Assessing teachers' Digital Competence and Technological Integration Competence of Vocational School in China: Perceptions, Attitudes, and Influential Factors

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INTRODUCTION

In contemporary education, the integration of digital technologies has become ubiquitous, fundamentally altering the landscape of teaching and learning. Amidst this digital revolution, the digital competence of educators, particularly teachers,has emerged as a crucial determinant of educational quality and effectiveness[1]. Recognizing the significance of digital competence, various initiatives, such as the European Union's Digital Education Action Plan [2], Spain's National Plan of Digital Competences stresses Teachers Digital Competencies acquisition across educational levels[3] and China's National Education Work Conference introduced a digitalization strategy[4]. underscore the imperative to equip educators with the necessary skills to navigate the digital realm competently[5].

The concept of digital teaching is inherently transdisciplinary, encompassing pedagogical knowledge, methodological expertise, and content mastery across diverse school subjects[6]. Within this framework, teachers' competences extendbeyond technical proficiency[7], encompassing the ability to leverage digital tools effectively in pedagogical practices[8],foster critical digital literacy skills among students[9], and adapt teaching methodologies to evolving technological landscapes[10].

However, while digital competence frameworks have been developed to evaluate and enhance educators' digital skills[11],there exists a growing recognition that these frameworks may not fully capture the nuanced requirements and contexts of diverse groups of teachers[12]. Particularly in vocational education settings, where the focus is on preparing students for the workforce with specific technical skills[13], the adequacy of existing frameworks in assessing teachers' digital competence remains uncertain[14].

In China, vocational education holds immense significance, with approximately fifty percent of secondary school graduatespursuing vocational education within vocational schools[15]. Despite the pivotal role of teachers in shaping technology integration within teaching practices [16] ,empirical research on teachers' digital competence in China[17], especially withinvocational education contexts, remains limited[18].

Furthermore, the unique challenges faced by teachers in China, such as inadequate investment in education[19] leading todeficient hardware equipment[20] and limited support, necessitate a tailored approach to assess and enhance teachers' digital competence effectively.

Hence, this proposed research seeks to address these gaps by conducting a comprehensive examination of teachers' digital competence and technological integration competence within vocational education settings in China. By evaluating a measurement model to assess teachers' digital competence (such as their proficiency in using digital tools for teaching, integrating technology into their practices, managing digital resources, engaging with online communities, and their attitudes towards digital technologies in education.By exploring the influence of individual and contextual factors on
these competencies.

By examining these aspects and considering individual and contextual factors that influence teachers' digital competence, this study aims to localize and refine the measurement model. Ultimately, the goal is to deepen theoretical understanding and provide practical insights for enhancing teachers' digital skills to facilitate effective digital education delivery in Chinesevocational schools.an attempt will be made to localize and refine the model this study aims to deepen our theoretical understanding and provide practical insights into enhancing teachers' digital skills for effective digital education delivery. Through this endeavor, the research aims to contribute to the broader discourse on digital education and professionaldevelopment, ultimately ensuring the provision of high-quality and equitable education for all students in China.

WORKING HYPOTHESIS AND PRINCIPAL OBJECTIVES

Hypothesis:

Within the vocational education context of China, teachers' perceptions and attitudes play a pivotal role in shaping the evolution and utilization of their digital competencies. Additionally, there exists discernible variability in the digital competence and technology integration proficiencies among teachers in Chinese vocational schools. This variance is influenced by a spectrum of factors, including but not limited to their individual backgrounds, educational preparation, teaching tenure, and the level of institutional support they receive.

Main objective:

to develop and validate a digital competency framework for contemporary Chinese teachers. This framework will offer guidelines for assessing and improving teachers' digital skills and technology integration abilities. It aims to address the evolving needs of educators in effectively incorporating digital tools into teaching practices. Validation ensures the framework's reliability and applicability, benefiting teacher professional development and educational enhancement efforts in China's vocational education sector.

Principal Objectives:

1. Develop and validate a measurement model to assess the digital competence of vocational education teachers in China, incorporating teaching and professional activities in digital education, with measurable criteria across different components.

2. Investigate variations in digital competence among vocational education teachers based on individual and contextual factors such as gender, age, teaching subject, stage, and educational level, ensuring clear measurement criteria for analysis.

3. Conduct a comprehensive evaluation of the current digital competence, technological integration proficiency, perceptions, attitudes, and proficiency in utilizing digital tools among vocational school teachers in China, establishing measurable benchmarks for assessment.

4. Develop targeted interventions and strategies to enhance vocational school teachers' digital skills and promote effective digital education practices, with specific, measurable goals for improvement.

5. Provide actionable recommendations for policymakers and educational stakeholders to support the professional development of vocational school teachers in digital education, specifying areas for intervention such as curriculum development, policy implementation, or resource allocation.

METHODOLOGY

The primary agents participating directly or indirectly in the research include:Vocational school teachers,school administrators,Educational technology experts and researchers,etc.For researching the topic of assessing teachers' digital competence and technological integration competence in vocational schools in China, a mixed-methods approach incorporating quantitative and qualitative methods would be appropriate. Here's a suggested methodology:

1. Measurement Model Evaluation:
   - Utilize quantitative methods to assess the validity and reliability of the measurement model for digital competency.
   - Employ statistical techniques such as confirmatory factor analysis to examine the structural validity of the model.
   - Assess internal consistency using indicators like split-half reliability and composite reliability.

2. Profile Analysis:
   - Conduct quantitative analysis to explore differences in digital competency across various teacher profiles.
   - Use demographic and contextual factors (gender, age, subject taught, teaching experience, educational level) as independent variables.
   - Employ techniques such as analysis of variance (ANOVA) or regression analysis to identify significant associations.

3. Digital Competence Assessment:
   - Employ mixed-methods approaches to evaluate the current level of digital competence among vocational school teachers.
   - Use surveys, interviews, and observation protocols to gather data on teachers' digital skills, knowledge, and practices.
   - Analyze quantitative data descriptively and qualitatively to identify strengths, weaknesses, and areas for improvement.

4. Perceptions and Attitudes Investigation:
   - Conduct qualitative research methods such as interviews and focus groups to explore teachers' perceptions and attitudes towards digital technologies.
   - Use thematic analysis to identify common themes and patterns in teachers' responses.

5. Proficiency Measurement:
   - Utilize both quantitative and qualitative methods to measure the proficiency of vocational school teachers in utilizing digital tools and integrating technology into teaching.
   - Assess teachers' abilities to design digital learning materials, use educational software, and facilitate online learning environments.

6. Intervention Development:
   - Collaborate with stakeholders to develop targeted interventions and strategies aimed at enhancing teachers' digital skills.
   - Incorporate evidence-based practices and best practices from existing literature and successful interventions.
   - Consider factors such as accessibility, scalability, and sustainability of interventions.

Regarding ethical code as a reference in the research, the guidelines established in the Ethical Guidelines for Educational Research by BERA will be followed: responsibilities towards participants; responsibilities towards sponsors, clients, and stakeholders in the research; responsibilities towards the community of researchers in education; responsibilities with publication and dissemination; and responsibilities towards the welfare and development of researchers

MATERIAL MEANS

For the literature review phase, access to various databases provided by the University of Salamanca will be utilized. The following tools and resources are highlighted:

1. Digital Competency Frameworks: Utilization and development of existing frameworks designed for assessing digital competence in educational contexts, sourced from educational institutions and governmental organizations.
2. Survey Instruments: Implementation of surveys and questionnaires tailored to measure teachers' perceptions, attitudes, and digital skills within vocational education settings.
3. Statistical Software: Access to sophisticated statistical analysis tools like SPSS and AMOS 26, facilitating confirmatory factor analysis and structural equation modeling for robust data analysis.
4. Qualitative Analysis Tools: Deployment of qualitative data analysis software such as NVivo or ATLAS.ti for in-depth analysis of interview transcripts and focus group discussions.
5. Educational Technology Platforms: Availability of educational technology tools, learning management systems, and digital assessment platforms commonly utilized in vocational schools.

TIMING SCHEDULE

Year 1 (2023-2024):
1. Establishment of the Research Line:
  - Define the research topic and objectives.
  - Review relevant literature to refine the research focus.

2. Systematic Literature Review:
  - Conduct a comprehensive review of existing literature on teachers' digital competence and technological integration in vocational schools in China.

3. Diagnostic Phase of the First Cycle:
  - Design the study methodology, including survey instruments and data collection procedures.
  - Establish contact with vocational school teachers and stakeholders for their involvement in the research.

4. Intervention Phase of the First Cycle:
  - Collect data from vocational school teachers regarding their perceptions, attitudes, and digital competencies.
  - Analyze the obtained results to identify trends and insights.

5. Initial Version of the Trainer Training Model:
  - Develop a preliminary version of the digital competency framework based on collected data and literature analysis.

Year 2 (2024-2025):
6. Initiation of Technological Infrastructure:
  - Begin the development of the necessary technological infrastructure, such as web platforms and learning management systems.

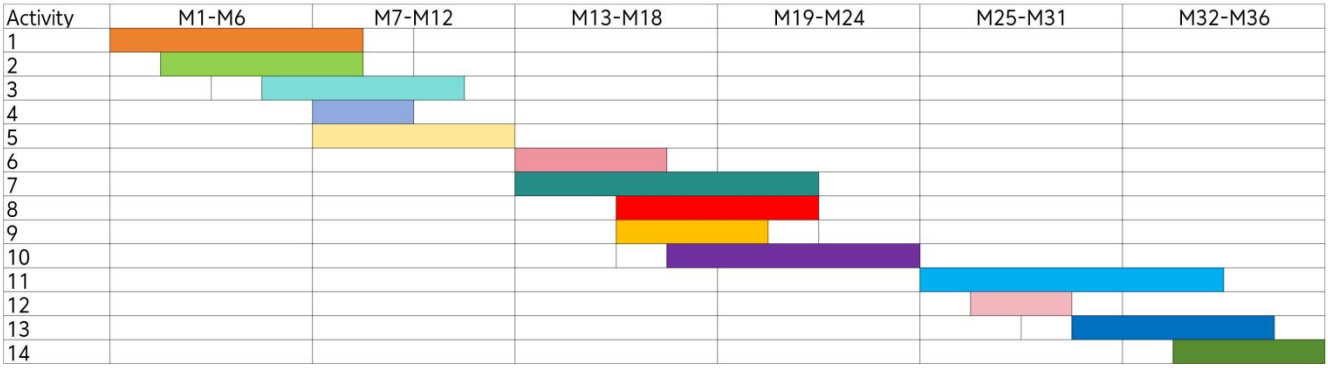
7. Development of the Learning Ecosystem:
  - Select and configure educational technology tools to support the implementation of the digital competency framework.

8. Diagnostic Phase of the Second Cycle:
  - Design the validation process for the digital competency framework and the training course applying the model.

9. Intervention Phase of the Second Cycle:
  - Implement the training course based on the digital competency framework and analyze the outcomes.

10. Submission of Communications:
  - Present research progress at national or international conferences relevant to education and technology.

Year 3 (2025-2026):
11. Development of the Course:
 - Refine and finalize the training course based on feedback and analysis from the intervention phase.
12.Data Analysis:
- Analyze the data collected from the training course to evaluate the effectiveness of the digital competency framework.
13.Revision or Formulation of Final Version:
- Revise and finalize the digital competency framework and training course based on the results of data analysis and feedback.
14.Submission of dissertation:
- Revision or formulation of final version.



PERSONAL TRAINING PLAN

1. Introduction

This Personal Training Plan outlines the various training activities to be undertaken during the doctoral thesis period. The plan includes courses, seminars, mobility exchanges, and other relevant activities aimed at supporting the research and professional development of the doctoral candidate.

2. Courses

Advanced Research Methodologies: A comprehensive course covering qualitative and quantitative research methods
.
Specialized Subject Course: An in-depth course focusing on the specific field of the doctoral thesis.

3. Seminars

Research Seminars: Regular seminars to present and discuss ongoing research work with peers and faculty.
Guest Lectures: Attending lectures by visiting scholars and industry experts.

4. Mobility Exchanges

International Research Exchange: A program facilitating research exchange with an overseas university or research institution.
Collaborative Projects: Participation in collaborative research projects with other institutions.

5. Conferences and Workshops

Academic Conferences: Participation in national and international conferences to present research findings andnetwork with other researchers.
Workshops: Engaging in workshops related to research tools, methodologies, and professional development.

6. Additional Training Activities

Soft Skills Development: Workshops and courses on communication, time management, and leadership skills.

7. Monitoring and Evaluation

Regular meetings with supervisors to assess progress and make necessary adjustments to the training plan.
This Personal Training Plan is a dynamic document and will be periodically reviewed and updated to ensure it meets the evolving needs of the doctoral research and professional development objectives.

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