Development of Strategies to Promote Sustainable Professional Competences for University Lecturers in the Digital Era, Sichuan Province

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Abstract

This research aimed to study the current situation of sustainable professional competencies for university lecturers in the digital era in Sichuan Province, provide guidelines for improving these competencies, and evaluate the adaptability and feasibility of the guidelines. The research sample comprised 375 university lecturers in Sichuan Province, selected by systematic and random sampling, 10 expert interviewees, and 7 high-level administrators who evaluated the guidelines. Research instruments included questionnaires, structured interviews, and evaluation forms. Data analysis used percentage, mean standard deviation, and content analysis. The results showed that the overall level of sustainable professional competencies for university lecturers in the digital era is relatively high but unbalanced across different aspects. The implementation level of subject knowledge competencies is the highest, while sustainable learning competencies are the lowest. The guidelines for improvement are divided into four elements with 31 measures: 7 for subject knowledge, 5 for teaching ability, 8 for digital skills, and 6 for sustainable learning. The adaptability and feasibility of the guidelines were evaluated at the highest level.

Keywords: sustainable professional competencies, university lecturers, digital Era, Sichuan Province, strategies to promote

1. Introduction

Cultivating sustainable professional competencies for university lecturers in the digital era is an urgent and imperative area of academic investigation. An avenue explored for potential resolution involves utilizing blended learning strategies, which entails integrating traditional face-to-face pedagogical methods with digital online media (Handayaningrum & Abdillah, 2019). This approach holds the promise of augmenting the professional growth of lecturers, facilitating the adaptation and refinement of pedagogical methods in response to the demands of the digital age. Moreover, a more nuanced understanding can be obtained by considering lecturers' self-assessment of their digital competence, as this elucidates the diverse array of resources and support required by educators, contingent on their unique educational contexts and individual professional backgrounds (Martín-Párraga et al., 2023).

Although utilizing blended learning strategies offers considerable utility, it underscores the deeper issue of digital competency among university lecturers. For the effective implementation of blended learning approaches, digital competence serves as a foundational prerequisite. In this context, digital competence transcends the mere acquisition of technical skills essential for utilizing digital tools; it encompasses the ability to engage in critical thinking and includes a diverse set of proficiencies that empower individuals to employ Information Society Technology safely and critically for work, leisure, and communication.

In response to this challenge, various universities across Europe have endeavored to address this issue by implementing professional development programs to promote the communication and pedagogical skills of lecturers tasked with instructing in the digital realm. These programs draw upon previous research in the domains of English for Academic Purposes (EAP) and English for Specific Purposes (ESP), as well as methodological principles that promote active student engagement and the cultivation of communication and digital competencies.

The imperative to cultivate and sustain professional competencies for university lecturers in the digital era is an essential undertaking aimed at upholding the quality of education and facilitating the seamless integration of technology into teaching practices. Educators must possess the requisite knowledge, skills, and competencies in the contemporary digital landscape to proficiently harness digital tools and technologies in their pedagogical approaches (Setiawan, 2017).

As articulated by Setiawan (2017), the utilization of digital tools and technologies necessitates the acquisition of technical skills and a profound understanding of the associated knowledge and learning factors in information technology. These elements collectively underpin the development of professional competence among educators. Consequently, educators must be proficient in navigating digital platforms and effectively employing technology-enhanced teaching methodologies.

An effective approach to fostering professional competencies for university lecturers in the digital era is integrating digital tools and technologies within professional development programs. Research conducted by Gil and Dueñas (2023) underscores such initiatives' effectiveness in nurturing communicative and pedagogical skills essential for teaching in the digital age. By infusing digital

components into professional development, educators are better prepared to harness the potential of technology for educational purposes.

Moreover, the findings of professional development endeavors focused on technology integration among educators underscore the pivotal role of Information and Communication Technologies (ICTs), Google Applications for Educators, and other digital resources in augmenting professional competence. These tools facilitate efficient teaching and encourage innovative and interactive approaches to education, aligning with the demands of the digital era.

Despite the foundational frameworks established by research endeavors worldwide in digital pedagogical competence among educators, the specific educational context within Sichuan Province has remained insufficiently explored. Serving as a representative region in southwestern China, Sichuan Province exhibits comparatively lower academic standards, faculty development challenges, and a shortage of digital educational resources. Notably, in critical domains such as subject knowledge, pedagogical skills, digital literacy, and sustainable learning, there exists a conspicuous absence of in-depth and contextual investigations. Consequently, this study aims to formulate strategies tailored to the development of digital pedagogical competence among educators in Sichuan Province, thereby bridging the research gaps observed in current academic literature. Through comprehensive investigation and rigorous analysis, this research aims to provide empirical support and concrete strategic guidance for educational reform in Sichuan Province.

Against this backdrop, the research topic under consideration is substantiated. Leveraging my extensive experience in educational initiatives focused on faculty competence development and drawing from the latest national policies, academic research findings, and data of administrators and middle-level leaders in ten public universities within Sichuan Province, this study presents pertinent development guidelines. The overarching aim is to promote the sustainable professional competence of university lecturers in the digital era in Sichuan Province. This endeavor intends to realize better Bettergion's objectives of sustained professional competence development for educators, thereby elevating the quality of teaching and student nurturing and advancing the professional competence of higher education faculty in Sichuan Province.

1.1 Research Questions

ln order to be consistent with the research objectives and to get an idea of the research questions; the researcher defined the research questions as follows.

1. What is the current status of lecturers' sustainable professional competencies in the digital era, Sichuan province?

2. What are the strategies for promoting lecturers' sustainable professional development competencies in the digital era, Sichuan province?

1.2 Objectives

1. To study the current status of lecturers' sustainable professional competencies in the digital era, Sichuan province.

2. To study the strategies for promoting lecturers' sustainable professional competencies in the digital era, Sichuan province.

3. To evaluate the feasibility of the strategies for promoting lecturers' sustainable professional competencies in the digital era, Sichuan province.

1.3 The Variable

Under the compilation and analysis of relevant theories and research content, the study explores strategies to promote the sustainable professional competence of university lecturers in Sichuan Province in the digital era in 4 aspects.

Independent Variable

Strategies for promoting sustainable professional competencies for university lecturers in the digital era, Sichuan Province.

Dependent Variable

The quality of strategies for enhancing the adaptability and feasibility of sustainable professional competencies for university lecturers in the digital era, Sichuan Province.

1. Subject knowledge

2. Teaching ability

3. Digital skills

4. Sustainable learning

2. Concept and Theory of Education for Sustainable Development

2.1 The Concept of Education for Sustainable Development

Education for Sustainable Development (ESD) is a holistic and integrated approach to education to develop knowledge, skills, values, and behaviors needed for sustainable living and social participation. It encompasses various topics such as environmental stewardship, social equity, economic sustainability, and cultural diversity. ESD encourages critical thinking, problem-solving, and active participation in shaping a sustainable future. It integrates these principles across all subjects and levels of education, fostering a more interconnected and comprehensive understanding of how individual actions can impact global challenges.

As shown in Table 1:

Table 1. Lists the Definition of Education for Sustainable Development

NO	Author	Insight
1	Thakran (2015)	Defines ESD as integrating sustainability concepts across all education levels.
2	International Journal of Education and Applied Social Sciences	Describes ESD's focus on sustainable living and social responsibility.
3	Devat and Rathod (2013)	Highlights ESD's role in developing critical thinking and problem-solving.
4	Lavanya and Saraswathi (2014)	Emphasizes participatory methods and active learning in ESD.
5	Bhawani (2009)	Discusses ESD's aim to empower environmental integrity and a just society.

Table 1 Education for sustainable development is an educational model designed to cultivate learners' profound understanding and active engagement with global challenges such as environmental protection, social justice, and economic sustainability. This pedagogical approach is closely integrated with the United Nations Sustainable Development Goals (SDGs). Through interdisciplinary learning and practical activities, it fosters students' critical thinking, problem-solving skills, and global citizenship awareness. Sustainable Development Education extends beyond traditional classroom teaching, encompassing various forms of education, including informal and non-formal education, such as community involvement and media campaigns. Its core objective is to enable learners to

comprehend and address challenges like climate change, resource scarcity, and social inequality, thereby facilitating sustainable development at both personal and societal levels.

2.2 The Emergence of Education for Sustainable Development

The emergence of sustainable development education has evolved from environmental education without altering the meaning of the article, and the word count remains the same. The term "Environmental Education" (EE) first appeared in the United States in 1970 with the enactment of environmental education legislation (National Environmental Policy Act, 1970). However, the true landmark for global environmental education came in 1972 during the United Nations Conference on the Human Environment in Stockholm, Sweden. This conference called for global efforts to protect Earth's resources, officially establishing the name of environmental education. It emphasized the importance of conducting environmental education and the necessity of international cooperation in its documents. This event marked the entry of ecological education onto the global stage and became a milestone in the history of environmental conservation (Sun, 2022).

Following the 1972 United Nations Conference on the Human Environment, environmental education gradually gained promotion and development, with increasing global attention to environmental issues (United Nations, 1972). However, it was not until the 1980s, with the emergence of the concept of sustainable development, that ecological education entered its second significant phase. The idea of sustainable development emphasizes the integration of environmental, social, and economic aspects, which positively and profoundly impact education on a global scale. With the introduction of sustainable development, the international environmental education community began to reconsider multiple environmental issues, emphasizing the need to orient education towards sustainable development. This led to the repositioning of environmental education and the birth of the "Education for Sustainable Development" (ESD) concept. UNESCO introduced the idea of Education for Sustainable Development in 1988, becoming one of the early proponents in this field.

Additionally, in 1992, the United Nations Conference on Environment and Development adopted the influential "Agenda 21," emphasizing the crucial role of education in promoting sustainable development and promoting people's development capabilities. This agenda explicitly stated that "education for environment and development should be integrated into all levels of formal and non-formal education" (United Nations, 1972). In 1997, UNESCO officially established the international status of "Education for Sustainable Development," marking the globalization process of education for sustainable development (UNESCO, 2012).

2.3 The Significance of Education for Sustainable Development

The importance of education for sustainable development resides in fostering environmental awareness and sustainable thinking within the upcoming generations, enabling them to confront global challenges.

Education for sustainable development plays a pivotal role in fostering economic growth, environmental protection, and cultivating a sustainable development culture. Higher levels of education are associated with specific environmentally conscious behaviors and sustainable energy consumption. Thus, Education plays a crucial role in promoting sustainable development by influencing attitudes and behaviors, and it must be integrated into various learning environments to yield a comprehensive impact. Attaining quality education is essential for the proper functioning of a sustainable society (Veckalne & Tambovceva, 2022).

As a component of education for sustainable development, environmental education is a key element of global education aimed at safeguarding human civilization and promoting sustainable practices. The significance of education for sustainable development cannot be overstated, as it forms the cornerstone for achieving the Sustainable Development Goals (SDGs) established by the United Nations. Education for sustainable development (ESD) is pivotal in shaping learners' knowledge and skills to actively promote sustainable development (O'Flaherty & Liddy, 2018). This assertion is further supported by research highlighting ESD's multifaceted impact and challenges, underscoring the necessity for its continued integration and exploration within various educational contexts.

In conclusion, the significance of education for sustainable development is evident across various facets of research and practice. It serves as the linchpin for achieving the SDGs, especially SDG 4, and equips learners with the knowledge and competencies needed to address complex sustainability challenges. Furthermore, the research and insights discussed underscore the multifaceted nature of ESD, emphasizing the imperative for its continued integration and exploration across diverse educational settings.

2.4 Goals of Education for Sustainable Development

The goals of education for sustainable development aim to cultivate environmentally conscious and socially responsible citizens capable of addressing global challenges.

Education for sustainable development (ESD) equips learners with the knowledge and skills to promote global justice and sustainability. In recent research, O'Flaherty and Liddy (2018) synthesized the impact of development education and ESD interventions. They examined the assessment measures and the evidence demonstrating the effects on learners' development. The researchers related the same ideas as Baena-Morales and González-Víllora (2023), centered their study on the contributions of physical education to the dimensions of sustainability and the Sustainable Development Goals (SDGs). They also emphasized the potential of holistic Health Physical Education (HPE) in advancing sustainable development.

Furthermore, Osson et al. (2022) conducted a longitudinal study to revisit the effectiveness of ESD, particularly focusing on its influence on secondary students' action competence for sustainability. Uggla and Soneryd (2023) delved into the possibilities and challenges of teaching sustainable development in higher education. They highlighted the formative role of higher education in the context of ESD. They proposed that sociology could be a foundation for fostering critical thinking and normative action in sustainable development education.

According to Adipat and Chotikapanich (2022), the viewpoint asserts that the "2030 Agenda for Sustainable Development" acknowledges the transformative power of education, with the primary goal of ensuring that by 2030, all young people have the opportunity to access high-quality primary education and attain proficiency in numeracy and practical literacy skills.

According to the viewpoint presented by Dorneanu et al. (2022), the objectives of education for sustainable development entail cultivating capabilities in individuals, groups, communities, organizations, and nations. These capabilities enable them to engage in thoughtful, action-oriented endeavors promoting sustainability. This overarching objective encompasses a comprehensive spectrum of educational domains, from individual skills to collaboration and societal transformation. In conclusion, the developmental objectives of sustainable education revolve around utilizing education to shape more sustainable modes of thinking and behavior, ultimately aiming to forge a more sustainable future. These objectives are instrumental in establishing a fairer, environmentally conscious, and prosperous society.

2.5 Concept and Theory of Professional Competence

2.5.1 Concept of Professional Competence

From an etymological perspective, according to the definition provided by the "New Oxford English Dictionary," we can interpret "ability" as the "capacity to successfully or effectively perform a task." In research, this concept primarily refers to the skills, knowledge, or expertise individuals or groups possess to execute a particular task successfully. "Professional competence" corresponds to specific positions within a certain profession or a category of positions. It represents the individual requirements that job positions have for practitioners. The professional competence of teachers exhibits dynamic, developmental, and adaptable characteristics, manifesting as educational objectives and environments change. Teachers' professional competence continually improves and develops as individual teachers grow. This professional competence encompasses, but is not limited to, language and literacy application skills in education and teaching, modern information technology application skills, pedagogical competence, management skills, the ability to implement education in compliance with laws, and the capacity for lifelong development in education and teaching. In exploring the research on the professional competence of university lecturers, some scholars believe that the professional competence of lecturers includes fundamental abilities, occupational skills, and self-improvement capabilities. However, with the continuous development of higher education, innovative abilities, self-directed learning capabilities, and research abilities have gradually become new requirements for university lecturers. Additionally, some scholars argue that vocational school teachers should keep pace with the times, cultivating self-directed learning and innovation abilities and staying updated with cutting-edge technologies to promote their professional practice continually.

Researchers such as Zhu and Chen (2015) constructed a quality assessment index system to cultivate professional competence in higher education lecturers. They categorized the professional competence of vocational school teachers into three dimensions and ten evaluation indicators. These dimensions encompass general abilities, work and professional competence, and practical capabilities. These evaluation indicators are used to assess lecturers' professional competence in various aspects, providing strong guidance for improving the educational quality of university lecturers. Moreover, Timperley (2008), titled Teacher Professional Learning and Development: Best

Evidence Synthesis Iterati analyzed 97 studies related to professional development, leading to improved student outcomes among participating teachers. These studies primarily originated from the United States, New Zealand, the Netherlands, the United Kingdom, Canada, and Israel. This research emphasizes the importance of professional and organizational learning in schools for promoting student learning.

2.6 Content of Professional Competence

The professional competence of lecturers is an area explored through various lenses in academic research. Key findings include the importance of Continuous Professional Development (CPD) for vocational lecturers, the assessment of research competence at universities, and the role of lecturers' competencies in promoting the effectiveness of higher education institutions. Studies have also delved into students' perceptions of lecturers' pedagogical competence and the impact of the digital era on lecturers' job roles and skills.

As shown in Table 2:

Table 2. Lists of the Content of Professional Competence

No	Author	Paper Title	Relevant Insight
1	Priadi et al. (2023)	Continuous Professional Development (CPD) Model Development for Vocational Lecturers	Discusses the development of a CPD model for promoting vocational lecturers' skills.
2	Bui et al. (2023)	An Analysis of the University of Social Sciences and Humanities, Vietnam National University Ho Chi Minh City Lecturers' Research Competence	Assesses research competence among university lecturers in social sciences.
3	Engelbrecht and Engelbrecht (2022)	Professional competencies: an assessment of lecturers at a private higher education institute in South Africa	Evaluate the professional competencies of lecturers in a South African institute.
4	Asrifan et al. (2022)	Students' Perception Toward Good Lecturer Pedagogical Competence	Explores students' views on lecturers' pedagogical skills.
5	Muhammad et al. (2022)	Lecturer Professionalism in Improving the Effectiveness of Higher Education Institutions	Highlights the role of lecturer professionalism in higher education effectiveness.

Based on the content of Table 2 and the research questions and objectives, the focus can be placed on three dimensions: 1) Subject knowledge, 2) Teaching competence, and 3) Sustainable learning.

2.7 Definition of Professional Competence

Scholars generally agree that teacher professional competence is a synthesis of psychological and behavioral capabilities. It encompasses a range of qualities that educators need during the teaching and learning process to translate their pedagogical ideas into practical educational activities.

Hao and Zhe (2004) described teacher professional competence as "the skills exhibited by teachers during teaching activities. In this process, teachers draw upon their existing teaching experience, adapting flexibly to diverse educational contexts and responding promptly and effectively in educational situations."

Pan et al. (2002, p.11) define professional competence as "the ability of teachers to apply subject knowledge to solve real-world problems in their respective professional domains, primarily encompassing the relevant skills within their occupational fields."

Wu and Liu (2004, p.5) describe teacher professional competence as "the capacity to manifest individual psychological characteristics that facilitate the smooth completion of teaching tasks during educational and instructional activities."

Liu and Chen (2016, p.145-146) believed specific abilities include communication and interpersonal skills, organizational and managerial abilities, teaching and nurturing capabilities, and a strong knowledge base. These abilities are essential for teachers to engage in professional activities successfully. Furthermore, Douglas et al. (1982, p.512-519) argue that a teacher's teaching professional competence should also encompass the ability to create a

clear and emotionally engaging learning environment, the capacity to inspire active student participation, the ability to meet students' learning needs, the skill to help students identify learning outcomes, and the capability for continuous self-development.

Liu and Xie (2011) further point out that teacher professional competence is closely related to teaching and should encompass various aspects, including instructional design, teaching implementation, classroom organization and monitoring, educational assessment, scientific research, and the utilization of modern information technology. These abilities evolve and improve through continuous educational practice.

Ye et al. (2015) expand the concept of teacher professional competence to include various aspects such as interpersonal communication skills, organizational and managerial abilities, educational research skills, the ability to use multiple teaching methods, information organization and transformation skills, and the ability to receive information. This comprehensive perspective emphasizes the multidimensional qualities teachers must demonstrate in different domains and tasks.

Nachiappan et al. (2012) highlight six common qualities of excellent teachers, including positive teacher-student relationships, effective student learning motivation, high expectations with effectiveness, respect for student diversity and learning methods, strong communication skills, and dedication to excellent teaching. These qualities are further divided into 21 specific evaluation criteria. In conclusion, teacher professional competence is a multifaceted and intricate construct encompassing a fusion of general and particular abilities. These competencies cover a spectrum of skills and qualities that educators must exhibit to meet the demands of diverse fields and tasks.

In conclusion, teacher professional competence constitutes a multifaceted and intricate concept, encompassing the amalgamation of general and specific capabilities. These capabilities encompass various skills and qualities teachers must exhibit in educational instruction to meet the requirements of diverse domains and tasks.

2.8 Research on Professional Competence

Ye (2008) researched the professional competence of ordinary teachers in different educational stages, subjects, and regions. From the perspective of educational stages, she found that kindergarten teachers demonstrated good professional competence, leaning toward the upper end of the spectrum. On the other hand, secondary school teachers displayed professional competence that met standard requirements and showed relatively balanced development. However, some issues were identified, including a relatively weak ability to grasp teaching objectives, insufficient proficiency in the application of modern educational technologies, a limited focus on specialized moral education activities, a relatively monotonous student evaluation approach, limited communication with parents, colleagues, and the community, and lower levels of reflection and developmental abilities.

Qu and Wu (2021) pointed out that from the perspective of subjects, research on teacher professional competence spans various disciplinary fields. For instance, Chinese language teachers exhibit weaknesses in their awareness and proficiency in utilizing curriculum resources, and they demonstrate relatively limited reflection awareness and educational research capabilities. On the other hand, mathematics teachers face challenges related to incomplete mathematical professional competence, a lack of organizational ability for cooperative teaching, inadequate proficiency in modern teaching methods, and a deficiency in lifelong learning skills.

Ye (2008) argued that when viewed from a regional perspective, there is relatively less research on the professional competence of teachers in remote provinces. In contrast, more attention is being paid to studying teachers' professional competence in rural areas. This suggests that variations in educational backgrounds and resource allocation across different regions may impact teachers' professional competence and warrant further in-depth research. In conclusion, research on teacher professional competence encompasses multiple dimensions, including educational stages, subjects, and regions. These studies have identified certain characteristics and issues in the manifestation of teacher professional competence, offering valuable insights and guidance for promoting teacher professional competence. Further research is needed to gain a deeper understanding of these issues and address them, ultimately improving the quality and effectiveness of teacher education and training.

Yao and Zhang (2022) emphasize that teachers should continuously promote their professional competence by utilizing data and information gathered during educational practice, highlighting the significance of practical skills and reflective capabilities.

Yuan and Tian (2023) further propose that a teacher's years of service, educational qualifications, and academic rank are not only internal factors but also positively correlated with the professional development competence of rural teachers.

Yu et al. (2015) suggest that the social environment, school environment, and teacher admission system are important external factors that constrain teachers' professional development. Decreased trust in the teaching profession within society leads to a decline in teachers' commitment and enthusiasm, hindering their ability to promote their professional competence. Therefore, teachers' professional development necessitates systematic cultivation and ongoing training. This requires the establishment of high-level, specialized training centers for young teachers and professional training teams to promote teachers' professional development continually.

In conclusion, professional competence refers to the comprehensive capability of university lecturers encompassing subject knowledge, teaching ability, digital skills, and sustainable learning. This includes a profound understanding of their academic discipline, advanced teaching methodologies and techniques, proficient use of digital technologies, and a commitment to ongoing education and developmental abilities. Such competence enables lecturers to not only impart knowledge but also adeptly utilize various teaching tools and technologies, thereby continually promoting the effectiveness of their instruction. Consequently, this fosters an environment that effectively stimulates students' interest and engagement in learning.

3. Methodology

3.1 The Population / Sample Group

1) The population

The overall subject of the research encompasses 15647 lecturers from 10 universities in Sichuan Province. These include Sichuan Normal University, Leshan Normal University, Yibin University, Neijiang Normal University, Xihua Normal University, Sichuan University of Arts and Science, Mianyang Normal University, Aba Normal University, Xichang University, and Panzhihua University, covering lecturers from various academic disciplines.

2) The sample group

According to Krejcie and Morgan's sampling table, the sample population will consist of 375 university lecturers randomly selected from 10 universities across 18 cities within Sichuan Province. To ensure the sample's representativeness, efforts will be made to ensure that the sample population of the overall population is in terms of gender, age, educational background, teaching experience, and academic disciplines.

In selecting the sample population, scientific sampling principles such as randomness and representativeness will be followed to ensure the validity and credibility of the research results. Additionally, the rights and privacy of each participant will be respected to ensure the ethics of the research.

Table 3. Lists of Universities and Sample Sizes Reflecting the Characteristic

NO	University in Sichuan	Population	Sample Group
1	Sichuan Normal University	3000	72
2	Leshan Normal University	1500	36
3	Yibin University	1500	36
4	Neijiang Normal University	1500	36
5	Xihua Normal University	2600	63
6	Sichuan University of arts and science	1100	26
7	Mianyang Normal University	1254	30
8	Aba Normal University	843	20
9	Xichang University	1300	31
10	Panzhihua University	1050	25
Total		15647	375

3) interview groups

The research employed a random sampling method to select university lecturers from ten different institutions, namely Sichuan Normal University, Leshan Normal University, Yibin University, Neijiang Normal University, China West Normal University, Sichuan University of Arts and Science, Mianyang Normal University, Aba normal university, Xichang university, and Panzhihua university. One lecturer was selected from each university, resulting in a total sample size of ten participants. The interview group employed purposeful sampling to select participants who met the following criteria:1) Lecturers from regular undergraduate institutions with a minimum of 5 years of teaching experience. 2) Individuals with significant experience in digital learning or a background in the digital industry.

Table 4. Lists of University and Interviewer Size

NO	University in Sichuan	Interviewers
1	Sichuan Normal University	1
2	Leshan Normal University	1
3	Yibin University	1
4	Neijiang Normal University	1
5	Xihua Normal University	1
6	Sichuan University of arts and science	1
7	Mianyang Normal University	1
8	Aba Normal University	1
9	Xichang University	1
10	Panzhihua University	1
Total		10

4) Evaluation Group

Seven senior administrators from undergraduate institutions in Sichuan Province evaluated strategies to promote sustainable professional competencies for university lecturers in the digital era in Sichuan Province. The qualifications of these experts were based on the research objectives and research questions and included the following criteria:1) They should be affiliated with regular undergraduate institutions and possess a minimum of 5 years of teaching experience. 2) They should have substantial experience in digital learning or a background in the digital industry. 3) They should hold the academic title of associate professor or higher.

As shown in Table 5:

Table 5. Lists of University and Evaluation Size

NO	University in Sichuan	Interviewers
1	Sichuan Normal University	1
2	Leshan Normal University	1
3	Yibin University	1
4	Neijiang Normal University	1
5	Xihua Normal University	1
6	Sichuan University of arts and science	1
7	Mianyang Normal University	1
Total		7

3.2 Research Methods and Steps

The research employed data collection, analysis, and summarization, encompassing both quantitative and qualitative data, to verify and ensure the accuracy of the data. A survey questionnaire on strategies for promoting sustainable professional competencies for university lecturers in the digital era, Sichuan Province, was designed and administered to lecturers from 10 universities in Sichuan Province. Additionally, a structured interview questionnaire was developed to conduct interviews with 10 lecturers from the same universities. Through the investigation and analysis of the survey data, this paper puts forward strategies for promoting sustainable professional competencies for university lecturers in the digital era, Sichuan Province.

Step 1: Investigate the current status of sustainable professional competencies for university lecturers in the digital era, Sichuan Province.

Step 2: Conduct expert interviews to explore the formulation of strategies for promoting sustainable professional competencies for university lecturers in the digital era, Sichuan Province.

Step 3: Evaluate the feasibility of the strategies for promoting sustainable professional competencies for university lecturers in the digital era, Sichuan Province.

Step 4: Implement the strategies for promoting sustainable professional competencies for university lecturers in the digital era, Sichuan Province.

3.3 Research Instruments

The research utilized research tools, including questionnaires, interview guides, and a feasibility assessment form for the strategies to promote sustainable professional competencies for university lecturers in the digital era, Sichuan Province.

1) Designing research instruments

1.1) Questionnaire

The data collection tool for Objective 1 involved a questionnaire survey to assess the current status of sustainable professional competencies for university lecturers in the digital era, Sichuan Province. The questionnaire, designed to enhance sustainable professional competencies for university lecturers in the digital era, Sichuan Province, encompassed four main dimensions:1) Subject Knowledge, 2) Teaching Competence, 3) Digital Skills, and 4) Sustainable Learning.

The survey questionnaire was divided into two parts:

Part 1: Respondent Information, including gender, age, educational background, years of work experience, academic title, and other relevant data.

Part 2: Utilizing a 5-point Likert scale, the questionnaire consisted of four sections, each containing 9 items, to assess the current state of sustainable professional competencies for university lecturers in Sichuan Province across the four dimensions mentioned above. In total, there were 36 questions.

The criteria for data interpretation based on a five-point Likert's scale, as follows:

5. expresses that the level of sustainable professional competencies for university lecturers was at the highest level.

4 expresses that the level of sustainable professional competencies for university lecturers was high.

3 expresses that the level of sustainable professional competencies for university lecturers was at a medium level.

2 expresses that the level of sustainable professional competencies for university lecturers was low.

1 expresses that the level of sustainable professional competencies for university lecturers was at the lowest level.

The data interpretation for average value is based on Likert (1932).

The data interpretation is as follows:

4.50-5.00	refer to	the highest level
3.50-4.49	refer to	high level
2.50-3.49	refer to	middle level
1.50-2.49	refer to	low level
1.00-1.49	refer to	the lowest level

1.1.1) Constructing a questionnaire process

The construction process of the questionnaire was as follows:

Step 1: Review and analyze documents, concepts, theories, and research related to the sustainable professional competence of university lecturers in the digital era, Sichuan Province.

Step 2: Develop a survey questionnaire to assess the current status of sustainable professional competencies for university lecturers in the digital era, Sichuan Province. Share the questionnaire outline with mentors and make necessary revisions based on their feedback.

Step 3: Validate the questionnaire by assessing its Interrater Objectivity Coefficient (IOC) with three experts.

Step 4: Revise the survey questionnaire based on expert recommendations.

Step 5: Pilot-test the questionnaire by administering it to 30 teachers at Sichuan University.

Following the questionnaire design, to prevent deviations from the intended design, this study ensured that both the survey respondents and interviewees were lecturers from ten representative universities in Sichuan Province. Secondly, the questionnaire's reliability was assessed using Cronbach's Alpha Coefficient, resulting in a reliability score of 0.956. This high coefficient indicates a strong level of reliability for the scale.

Step 6: Distribute the questionnaire to 375 teachers from ten universities in Sichuan Province and await data collection.

1.2 Structured interviews

For the data collection tool related to Objective 2: "Guidelines for promoting Sustainable Professional Competencies for University Lecturers in the Digital Era, Sichuan Province" were proposed. Building upon the analysis of interviewee data, this study systematically outlined strategies for improving the sustainable professional competence of university lecturers in the digital era, Sichuan Province. Additionally, interview content and a structured interview template were developed with a questionnaire survey. Adhering to a problem-oriented approach, deficiencies in four aspects—disciplinary knowledge, teaching abilities, digital skills, and sustainable learning—were identified as areas for improvement. Targeted guidance was provided to strengthen the sustainable professional competence of university lecturers in the digital era, Sichuan Province.

1.3 Evaluate the feasibility of the strategy

For the data collection tool related to Objective 3: "Assessment of the feasibility of promoting sustainable professional competencies for university lecturers in the digital era, Sichuan Province," in this phase, seven experts from seven representative undergraduate universities in Sichuan Province were invited. The Likert scale method was employed to assess the adaptability and feasibility of the guidelines.

The standards are as follows:

4.50-5.00   Refer to   the highest level

3.50-4.49   Refer to   high level

2.50-3.49   Refer to   middle level

1.50-2.49   Refer to   low level

1.00-1.49   Refer to   the lowest level

3.4 Data Collection

Depending on the type of research instrument, the researchers designed different steps to collect data. Here are some examples.

3.4.1 Questionnaire

The data collection for objective 1: To study the current status of lecturers' sustainable professional competence in the digital era, Sichuan province.

Step 1: The researcher requested a letter of request from the graduate school at Bansomdejchaopraya Rajabhat University to collect data from 375 university lecturers in Sichuan Province.

Step 2: The researcher distributed the questionnaire to 375 university lecturers in Sichuan Province. And ensure that all questionnaires are returned, accounting for 100%

3.4.2 Structured interviews

The data collection for objective 2: To study the strategies for promoting lecturers' sustainable professional competence in the digital era, Sichuan province.

Step 1: Review existing literature, conduct a search on the research and development of sustainable professional competence enhancement strategies among university lecturers in the digital era, Sichuan Province, and extract guidelines based on the Sustainable Development Goals (SDGs) and relevant policy documents in China regarding the sustainable development of university teachers.

Step 2: Organize the suggestions and opinions of the respondents and form guidelines.

3.4.3 Evaluate the feasibility of the strategy

The data collection for objective 3: To evaluate the feasibility of the strategies for promoting lecturers' sustainable professional competence in the digital era, Sichuan province.

Step 1: The researcher requested a letter of authorization from the Bansomdejchaopraya Rajabhat University graduate school to collect data from 7 experts representing universities in Sichuan Province to formulate strategies to promote sustainable professional competence.

Step 2: The research team disseminated the assessment forms to the 7 experts, coordinated suitable schedules and venues for engaging with these experts, provided guidance for completing the assessment forms, and meticulously ensured the collection of all evaluation forms.

3.5 Data Analysis

After verifying the completeness and effectiveness of the questionnaire, the researchers divided the data analysis into two steps: preliminary analysis and in-depth analysis.

Step 1. Questionnaire Categorization: Analyze the data characteristics of various research variables and perform preliminary data analysis and basic statistical analysis for each variable using SPSS. The initial data categorization is based on the personal information of the samples, including gender, major, educational background, and so forth.

Step 2: The current status of sustainable professional competencies for university lecturers in Sichuan Province is divided into four aspects: 1) Subject knowledge, 2) Teaching abilities, 3) Digital skills, and 4) Sustainable learning. Analysis is conducted using mean values and standard deviations to achieve the research objectives.

Step 3: Content analysis of the strategies for promoting sustainable professional competencies for university lecturers in the digital era, Sichuan Province.

Step 4: Using mean values and standard deviation methodology, the feasibility analysis of the improvement guidelines for the strategies to promote sustainable professional competencies for university lecturers in the digital era, Sichuan Province.

4. Results

The researcher conducted a comprehensive analysis of the data, segmented into the following four parts:

Part 1: Analysis results of respondents' personal information, categorized by gender, years of teaching experience, professional title, and educational background, with data presented in terms of frequency and percentage.

According to Table 6, in terms of gender, there are 200 male respondents, accounting for 53.33%, and 175 female respondents, accounting for 46.67%. The proportion of male lecturers among the respondents is relatively higher. The main range of years of teaching experience is 20-30 years, accounting for 37.33% of the total population, followed by 10-20 years, with 0-10 years being the least, with only 60 people accounting for 16%. The respondents' professional titles are mainly lecturers, with 150 people accounting for 40%, followed by associate professors, accounting for 26.67%. The educational background of the respondents is mainly master's degrees, with 173 people accounting for 60.71%, followed by doctoral degrees, while the number of people with a bachelor's degree or below is the least, with only 8 people accounting for 2.13%.

Table 6. Number of People and Percentage of Respondents

(n=375)

	Personal Information	Frequency	Percentage
Gender	Male	200	53.33
	Female	175	46.67
	Total	375	100
Years of teaching experience	0-10 years	60	16
	10-20 years	120	32
	20-30 years	140	37.33
	Over 30 years	55	14.67
	Total	375	100
Professional Title	Junior	80	21.33
	Intermediate	150	40
	Associate Professor	100	26.67
	Full Professor	45	12
	Total	375	100
Highest educational attainment	less than a bachelor's degree	8	2.13
	Bachelor's degree	17	4.53
	Master's degree	204	54.4
	Doctor's degree	146	38.94
	Total	375	100

Part 2: Analysis results of the current state of sustainable professional competencies for university lecturers in the digital era, Sichuan Province, with data presented in terms of mean and standard deviation.

Table 7. The Average Value and Standard Deviation of Sustainable Professional Competencies for University Lecturers in the Digital Era, Sichuan Province

(n=375)

	Competences for University Lecturers in Sichuan Province	$\overline{X}$	S.D.	level	rank
1	Subject Knowledge	3.92	0.82	High	1
2	Teaching Ability	3.90	0.85	High	3
3	Digital Skills	3.91	0.86	High	2
4	Sustainable Learning	3.88	0.88	High	4
	Total	3.90	0.85	High	

According to Table 7, the current situation of sustainable professional competencies for university lecturers in the digital era in Sichuan Province is at a high level ($\overline{X}$= 3.90). Considering the results, the aspects ranged from highest to lowest level were as follows: the highest level was subject knowledge ($\overline{X}$= 3.92), followed by digital skills ($\overline{X}$= 3.91), teaching ability ($\overline{X}$= 3.90), and sustainable learning was the lowest level ($\overline{X}$= 3.88).

Table 8. The Average Value and Standard Deviation of Sustainable Professional Competencies for University Lecturers in Subject Knowledge in the Digital Era, Sichuan Province

(n=375)

NO	Subject knowledge	$\overline{X}$	S.D.	level	rank
1	Engage in regular study to update disciplinary knowledge	3.86	0.86	high	6
2	Possess professional competitiveness within the disciplinary domain	3.80	0.78	high	9
3	Participate in research activities relevant to the discipline	3.83	0.78	high	8
4	Review the latest literature about the discipline	3.84	0.89	high	7
5	Attend academic conferences relevant to the discipline	3.98	0.75	high	2
6	Utilize online resources to enhance disciplinary knowledge	4.10	0.74	high	1
7	Exchange ideas with peers to advance disciplinary knowledge	3.95	0.87	high	5
8	Encourage students to pose discipline-related inquiries	3.97	0.82	high	4
9	Periodically assess one's level of disciplinary knowledge	3.98	0.81	high	3
	Total	3.93	0.82	high	

According to Table 8, the current situation of sustainable professional competencies for university lecturers in subject knowledge was high$\overline{X}$= 3.93). Considering the results of this research, aspects ranged from the highest to lowest level as follows: the highest level was "Utilize online resources to enhance disciplinary knowledge" ($\overline{X}$= 4.10), followed by "Attend academic conferences relevant to the discipline" ($\overline{X}$= 3.98), and "Possess professional competitiveness within the disciplinary domain" was the lowest level ($\overline{X}$= 3.80).

Table 9. The Average Value and Standard Deviation of Sustainable Professional Competencies for University Lecturers Teaching Ability in the Digital Era, Sichuan Province

(n=375)

NO	Teaching ability	$\overline{X}$	S.D.	level	rank
1	Engage in regular reflection on one's teaching methods	4.01	0.78	high	1
2	Utilize diverse teaching approaches	3.96	0.81	high	3
3	Adapt teaching strategies based on student feedback	3.99	0.75	high	2
4	Employ case studies to facilitate student comprehension	3.94	0.88	high	5
5	Encourage students to engage in critical thinking	3.89	0.82	high	6
6	Attend regular workshops or training sessions on teaching methodologies	3.95	0.87	high	4
7	Utilize teaching feedback to enhance teaching quality	3.82	0.88	high	8
8	Provide personalized learning support for students	3.83	0.90	high	7
9	Conduct periodic evaluations of one's teaching effectiveness	3.76	0.94	high	9
	Total	3.91	0.85	high	

According to Table 9, the cu, current situation of sustainable professional competencies for university lecturers in teaching ability was at a high level ($\overline{X}$= 3.91). Considering the results of this research, aspects ranged from the highest to lowest level as follows: the highest level was "Engage in regular reflection on one's teaching methods" ($\overline{X}$= 4.01), followed by "Adapt teaching strategies based on student feedback" ($\overline{X}$= 3.99), and "Conduct periodic evaluations of one's teaching effectiveness" was the lowest level ($\overline{X}$= 3.76).

Table 10 shows the sustainable professional competencies of university lecturers with stronger kills $\overline{X}$= = 3.91). Considering the results of this research, aspects ranged from the highest to lowest level as follows: the highest level was "Participate in training related to digital skills" ($\overline{X}$= 4.08), followed by "Employ digital tools to enhance teaching interactivity" ($\overline{X}$= 3.97), and "Keep track of the latest trends in educational technology" was the lowest level ($\overline{X}$= 3.79).

Table 10. The Average Value and Standard Deviation of Sustainable Professional Competencies for University Lecturers in Digital Skills in the Digital Era, Sichuan Province

(n=375)

NO	Digital skills	$\overline{X}$	S.D.	level	rank
1	Stay abreast of the latest educational technology tools	3.89	0.88	high	6
2	Encourage students to utilize digital tools for learning	3.86	0.94	high	7
3	Engage in regular learning of digital skills	3.97	0.81	high	3
4	Employ digital tools to enhance teaching interactivity	3.97	0.83	high	2
5	Integrate digital resources into teaching	3.91	0.84	high	4
6	Utilize social media to facilitate learning	3.90	0.80	high	5
7	Use online platforms to share course materials	3.81	0.91	high	8
8	Keep track of the latest trends in educational technology	3.79	0.98	high	9
9	Participate in training related to digital skills	4.08	0.71	high	1
	Total	3.91	0.86	high	

Table 11. The Average Value and Standard Deviation of Sustainable Professional Competencies for University Lecturers in Sustainable Learning in the Digital Era, Sichuan Province.

(n=375)

NO	Sustainable learning	$\overline{X}$	S.D.	level	rank
1	Have a continuous learning plan	4.00	0.75	high	1
2	Is continuous learning crucial for professional development	3.95	0.80	high	2
3	Seek opportunities to enhance one's professional skills	3.88	0.84	high	5
4	Maintain an open attitude toward new knowledge	3.84	0.89	high	7
5	Set regular personal and professional development goals	3.74	0.95	high	9
6	Utilize online resources for self-directed learning	3.89	0.97	high	4
7	Adapt to rapid changes in the field of education	3.80	0.93	high	8
8	Encourage colleagues and students to engage in continuous learning	3.90	0.87	high	3
9	Engage in interdisciplinary learning activities	3.87	0.85	high	6
	Total	3.88	0.88	high	

According to Table 11, the current situation of sustainable professional competencies for university lecturers in sustainable learning was at a high level $\overline{X}$= 3.88). Considering the results of this research, aspects ranged from the highest to lowest level as follows: the highest level was "Have a continuous learning plan" ($\overline{X}$= 4.00), followed by "Is continuous learning crucial for professional development" ($\overline{X}$= 3.95), and "Set regular personal and professional development goals" was the lowest level ($\overline{X}$= 3.74).

The overall level of sustainable professional competencies of university lecturers in Sichuan Province.

In summary, according to the data interpretation for average value based on Likert (1932), the data interpretations are as follows: 4.50 – 5.00 express the highest level; 3.50 – 4.49 express a high level; 2.50 – 3.49 express a medium level; 1.50 – 2.49 express a low level; 1.00 – 1.49 express the lowest level. A questionnaire survey of university lecturers found that the average value of the total scale of sustainable professional competencies of university lecturers was at a high level $\overline{X}$= 3.90). The average value of subject knowledge was at a high level $\overline{X}$= 3.92). The average value of digital skills was at a high level ($\overline{X}$= 3.91), teaching ability was at a high level ($\overline{X}$= 3.90), and sustainable learning was at a high level ($\overline{X}$= 3.88). The average order of the four first-order dimensions is subject knowledge ($\overline{X}$= 3.92) > digital skills ($\overline{X}$= 3.91) > teaching ability ($\overline{X}$= 3.90) > sustainable learning ($\overline{X}$= 3.88). The level of subject knowledge is the highest, while the average level of sustainable learning is the lowest. Therefore, to some extent, it indicates that teaching ability, digital skills, and sustainable learning need further improvement.

Table 12. Personal Information of the Interviewee

Interviewee	School	Education background	Interview Date and Time
Interviewee 1	Sichuan Normal University	Professional title: Full Professor Expertise: Digital Education for Lecturers Work experience: 30 years	May 15, 2024 at 09:00 pm, GMT+8
Interviewee 2	Leshan Normal University	Post: Director of the Personnel Office Expertise: University Personnel Management Work experience: 25 years	May 15, 2024 at 10:30 pm, GMT+8
Interviewee 3	Yibin University	Professional title: Full Professor Expertise: Lecturer Training and Education Work experience: 30 years	May 15, 2024 at 2:30 pm, GMT+8
Interviewee 4	Neijiang Normal University	Post: Director of the Information Center Expertise: Digital Teaching Work experience: 26 years	May 16, 2024 at 9:30 pm, GMT+8
Interviewee 5	Xihua Normal University	Professional title: Full Professor Expertise: Lecturer Training and Education Work experience: 30 years	May 16, 2024 at 2:30 pm, GMT+8
Interviewee 6	Sichuan University of arts and science	Post: Dean of the School of Computer Science Expertise: Digital Competence Work experience: 27 years	May 17, 2024 at 10:30 pm, GMT+8
Interviewee 7	Mianyang Normal University	Professional title: Full Professor Expertise: Lecturer Training and Education Work experience: 20 years	May 17, 2024 at 2:30 pm, GMT+8

Based on the analysis of the average and standard deviation data of the questionnaire on sustainable professional competencies of university lecturers, the unanimous conclusion is that the current situation of sustainable professional competencies of university lecturers in Sichuan Province can be summarized in three aspects:

Firstly, the overall level of sustainable professional competencies of university lecturers in Sichuan Province is high, but the implementation level of each dimension is unbalanced.

Secondly, the level of subject knowledge among university lecturers in Sichuan Province is the highest.

Thirdly, the level of sustainable learning among university lecturers in Sichuan Province is the lowest.

Part 3: Analysis of results of interview content regarding developing strategies to promote sustainable professional competencies for university lecturers in the digital era, Sichuan Province.

Table 12 from the interview content, currently, there has been significant progress in sustainable professional competence in sustainable learning among university lecturers in the digital era, Sichuan Province, but challenges also exist. Many lecturers have recognized the importance of having a continuous learning plan and regularly seek opportunities to enhance their professional skills. They understand that constant learning is crucial for professional development and actively encourage colleagues and students to engage in lifelong learning. Additionally, lecturers are increasingly adept at utilizing online resources for self-directed learning and setting regular personal and professional development goals.

However, challenges persist. Not all lecturers are equally adept at adapting to rapid changes in the field of education or engaging in interdisciplinary learning activities. While many maintain an open attitude towards new knowledge, the variability in their engagement highlights the need for more structured support and resources to foster sustainable learning practices.

The guidelines for enhancement can be summarized into the following aspects: 1) Continuous Professional Development: Universities should offer regular, targeted professional development opportunities that focus on the latest advancements in their respective fields and educational technology. Workshops, seminars, and online courses can help lecturers stay current and enhance their skills. 2) Personal Learning Plans: Encouraging lecturers to develop and maintain personal learning plans can help them set specific, achievable goals for their professional development and track their progress over time. Universities can support this by providing resources and guidance. 3) Interdisciplinary Collaboration: Promoting interdisciplinary collaboration can significantly enhance sustainable learning. Encouraging lecturers to engage in learning activities outside their immediate discipline can provide fresh perspectives and innovative approaches to teaching. This can be facilitated through cross-departmental collaborations and interdisciplinary projects. 4) Effective Use of Digital Resources: Leveraging digital resources effectively is crucial. Lecturers should be proficient in using online databases, digital libraries, and educational platforms to access the latest research and teaching materials. Universities should ensure these resources are readily available and provide training on utilizing them effectively. 5) Reflective Practice: Integrating reflective practice into the professional development process is important. Lecturers should regularly reflect on their teaching practices, seek feedback from peers and students, and adjust based on these reflections. Establishing a supportive community of practice where lecturers can share their experiences and learn from one another can significantly enhance this process.

In conclusion, while the current state of sustainable learning among university lecturers in Sichuan Province is improving, promoting a culture of lifelong learning, supporting personal learning plans, encouraging interdisciplinary collaboration, leveraging digital resources, and fostering reflective practice are essential strategies for further enhancement in the digital era.

According to Table 13, the researcher provided guidelines for improving the sustainable professional competencies of university lecturers in the digital era, Sichuan Province, divided into four aspects containing 28 measures. There are 7 measures for enhancing subject knowledge, 5 for enhancing teaching ability, 8 for improving digital skills, and 6 for enhancing sustainable learning.

Part 4: Analysis results of evaluating the appropriateness and feasibility of strategies to promote sustainable professional competencies for university lecturers in the digital era, Sichuan Province, with mean and standard deviation data.

According to Table 14, the adaptability and feasibility of guidelines for promoting sustainable professional competencies for university lecturers in four aspects were at the highest level with values between 4.50 and 5.00 ($\overline{X}=$ 4.68 ad $\overline{X}=$ 4.68), indicating that the guidelines are both adaptable and feasible

Table 13. Strategies to Promote Sustainable Professional Competences for University Lecturers in the Digital Era, Sichuan Province

Strategies to Promote Sustainable Professional Competences for University Lecturers	HOW TO
Subject knowledge	1. Engage in regular study to update disciplinary knowledge
	2. Participate in research activities relevant to the discipline
	3. Review the latest literature about the discipline
	4. Attend academic conferences relevant to the discipline
	5. Utilize online resources to enhance disciplinary knowledge
	6. Exchange ideas with peers to advance disciplinary knowledge
	7. Periodically assess one's level of disciplinary knowledge
Teaching ability	1. Engage in regular reflection on one's teaching methods
	2. Utilize diverse teaching approaches
	3. Adapt teaching strategies based on student feedback
	4. Attend regular workshops or training sessions on teaching methodologies
	5. Utilize teaching feedback to enhance teaching quality
Digital skills	1. Stay abreast of the latest educational technology tools
	2. Employ digital tools to enhance teaching interactive
	3. Engage in regular learning of digital skills
	4. Integrate digital resources into teaching
	5. Participate in training related to digital skills
	6. Keep track of the latest trends in educational technology
	7. Utilize social media to facilitate learning
	8. Use online platforms to share course materials
Sustainable learning	1. Have a continuous learning plan
	2. Seek opportunities to enhance one's professional skills
	3. Adapt to rapid changes in the field of education
	4. Utilize online resources for self-directed learning
	5. Set regular personal and professional development
	6. Engage in interdisciplinary learning activities

Table 14. Mean and Standard Deviation of the Evaluation of the Appropriateness and Feasibility of Strategies to Promote Sustainable Professional Competences for University Lecturersin the Digital Era, Sichuan Province Across Four Aspects

(n=7)

Strategies to Promote Sustainable Professional Competences for University Lecturers	Adaptability			Feasibility		
	$\overline{X}$	S.D.	level	$\overline{X}$	S.D.	level
Subject knowledge						
1. Engage in regular study to update disciplinary knowledge	4.57	0.53	highest	4.71	0.49	highest
2. Participate in research activities relevant to the discipline	4.71	0.49	highest	4.71	0.49	highest
3. Review the literature on the discipline	4.43	0.79	high	4.57	0.79	highest
4. Attend academic conferences relevant to the discipline	4.57	0.79	highest	4.43	0.79	high
5. Utilize online resources to enhance disciplinary knowledge	4.71	0.49	highest	4.71	0.49	highest
6. Exchange ideas with peers to advance disciplinary knowledge	4.86	0.38	highest	4.71	0.49	highest
7. Periodically assess one's level of disciplinary knowledge	4.71	0.49	highest	4.86	0.38	highest

Total	4.65	0.56	highest	4.67	0.55	highest
Teaching ability						
1. Engage in regular reflection on one's teaching methods	4.43	0.79	high	4.71	0.49	highest
2. Utilize diverse teaching approaches	4.43	0.79	high	4.43	0.79	high
3. Adapt teaching strategies based on student feedback	4.71	0.49	highest	4.71	0.49	high est
4. Attend regular workshops or training sessions on teaching methodologies	4.71	0.49	highest	4.71	0.49	hig hest
5. Utilize teaching feedback to enhance teaching quality	4.43	0.79	high	4.43	0.79	high
Total	4.49	0.78	high	4.6	0.60	highest
Digital skills						
1. Stay abreast of the latest educational technology tools	4.71	0.49	highest	4.57	0.53	hig hest
2. Employ digital tools to enhance teaching interactivity	4.86	0.38	highest	4.86	0.38	hi guest
3. Engage in regular learning of digital skills	4.86	0.38	highest	4.86	0.38	h highest
4. Integrate digital resources into teaching	4.57	0.79	highest	4.71	0.49	h highest
5. Participate in training related to digital skills	4.86	0.38	highest	4.57	0.79	h highest
6. Keep track of the latest trends in educational technology	4.86	0.38	highest	4.71	0.49	h highest
7. Utilize social media to facilitate learning	4.86	0.38	highest	4.71	0.49	highest
8.Use online platforms to share course materials	4.86	0.38	highest	4.71	0.49	highest
Total	4.80	0.44	highest	4.71	0.49	highest
Sustainable learning						
1. Have a continuous learning plan	4.57	0.79	highest	4.86	0.38	highest
2. Seek opportunities to enhance one's professional skills	4.71	0.49	highest	4.71	0.49	highest
3. Adapt to rapid changes in the field of education	4.86	0.38	highest	4.57	0.79	highest
4. Utilize online resources for self-directed learning	4.57	0.53	highest	4.71	0.49	highest
5. Set regular personal and professional development goals	4.57	0.53	high	4.57	0.7 9	highest
6. Engage in interdisciplinary learning activities	4.71	0.76	highest	4.86	0.38	highest
Total	4.67	0.57	highest	4.71	0.55	highest
Evaluation level of scale strategies	4.68	0.55	highest	4.68	0.54	highest

5. Discussion

Part 1: The Current Status of Sustainable Professional Competences of University Lecturers in the Digital Era, Sichuan Province.

In the digital era, the current status of sustainable professional competencies among university lecturers in Sichuan Province shows that their overall level is relatively high, with subject knowledge being the highest and digital skills being the lowest.

Firstly, the sustainable professional competencies of university lecturers in Sichuan Province in the digital era are generally high, but the implementation levels across different dimensions are uneven. This disparity can be attributed to several reasons:

On the one hand, China places significant emphasis on the sustainable professional competencies of university lecturers. For example, documents such as the "Ten Guidelines for Professional Conduct of University Teachers in the New Era," the "Guiding Opinions of the Ministry of Education and Six Other Departments on Strengthening the Reform of the Construction of the University Teacher Workforce in the New Era," and the "Opinions of the CPC Central Committee and the State Council on Comprehensively Deepening the Reform of the Teacher Workforce in the New Era," reflect the country's strong commitment to enhancing the professional competences of university lecturers in the digital age. For instance, the Ministry of Education issued the "Ten Guidelines for Professional Conduct of University Teachers in the New Era" in 2018, which clearly outlines the professional conduct standards for university lecturers in the contemporary educational environment, including improving teaching quality and adapting to digital and information-based teaching environments. These initiatives have strengthened and enhanced university lecturers' professional competencies to a certain extent.

Secondly, among the four dimensions, the implementation level of subject knowledge is the highest for university lecturers. This is because subject knowledge management is the foundation of sustainable professional competencies, covering the entire process and serving as the core of teachers' professional development. According to Setiawan (2017), subject knowledge management is central to overseeing many management factors or key stages, especially in assessing competencies. Establishing subject knowledge management is crucial in implementing professional competencies.

Thirdly, the implementation level of sustainable learning is generally considered the lowest among the four aspects of sustainable professional competencies. On one hand, sustainable learning strategies in higher education institutions are still in the exploratory stage. According to Cai (2013, p.5), Chinese higher education institutions are relatively late in exploring sustainable learning strategies compared to developed Western countries. On the other hand, there is a lack of research on practical issues related to the evaluation index system for sustainable learning of university lecturers. Most studies focus mainly on theoretical aspects, constructing evaluation index systems without practical application.

Part 2: The Strategies for Promoting Sustainable Professional Competences of University Lecturers in the Digital Era, Sichuan Province

The guidelines for improving the sustainable professional competencies of university lecturers are divided into four aspects, comprising 28 measures. These include seven measures for enhancing subject knowledge, five for improving ability, eight for digital skills, and six for obtainable learning. These measures are proposed based on the assessment results of the current status of university lecturers. The assessment results highlight issues that guide the improvement of lecturers' professional competencies. According to the findings from expert interviews, the strategy recommendations adhere to a problem-oriented principle, focusing on addressing deficiencies in subject knowledge, teaching ability, digital skills, and sustainable learning.

Firstly, improving lecturer. They were of subject knowledge. Given the emphasis by the state and education departments on the development of university lecturers' professional competencies, universities recognize that mastering subject knowledge is the initial step in enhancing lecturers' professional competencies and plays a crucial role in their career development. Therefore, subject knowledge is highly valued, and the management level is relatively high. However, issues such as the rapid update of subject expertise, insufficient learning resources for lecturers, and limited opportunities for academic exchanges persist. Institutional construction should be strengthened, learning resources optimized, and a more comprehensive academic exchange system should be established to address these issues. According to Kind and Chan (2019), developing effective subject knowledge update plans can further enhance lecturers' teaching and research abilities, optimize knowledge transfer, and promote educational reform. Rational and scientific mastery of subject knowledge is the first step in implementing comprehensive plans to improve teachers' professional competencies, laying a solid foundation for career development.

Secondly, it enhances lecturers' teaching ability. Teaching ability is a vital component of lecturers' professional competencies. To ensure the achievement of teaching objectives, the guidelines emphasize top-level design, institutional construction, the establishment of teaching effect tracking and monitoring mechanisms, and the use of information technology methods to collect and analyze teaching feedback regularly. This includes tracking, managing, and supervising the implementation of teaching objectives, correcting teaching deviations, highlighting teaching strengths, establishing comprehensive teaching feedback and control systems, closely monitoring teaching activities, achieving teaching goals, and ensuring the improvement of teaching quality. Measures such as participating in training on teaching methods, regular teaching evaluations and reflections, and applying diverse teaching strategies can effectively enhance lecturers' teaching ability.

Thirdly, they improve lecturers' digital skills. The guidelines are proposed because survey results show that digital skills among university lecturers in Sichuan Province are indeed the most unbalanced. On one hand, many lecturers, although familiar with basic digital tools, lack systematic and in-depth application in teaching. Some lecturers use digital tools in the classroom only for basic demonstrations without fully utilizing these tools' interactive and innovative potential. On the other hand, existing digital skills training is inadequate, with overly basic training content that does not thoroughly cover the latest educational technologies and tool applications.

Additionally, incomplete digital skills evaluation indicators are a major issue in enhancing lecturers' digital skills. Although some universities have provided digital skills training, the evaluation indicators for training effectiveness are simplistic, only performing basic statistical analysis of participation without assessing the actual application effects post-training. There is no unified evaluation standard and comprehensive digital skills evaluation indicator system, resulting in a lack of measurement basis and practical significance for enhancing digital skills. Therefore,

universities should establish comprehensive digital skills evaluation indicator systems based on their circumstances. According to Singh (2018), the most critical aspect of constructing an evaluation indicator system for enhancing university lecturers' digital skills is a series of design and application processes. The aim is to manage and evaluate the effectiveness of digital skills enhancement, optimize resource allocation, improve the efficiency of educational technology applications, and achieve more teaching innovation with less training input, making university teaching management more scientific and refined.

They are fourth enhancing lecturers' sustainable learning ability. According to the questionnaire survey, sustainable learning ability is the weakest. University lecturers in Sichuan Province in the digital era face several issues in sustainable learning: Firstly, learning outcomes are not directly linked to career development planning, leading to a lack of motivation for learning. Secondly, systematic and in-depth digital skills training is insufficient, preventing lecturers from fully utilizing the latest educational technologies. Finally, limited opportunities for academic exchanges and continuous professional development hinder lecturers' competitiveness in a rapidly changing educational environment. Therefore, enhancing lecturers' sustainable learning ability is crucial.

Part 3: The Adaptability and Feasibility of Strategies for Promoting Sustainable Professional Competences of University Lecturers in the Digital Era, Sichuan Province.

The researcher invited 7 experts to evaluate the guidelines for developing sustainable professional competencies for university lecturers in Sichuan Province in the digital era. These experts are from Sichuan University, Sichuan Normal University, Chengdu University of Technology, Southwest Jiaotong University, University of Electronic Science and Technology of China, Southwest University for Nationalities, and Southwest Petroleum University. These universities are renowned for their high academic standards and strong emphasis on digital education. The invited experts possess extensive experience and theoretical knowledge in professional development. According to Likert's (1932) data interpretation for average value, the suitability and feasibility of the guidelines were rated at the highest level, with values between 4.00 and 5.00, indicating that the guidelines are both suitable and feasible.

6. Conclusion

Part 1: The Current Status of Sustainable Professional Competences of University Lecturers in the Digital Era, Sichuan Province.

The current situation of sustainable professional competence of university lecturers in Sichuan Province in the digital era can be summarized in three aspects:

Firstly, the overall level of sustainable professional competence among university lecturers in Sichuan Province is commendable, but the implementation level across different dimensions is uneven. While many lecturers actively update their subject knowledge and integrate digital tools into their teaching, the consistency and depth of these practices vary.

Secondly, competence in the subject is notably high. Lecturers regularly engage in professional development activities such as attending conferences, reviewing the latest literature, and participating in research, which keeps their disciplinary knowledge current and competitive.

Thirdly, competence in digital skills shows significant progress, yet it is the most variable among the dimensions. While some lecturers excel in employing digital tools and staying updated with educational technology trends, others require more structured support and training to leverage these resources in their teaching fully.

Part 2: The guidelines for improving the sustainable professional competencies of university lecturers in the digital era of Sichuan Province are divided into four aspects, which contain 28 measures. There are 7 measures for enhancing subject knowledge, 5 for enhancing teaching ability, 8 for improving digital skills, and 6 for enhancing sustainable learning.

Part 3: the adaptability and feasibility of guidelines for promoting sustainable professional competencies for university lecturers in four aspects were at the highest level with values between 4.50 and 5.00 ($\overline{X}$= 4.68 and $\overline{X}$= 4.68), indicating that the guidelines are both adaptable and feasible

7. Recommendations

1. Education Department: The education department can formulate and implement policies that facilitate the development of lecturers' digital competencies. This includes providing special funding, encouraging lecturers to participate in digital teaching training, and incorporating digital competencies as key criteria for lecturer evaluation and promotion, thereby establishing institutional support. The education department can also develop national or regional digital education resource platforms to promote resource sharing among universities and enhance overall educational standards. Setting standards and guidelines for digital teaching and learning ensures consistency in lecturer training and development, which can be continuously improved through regular evaluations and feedback mechanisms. Furthermore, the education department should promote collaboration between universities, research institutions, and tech companies to advance research and application of cutting-edge digital education technologies, ensuring that lecturers can access the latest educational technology achievements promptly.

2. Universities: Universities should regularly organize digital teaching skills training, inviting experts to conduct lectures and workshops to enhance lecturers' digital teaching levels. Modern teaching equipment and technical support ensure lecturers receive timely assistance when implementing digital teaching. Universities can also establish incentive mechanisms to encourage lecturers to participate actively in digital teaching reform and innovation, thus enhancing their enthusiasm and engagement through various motivational measures. Additionally, universities should offer more career development opportunities, such as funding lecturers to attend international conferences and training programs, promoting their continuous progress in digital teaching. Creating internal knowledge-sharing platforms and communities allows lecturers to exchange and learn from each other, sharing teaching experiences and resources to improve teaching standards collectively.

3. Society: Society can collaborate with tech companies to provide practical opportunities and technical support, helping lecturers understand and master the latest digital tools and technologies. Enhancing public awareness of digital education through media and social organizations creates a positive social atmosphere. Organizing cross-disciplinary academic exchange activities fosters interaction between lecturers and experts from different fields, broadening perspectives and improving overall teaching standards. Social organizations and companies can also fund and support various digital education projects and research, promoting the deep integration of education and technology and providing lecturers with more resources and platforms. Furthermore, society should advocate for lifelong learning, encouraging people from all walks of life to actively participate in and support educational endeavors, creating a favorable learning environment and atmosphere.

4. Lecturers: Lecturers should actively utilize online resources and platforms to continuously learn the latest digital teaching methods and technologies and develop personal professional development plans with specific learning and growth objectives, regularly evaluating their progress. Participating in academic conferences, seminars, and online forums to exchange experiences and insights with peers is crucial for continuously enhancing their digital teaching competencies. Moreover, lecturers should adapt to the rapidly changing educational environment by engaging in cross-disciplinary learning and practical activities to improve their comprehensive qualities and competitiveness. Through self-reflection and continuous improvement of teaching methods, lecturers can enhance teaching effectiveness and student satisfaction, achieving sustainable professional development in the digital era. Additionally, lecturers should remain sensitive to the latest educational trends and technologies, proactively seeking learning and growth opportunities and cultivating innovative thinking and problem-solving skills, becoming role models and guides for their students.

8. Future Research

1. This paper is based on an analysis and discussion of the current sustainable professional competencies of university lecturers in the digital era in Sichuan Province. While the analysis studies many aspects, certain issues haven't been addressed in-depth due to scope and research depth limitations. Moreover, some elements of the development system may need further enrichment and refinement through practical implementation. For instance, the operational aspects of digital skills enhancement, effectively integrating new teaching methodologies, and designing continuous learning indicators to suit the current situation must be explored further in practice. To ensure the effective functioning of competence development, it is essential to continue testing and validating these aspects in practical scenarios. Practical experience will contribute to the formulation of concrete and viable improvement measures. Additionally, ongoing discussions and the accumulation of practical cases and beneficial experiences are necessary to refine the competence development system further. While this paper provides a comprehensive analysis

and discussion of sustainable professional competencies in Sichuan universities, there is still room for further exploration, experimentation, and refinement in practice.

2. Studying university lecturer competence development goes beyond just digital skills. This research focuses on sustainable professional competencies in the digital era. I have developed a strong interest in lecturer competence development by exploring relevant theories and literature on professional development during this phase. I hope to expand the scope of my research in the future to encompass aspects like research competence and teaching effectiveness, enabling a comprehensive study of lecturer competence development beyond the confines of digital skills, as long as the circumstances allow for it.

3. Conducting research that compares the situation between domestic and foreign contexts. This study did not involve a comparative analysis of sustainable professional competencies between domestic and foreign universities. The main reason is that the researcher's understanding of professional development models in foreign universities is still limited, and relevant literature is scarce in this area. There are plans to enhance this understanding through visits to foreign universities, field studies, or conducting specialized interviews with returning scholars, such as in Thailand. This will facilitate an in-depth analysis of the methods and approaches to lecturer competence development in foreign universities. Moreover, a comparative study will be conducted between these approaches and the current competence development models Chinese universities adopt, outlining their strengths and weaknesses. The aim is to provide theoretical and practical references for enhancing Chinese universities' competence development and governance capacity.

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