

Development and Validation of Digital Teaching Competence Scale for Chinese Foreign Language Teachers in Primary and Secondary Schools

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Abstract

The digital transformation of foreign language education in China hinges on the digital teaching competence of primary and secondary school foreign language teachers. Despite considerable interest from educational researchers, there is a lack of evaluation studies focused on this group and an absence of a comprehensive assessment system for their digital teaching competence. This study aims to address this gap by developing a scale based on the dimensions of “digital awareness,” “digital knowledge,” and “digital skills.” Using a rigorous scientific approach, the research first conducted a pilot test with convenient sampling, distributing online questionnaires to teachers in three schools in Z province, yielding 109 valid responses from 139 attempts. A following nationwide random sampling survey yielded 449 valid responses from 489 attempts. The data were randomly divided into two samples: 217 participants underwent exploratory factor analysis, while 232 participants were subjected to confirmatory factor analysis. The scale demonstrated high reliability, with a Cronbach’s alpha of 0.974 and a KMO value of 0.953. The scale meets measurement standards and serves as a valuable reference for studying digital teaching competence among Chinese foreign language teachers.

Keywords: Digital teaching competence, Scale development, Scale validation, Primary and Secondary foreign language teachers

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Introduction

In the era of digital transformation, the proficiency of foreign language teachers in utilizing digital tools has become a critical factor in the success of language education (Inamorato et al., 2023; Tsz et al., 2023). Despite the significance of digital teaching competence, there is a dearth of evaluation tools specifically designed for Chinese primary and secondary foreign language teachers. This study seeks to address this gap by developing a Digital Teaching Competence Scale that accurately assesses and promotes the digital literacy of these educators. Self-reported scales were chosen to assess digital teaching competence among Chinese foreign language teachers due to their ability to capture teachers' perceptions, cover various aspects of competence, and offer practical, large-scale data collection. Our approach aligns with established methodologies in the field, ensuring consistency and comparability with previous research.

Literature Review

The study is anchored in the Generalized Technology Competence and Use (GTCU) framework (Blayone et al., 2018), which outlines three dimensions of digital competence: epistemological (awareness), informational (knowledge), and social (skills). It also draws from the EU Digital Competence Framework for Teachers (Dias-Trindade & Ferreira, 2020) and a framework for university foreign language teachers in China (Xu et al., 2021), which emphasize the integration of online and offline teaching. These frameworks provide a foundation for the development of a scale that encompasses the multifaceted nature of digital teaching competence.

This adoption of self-reported scale to evaluate competencies is well-established in educational research as it is simple and user-friendly, ideal for large-scale data collection (Blayone et al., 2018; Podsakoff et al., 2003). Psychometric validation of a self-reported scale involves evaluating its reliability and validity. This process ensures that the scale effectively measures the intended constructs and provides consistent results over time, thereby confirming its accuracy and dependability (DeVellis, 2016).

Methods and Scale Development

The development of the scale was a meticulous process that began with a comprehensive review of relevant literature and Chinese policy documents to establish a clear understanding of digital competence among foreign language teachers in primary and secondary schools. This was followed by an analysis

of the defining characteristics and influencing factors of digital competence, which led to the preliminary 33-item scale. The scale was then refined through expert feedback and a pre-survey, and further validated through exploratory factor analysis and confirmatory factor analysis.

This research involved adapting and validating a digital teaching competence scale specifically for Chinese primary and secondary school language teachers. The process included incorporating localized items to address the specific needs of Chinese educators and covering aspects unique to the Chinese educational landscape, such as local digital resources. The comprehensive validation, which involved exploratory and confirmatory factor analysis, ensured the scale's psychometric soundness and appropriateness for the Chinese K-12 context.

Results and Analysis

The pilot test, involving 109 foreign language teachers with convenient sampling, yielded a highly reliable scale with an overall alpha coefficient of 0.971. Factor analysis revealed the need to remove items with low loadings, resulting in a refined 27-item scale that included three key factors: Digital Awareness, Digital Knowledge and Digital Skills. The formal scale recruited 449 valid samples, which was randomly divided into Sample 1 (217) and Sample 2. Sample 1 was used to run the exploratory factor analysis again, with a cumulative variance of 77.794% explained by the three factors. The factor loadings for Digital Awareness (0.716 to 0.891), Digital Knowledge (0.620 to 0.855), and Digital Skills (0.660 to 0.820) were determined to be statistically significant.

The scale's structural validity was confirmed through cross-validation with Sample 2, using structural equation modeling in AMOS 24.0. The results of the validation factor analysis showed that the X^2/df value was less than 3, the CFI, IFI, and TLI were greater than 0.9, the RMSEA was less than 0.08, and the RMR was less than 0.05, which indicated that the model fit was better and had high structural validity.

Conclusion and Implications

The adaptation and validation of the Digital Teaching Competence Scale enhance theoretical frameworks and offer culturally relevant insights for Chinese primary and secondary foreign language teachers. This robust, validated tool highlights areas needing additional support and informs targeted professional development. Aligning with the "Transitions in CALL" conference theme, the scale addresses current and past technological shifts in education, such as AI and mobile computing, while preparing for future advancements

like generative AI and extended reality. By reflecting ongoing changes and supporting educators in technology integration, this study advances the field of language education and sets a foundation for future research and practice.

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References

- Blayone, T. J. B., Mykhailenko, O., vanOostveen, R., Grebeshkov, O., Hrebeshkova, O., & Vostryakov, O. (2018). Surveying digital competencies of university students and professors in Ukraine for fully online collaborative learning. *Technology, Pedagogy and Education*, 27(3), 279–296. doi: 10.1080/1475939X.2017.1391871
- DeVellis, R. F. (2016). *Scale development: Theory and applications* (4th ed.). Sage Publications.
- Dias-Trindade, S., & Ferreira, A. G. (2020). Digital teaching skills: DigCompEdu Checkin as an evolution process from literacy to digital fluency. *Revista ICONO14*, 18(2), 162–187. doi: 10.7195/RI14.V18I2.1519
- Inamorato, A., Chinkes, E., Carvalho, M. A. G., Solórzano, C. M. V., & Marroni, L. S. (2023). The digital competence of academics in higher education: is the glass half empty or half full? *International Journal of Educational Technology in Higher Education*, 20, 9. doi: 10.1186/s41239-022-00376-0
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879–903. doi:10.1037/0021-9010.88.5.879
- Tsz, D., Ng, K., Ka, J., Leung, L., Su, J. Chi, R., Ng, W., Kai, S., & Chu, W. (2023). Teachers' AI digital competencies and twenty-first century skills in the post-pandemic world. *Educational Technology Research and Development* 71, 137–161. doi: 10.1007/s11423-023-10203-6
- Xu, J., Li, G. & Liu, W. (2021). Constructing a competence framework for university foreign language teachers in the context of online and offline integration. *Foreign Language World*, 4, 11–18.