



A TEACHER COMPETENCE MODEL AND MEASUREMENT BASED ON SMART EDUCATION

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ABSTRACT

Objective: This study mainly explores the impact of professional identity and digital literacy on the teacher ability of normal school graduates in the context of smart education and its impact channels and mechanisms.

Theoretical Framework: Based on the research objectives and research hypotheses, we constructed a comprehensive conceptual model to understand the impact, impact pathways and mechanisms of professional identity and digital literacy on teacher competency of normal college students

Method: The research uses a method that combines theoretical analysis and empirical investigation and combines positive psychology and teachers' professional development stage theory. This study established a competency structure model suitable for measuring normal college students. It used scale tools such as the College Students' Professional Identity Scale and the College Students' Learning Engagement Scale and used statistical methods such as structural equation modeling (SEM) and multiple regression to analyze the questionnaires.

Results and Discussion: Examine the impact of professional identity and learning investment on teacher competency of normal college students, analyze the size of the influencing factors, measure the current competency level of normal college graduate teachers, analyze existing problems, and propose improvement strategies, thereby exploring the transformation of teacher education under the background of smart education basic logic and realistic path.

Research Implications: The sample size and representativeness of this study are limited to one local undergraduate normal university. Therefore, there are still many shortcomings in this study, which need to be further deepened and improved in future research.

Originality/Value: This study explores the relationship between teacher competence and digital literacy, professional identity, learning engagement, and learning efficacy among teacher trainees, and examines the mediating role of learning engagement and learning efficacy in the relationship between professional identity and learning. This is beneficial for us to gain a deeper understanding of the formation of teacher competence among teacher trainees in the context of smart education

Keywords: Teacher Competence, Model, Smart Education.

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UM MODELO E MEDIÇÃO DE COMPETÊNCIAS PROFESSORES BASEADO NA EDUCAÇÃO INTELIGENTE

RESUMO

Objetivo: Este estudo explora principalmente o impacto da identidade profissional e da literacia digital nas capacidades docentes dos diplomados do ensino normal no contexto da educação inteligente e os seus canais e mecanismos de impacto.

Referencial Teórico: Com base nos objetivos e hipóteses de pesquisa, construímos um modelo conceitual abrangente para compreender o impacto, as vias de impacto e os mecanismos da identidade profissional e da alfabetização digital na competência docente de estudantes universitários normais

Método: A pesquisa utiliza um método que combina análise teórica e investigação empírica e combina psicologia positiva e teoria do estágio de desenvolvimento profissional dos professores. Este estudo estabeleceu um modelo de estrutura de competências adequado para medir estudantes universitários normais. Utilizou ferramentas de escala como a Escala de Identidade Profissional de Estudantes Universitários e a Escala de Engajamento de Aprendizagem de Estudantes Universitários e utilizou métodos estatísticos como modelagem de equações estruturais (SEM) e regressão múltipla para analisar os questionários.

Resultados e Discussão: Examinar o impacto da identidade profissional e do investimento em aprendizagem na competência docente de estudantes universitários normais, analisar o tamanho dos fatores de influência, medir o nível de competência atual de professores graduados universitários normais, analisar os problemas existentes e propor estratégias de melhoria, assim explorar a transformação da formação de professores no contexto da lógica básica da educação inteligente e do caminho realista.

Implicações de pesquisa: O tamanho da amostra e a representatividade deste estudo estão limitados a uma universidade local de graduação normal. Portanto, ainda existem muitas deficiências neste estudo, que precisam ser ainda mais aprofundadas e melhoradas em pesquisas futuras.

Originalidade/Valor: Este estudo explora a relação entre a competência dos professores e a literacia digital, a identidade profissional, o envolvimento na aprendizagem e a eficácia da aprendizagem entre professores estagiários e examina o papel mediador do envolvimento na aprendizagem e da eficácia da aprendizagem na relação entre a identidade profissional e a aprendizagem. Isto é benéfico para obtermos uma compreensão mais profunda da formação de competências docentes entre professores estagiários no contexto da educação inteligente.

Palavras-chave: Competência Docente, Modelo, Educação Inteligente.

UN MODELO Y MEDICIÓN DE COMPETENCIA DOCENTE BASADO EN LA EDUCACIÓN INTELIGENTE

RESUMEN

Objetivo: Este estudio explora principalmente el impacto de la identidad profesional y la alfabetización digital en la capacidad docente de los graduados de la escuela normal en el contexto de la educación inteligente y sus canales y mecanismos de impacto.

Marco teórico: con base en los objetivos de la investigación y las hipótesis de la investigación, construimos un modelo conceptual integral para comprender el impacto, las vías de impacto y los mecanismos de la identidad profesional y la alfabetización digital en la competencia docente de los estudiantes universitarios normales.

Método: La investigación utiliza un método que combina el análisis teórico y la investigación empírica y combina la psicología positiva y la teoría de las etapas de desarrollo profesional docente. Este estudio estableció un modelo de estructura de competencias adecuado para medir a estudiantes universitarios normales. Utilizó herramientas de escala como la Escala de identidad profesional de estudiantes universitarios y la Escala de compromiso de aprendizaje de estudiantes universitarios y utilizó métodos estadísticos como el modelado de ecuaciones estructurales (SEM) y la regresión múltiple para analizar los cuestionarios.

Resultados y discusión: Examinar el impacto de la identidad profesional y la inversión en aprendizaje en la competencia docente de los estudiantes universitarios normales, analizar el tamaño de los factores que influyen,



medir el nivel de competencia actual de los profesores graduados universitarios normales, analizar los problemas existentes y proponer estrategias de mejora, para así explorar la transformación de la formación docente en el contexto de una lógica básica y un camino realista de la educación inteligente.

Implicaciones de la investigación: El tamaño de la muestra y la representatividad de este estudio se limitan a una universidad normal de pregrado local. Por lo tanto, todavía existen muchas deficiencias en este estudio, que deben profundizarse y mejorarse aún más en futuras investigaciones.

Originalidad/Valor: Este estudio explora la relación entre la competencia docente y la alfabetización digital, la identidad profesional, el compromiso con el aprendizaje y la eficacia del aprendizaje entre los docentes en formación, y examina el papel mediador del compromiso y la eficacia del aprendizaje en la relación entre la identidad profesional y el aprendizaje. Esto es beneficioso para nosotros para obtener una comprensión más profunda de la formación de la competencia docente entre los docentes en formación en el contexto de la educación inteligente.

Palabras clave: Competencia Docente, Modelo, Educación Inteligente.

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1 INTRODUCTION

1.1 BACKGROUND

In January 2020, the World Economic Forum released a report entitled "Schools of the Future: Defining a New Education Model for the Fourth Industrial Revolution". The report clearly defined the future of education under the Fourth Industrial Revolution. High-quality learning is the eighth characteristic of Education 4.0. Education 4.0 requires learners to contribute to future social and economic production and be responsible for future society. To achieve this goal, learners need to possess four key characteristics such as global citizenship, innovation and creativity, technical skills, and interpersonal skills in the change of learning content; in the change of learning experience, they need to shift to personalization and autonomy Learning, accessible and inclusive learning, problem-based and collaborative learning, lifelong learning and student-driven learning. In the future, schools should continue to innovate educational methods to promote changes in education models. The school of the future has three characteristics: first, through the establishment of a new educational field, cultivating future talents will be its core task; second, artificial intelligence technology will be deeply integrated with school education to provide support for students; finally, it will form a personalized The learning support system provides students with personalized education



through integrated learning scenarios, flexible and diverse learning methods, and flexible school organization.

Facing the new requirements for teacher competency in smart education, we need to think about learning in a different way, as well as the relationship between students, teachers, knowledge, and the world. However, the components and generation mechanism of teacher competency for normal college students oriented toward smart education are not yet completely clear. For the education and training of normal students, how to adapt to and use new technological knowledge and thinking methods to complete the transformation from traditional education to smart education has become an important issue in education. In the future education and teaching process, normal school students need to possess not only solid subject knowledge and education and teaching theories, but also digital technology capabilities, social communication skills, etc., in order to adapt to and use smart education technology to provide more personalized, digital, and connected services. Provide professional educational services to improve teachers' critical thinking, innovative thinking, communication skills, and problem-solving abilities, thereby improving teachers' initiative and flexibility in teaching. Teachers' digital technology capabilities and social communication skills have become important factors in the competency of future teachers.

1.2 RESEARCH QUESTIONS AND RESEARCH OBJECTIVES

This study uses a method that combines theoretical analysis and empirical investigation, combines positive psychology and teacher professional development stage theory, and studies the relationship between digital literacy, professional identity, learning investment, learning effectiveness, and teacher competency of normal college students. object. Foundation. The main research object is to explore the relationship between teacher competency of normal college students and digital literacy, professional identity, learning investment, and learning effectiveness, and to examine the mediating role of learning investment and learning effectiveness in the relationship between professional identity and learning effectiveness of normal college students. Teacher abilities.

This study has four main research objectives: 1. Explore the basic logic and realistic path of teacher education transformation in the context of smart education. 2. Construct an ability assessment model for normal college students with a background in smart education. 3. Find out the impact of professional identity and learning investment on teacher competency of normal college students, and analyze the magnitude of the influencing factors. 4. Measure the



current teacher competency level of normal school graduates, analyze problems, and propose improvement strategies.

2 LITERATURE REVIEW

2.1 SMART EDUCATION

Smart Education originates from the concepts of “Smart Planet” and “Smart City” proposed by IBM in 2008. Smart means "witty", "dexterous" or "intelligent" in Chinese. In Chinese, the word "wisdom" means "the ability to analyze, judge, invent and create." In this sense, "smart education" is the product of the integration of technology and education, and is the fourth stage after audio-visual education, educational technology, and information-based education.

Scholar Zhu Zhiting believes: “In the information age, smart education advocates promoting smart learning among learners by building a smart learning environment and using smart teaching methods, thereby improving their expectations for success, that is, cultivating people with high intelligence and creativity, using appropriate technology Participate in various practical activities intelligently and continuously create products and value, and realize smart and agile adaptation, shaping and selection of the learning environment, living environment, and working environment.”. Scholar Yang Xianmin believes from an ecological perspective: "Smart education is an educational information ecosystem that is connected, intelligent, perceptual, and ubiquitous based on new generation information technologies such as the Internet of Things, cloud computing, and wireless communications. The system is the advanced development stage of digital education.” (Yang Xianmin, 2014) . In summary, smart education originates from the educational concepts and technical means of the information age, using artificial intelligence education as infrastructure to subvert It uses unique educational technology as an innovative element to achieve "education model change and ecological reconstruction." Its wisdom is reflected in the intelligence of educational technology, that is, the use of sensing technology, big data, the Internet of Things, network technology, artificial intelligence, and virtual reality. Realistic and other technical means, expand and enhance traditional education tools and methods, and realize educational services such as situation awareness, learning analysis, and decision support.



2.2 NORMAL COLLEGE STUDENTS

Normal students are students or graduates of teacher education who receive specialized training in teacher training and education, aiming to become future educators. Teacher education courses cover related fields such as pedagogy, psychology, educational methods, curriculum design, teaching skills, and educational management, aiming to train students to become excellent teachers. In addition to learning educational theory and teaching skills, normal school students also undertake internships or teaching practices to gain practical teaching experience. After completing teacher education, they usually obtain corresponding education degrees, such as a bachelor's degree in education, a master's degree in education, and apply for a teaching qualification certificate as a primary school teacher or a secondary school teacher. After graduation, they can choose to engage in educational work in educational institutions such as kindergartens, primary schools, middle schools, high schools, and universities, as teachers or educational management positions. Normal students play an important role in the field of education, providing guidance and support for students' learning and development (Zhang Lingyang & Xie Ou, 2020) .

2.3 PROFESSIONAL IDENTITY

Occupational identity refers to an individual's perception and evaluation of a certain occupation before and during the process of engaging in the occupation, and forms attitudes, beliefs, sense of belonging and behavioral involvement (Cui Xinling & Liang Jinlong, 2011) . In the context of normal school students, professional identity mainly refers to students' perception and evaluation of the teaching profession in the pre-service or educational internship stage, and the comprehensive situation of cognition, emotion, will, expectations, values and professional behavioral tendencies formed (Song Guangwen & Wei Shuhua, 2006) . This article adopts the latter definition, that is, dynamic teacher professional identity, emphasizing the process of normal students' recognition of the teaching profession during the professional learning stage, internalization of social expectations of the teaching profession, and behavioral assimilation of the teacher's role.



2.4 DIGITAL LITERACY

Literacy refers to a state of readiness or a tendency to behave in a specific way, including moral character, appearance, knowledge level, and ability. In the Chinese context, literacy usually refers to the skills or abilities a person acquires through training and practice. Israeli scholar Yoram Eshet-Alkalai proposed the concept of digital literacy and believed that digital literacy should include five areas: picture/image literacy, re-creation literacy, branch literacy, information literacy, and social-emotional literacy (Aviram & Eshet-Alkalai, 2006). American scholar Paul Gilster defines digital literacy as "the ability to access various information through the Internet medium" (Davydov et al., 2020; Dressen, 2021). In 2017, the European Commission Joint Research Center released the "Digital Literacy Framework for EU Educators", and the 2.2 version of the "Digital Literacy Framework for European Citizens" was released in 2022 (Qingyi, 2023). In November 2021, the Central Cybersecurity and Informatization Commission issued the "Action Program to Improve National Digital Literacy and Skills 2022~2035", proposing that "by 2025, the national digital adaptability, competency, and creativity will be significantly improved" (Xiao Peng, 2022; Xiao Peng & Zhao Qingxiang, 2022).

In the definition of the Cyberspace Administration of China, digital literacy and skills refer to a series of qualities and skills such as digital acquisition, production, use, evaluation, interaction, sharing, innovation, safety and security, ethics and morals that citizens in a digital society should possess in their study, work and life. A collection of capabilities. Digital literacy includes digital awareness, computational thinking, digital learning and innovation, and digital social responsibility. Digital literacy has become the core literacy in the digital age (Xiao Peng, 2022; Xiao Peng & Zhao Qingxiang, 2022).

2.5 LEARNING INVESTMENT

Learning engagement refers to an individual showing full energy and strong mental toughness in learning, having a correct understanding and enthusiasm for the meaning of learning, and entering a state of self-investment (Zhu Hongcan, 2014). This is The Chinese translation of student participation in NSSE (National Survey for Student Engagement) of that university. Initially, Schaufeli et al. conducted related research on work engagement and defined it as employees working in a sustained positive emotional state. However, they accidentally discovered that this state also existed in students. Then the concept of learning



engagement is proposed and divided into three aspects: motivation, energy and concentration. Among them, motivation means that students are proud and enthusiastic about their studies and believe that learning has a certain meaning; energy means that students are energetic during the learning process, are willing to work hard for learning, have a proactive learning attitude, and can persevere when encountering setbacks; concentration It means that students have the characteristics of being undistracted and focused when studying, and maintaining a good attitude during study (Schaufeli et al., 2002) . The concept of learning engagement is widely used in the field of college student learning and development research at home and abroad. Based on Schaufeli's definition, it has become a widely accepted concept. This article also adopts this widely accepted definition.

2.6 LEARNING EFFECTIVENESS

At present, scholars have not yet formed a unified understanding of the concept of student learning effectiveness, and have different expressions when applying this concept. Academics use terms such as learning effectiveness, academic achievement, and learning outcomes to describe this concept. Existing research mainly defines academic effectiveness from two aspects: broad and narrow. American curriculum theorist Eisner EW proposed the concept of "Student Learning Effectiveness", which refers to the results of participating in some form of learning intentionally or unintentionally (Eisner, 1992) . Academic achievement is mainly measured by students' objective academic performance. The concept of academic achievement is almost equivalent to test scores. This definition is mainly applicable to the research field of academic achievement of primary and secondary school students.

With the in-depth development of research, scholars have gradually questioned whether objective academic performance can effectively represent students' academic achievements (Hu Yongmei & Yuan Jing, 2021). The definition of academic achievement has gradually developed from a single cognitive learning outcome in the early days to a concept that includes cognitive learning outcomes, non-cognitive learning outcomes and the comprehensive development of general abilities (He Kekang, 2002; Yu Shengquan, 2007). In the 1990s, the Joint Committee on Educational Evaluation Standards in the United States, as the most authoritative official organization, believed that "student learning outcomes" are a summary of the expected value of students' results after completing the learning process, that is, students complete professional theoretical learning and skills. Content that can be understood and operated after training. These abilities usually include knowledge and understanding (cognition), attitudes and values



(affectiveness), practical skills (skills) and behavior (Huang Haitao, 2010) . To sum up, this article believes that academic effectiveness refers to the degree and level of students' staged learning in school situations, including knowledge acquisition status, skill development status, learning ability and practical ability improvement status, etc.

2.7 COMPETENCE OF NORMAL COLLEGE STUDENT TEACHERS

Defined as characteristics that enable an individual to perform his job productively as measured by acceptable performance standards. This characteristic includes different aspects such as knowledge, skills, abilities, traits, attitudes, motivations and behaviors (Hoffmann, 1999; Shavelson, 2010, 2010; Woodruffe, 1993).

In the field of education, DINEKE EH proposed a definition of teacher competency, which includes a combination of personality characteristics, knowledge, and teaching skills and attitudes required in different teaching contexts (Selvi, 2010). LC Melby pointed out that teacher competency refers to the professional knowledge, professional skills and professional values possessed by individual teachers that are related to the successful implementation of teaching. For example, professional skills refer to the skills necessary for successful performance, including technical and non-technical abilities, while professional attitudes refer to the psychological tendencies of teachers' professional behavior, including cognitive, emotional and behavioral aspects (Melby, 1995). Xing Qiang and Meng Weiqing (2003) drew on this point of view in the study of teacher competency and pointed out that teacher competency, as an individual characteristic of teachers, is a necessary condition for successful teaching and the main training goal of teacher education institutions (Xing Qiang & Meng Weiqing, 2003)

The stage of normal school students as pre-service teachers is closely related to teachers' post-service development. The pre-service teacher development period to which normal students belong is at the beginning of their teaching career. At this stage, normal college students study teacher education, understand the teaching profession, and master the knowledge and abilities required for the teaching profession (Shao Guanghua, 2011). This study takes pre-service normal school students as a sample and focuses on examining the comprehensive characteristics of normal students who successfully implement teaching in the teaching professional field.



3 CONCEPTUAL MODEL

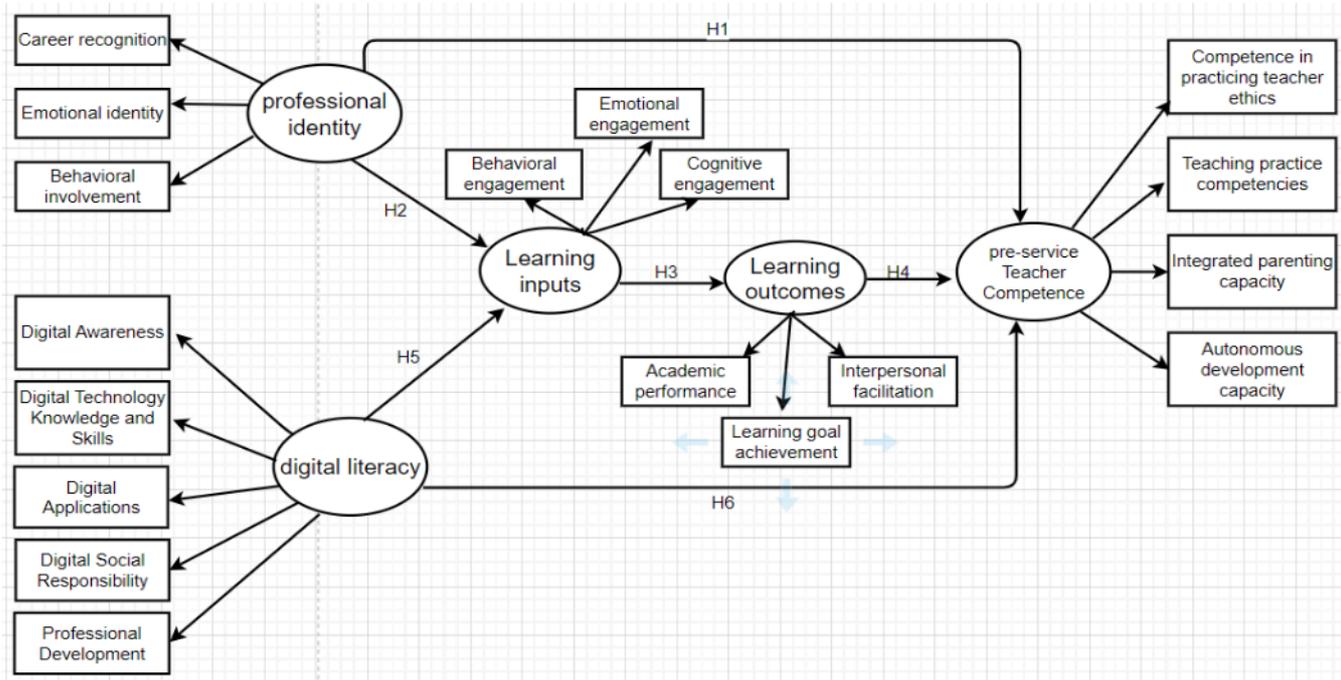
According to relevant literature and research results, it was found that there is a close correlation between the achievement motivation of professional identity and learning effectiveness, which ultimately affects the formation of teacher competency. In the future teacher competency framework, digital technology competence is considered an important competency factor. Based on the research objectives and research hypotheses, we constructed a comprehensive conceptual model to understand the impact, impact pathways and mechanisms of professional identity and digital literacy on teacher competency of normal college students. The research model takes professional identity and digital literacy as independent variables, and examines their impact on the teacher competency of normal college students as the dependent variable.

Considering that participation is an important aspect of the learning process, the effect of learning participation is the achievement of learning. Learning engagement usually plays the role of a mediating variable between students' achievement motivation and learning effectiveness (Boekaerts , 2016) . For example, Guo Jianpeng believed in the article "The Relationship between College Students' Learning Experience and Learning Outcomes: The Mediating Role of Student Engagement" that learning engagement plays a mediating role between learning experience and satisfaction (Guo Jianpeng & Ji Guojun, 2019) . Hu Xiaoyong et al. found in "An Empirical Study on the Relationship between Learners' Information Literacy, Online Learning Engagement and Learning Performance" that learning engagement is the mediating variable between information literacy and online learning performance (Hu Xiaoyong et al., 2020) . Therefore, we examine learning engagement and learning effectiveness together as mediating variables and incorporate them into the research conceptual model, as shown in the figure:



Figure 1

Conceptual Model



4 CONCLUSION

Of professional identity and digital literacy on the teacher abilities of normal school graduates in the context of smart education, as well as the pathways and mechanisms of this impact. This study established a competency structural model suitable for normal college students. It used scale tools such as the College Students' Professional Identity Scale and the College Students' Learning Engagement Scale, and used statistical methods such as structural equation modeling (SEM) and multiple regression to analyze the questionnaire, aiming to examine the mediating role of learning engagement and learning effectiveness between normal school students' professional identity and teacher competency. The purpose of the research is to help normal colleges better cultivate talents that meet the needs of smart education in the future, and at the same time help normal students better understand and improve their own teacher competency levels, and provide useful reference for relevant institutions.

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