience low digital self-efficacy, expressing uncertainty about their ability to use ICT effectively, which discourages experimentation and innovation [3]. Finally, institutional pressures also hinder ICT integration, as standardized exam preparation frequently takes precedence over pedagogical innovation, thereby limiting teachers' motivation to adopt ICT tools [11].

## 7. Future Research Directions

The literature highlights several directions for advancing ICT teaching abilities in China. ICT use should expand beyond general instruction to include applications in STEM, vocational, and professional domains [12]. Professional development must be sustained and prioritize pedagogical innovation, reflective practice, and digital self-efficacy, rather than focusing solely on technical skills [7][8]. Moreover, bridging the digital divide remains crucial, requiring national and local governments to provide equitable infrastructure, training, and institutional support for teachers in rural areas [10]. In addition, more methodological innovation in research is needed, particularly longitudinal and mixed-methods studies that can assess the long-term effects of ICT integration [13]. Finally, ICT pedagogy must be culturally adapted, ensuring that models reconcile with China's traditions while promoting student-centered learning practices [9].

## 8. Conclusion

Teachers' ICT teaching abilities in China are a critical determinant of educational quality, equity, and innovation. National strategies and large-scale reforms have laid the foundation for strengthening teachers' digital competencies, yet significant disparities and challenges persist. Professional development programs have proven effective in enhancing digital self-efficacy and pedagogical innovation, but access remains uneven across regions and school types. Likewise, the digital divide continues to hinder equitable implementation, particularly in rural and vocational contexts.

Sustainable solutions require integrating ICT pedagogy across disciplines, investing in context-sensitive PD, addressing systemic inequalities, and adapting digital teaching practices to align with China's cultural and educational traditions. By doing so, China can not only enhance teacher competence but also ensure that ICT integration contributes meaningfully to student learning and educational equity.

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