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TEACHER COMPETENCY FRAMEWORKS FOR APPLICATION-ORIENTED HIGHER EDUCATION: A MODEL FROM HAINAN, CHINA

Huiling LIU[1,2], Ganratchakan LERTAMORNSAK[1] and Suttipong BOONPHADUNG[1]

1 Faculty of Education, Suan Sunandha Rajabhat University, Thailand; 872375608@qq.com (H. L.); ganratchakan.le@ssru.ac.th (G. L.)

2 Haikou University of Economics, China

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Abstract

This study investigates teacher professional competency within application-oriented higher education institutions, contributing to Asia's growing discourse on skills-based education. Focusing on Hainan, China, the research employs a mixed-methods approach, analyzing survey data from 506 educators alongside qualitative insights from interviews. Exploratory Factor Analysis (EFA) reveals eight core competency components: Personal Competency, Resource Integration Competency, Teaching Competency, Practical Competency, Knowledge Competency, Research Competency, Reflective Competency, and Innovation & Development Competency. The proposed competency model stresses resource integration and its reflection of regional economic needs. Findings highlight the need for a comprehensive approach, incorporating industry collaboration and continuous professional development. This study provides a framework applicable to other Asian contexts undergoing similar shifts towards application-oriented education. It offers implications for teacher development, recruitment, and evaluation, fostering sustainable advancement in the region's higher education landscape.

Keywords: Application-Oriented Education, Teacher Competency, Higher Education, Asian Education, Competency Model

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Introduction

China is vigorously promoting the classification and management of higher education institutions. The rapid development of the economy and society necessitates more applied talents with strong innovation and entrepreneurship. The cultivation of such talents relies heavily on teachers; thus, improving the professional development capacity of faculty is crucial for elevating the level of education, teaching quality, and talent cultivation within colleges and universities. As many general undergraduate institutions transition to application-oriented models, strengthening their practical relevance becomes vital in China's economic and social progress (Dunrong, 2022). Drawing on the mature research on teacher development in developed countries offers a valuable perspective. However, the challenge remains in adapting these experiences and theories to China's unique context, particularly within application-oriented higher education. This requires developing and implementing a tailored teacher competency model and focused practice and research in this area. Zhang and Chen (2022) emphasized that application-oriented higher education aims to cultivate individuals with comprehensive competencies, knowledge, and qualities essential for management, production, service, and construction. Consequently, countries like China prioritize strengthening the capabilities of teachers in application-oriented institutions to enhance the quality of personnel training.

This strategic transformation of general undergraduate colleges to application-oriented institutions aims to align education with evolving societal and economic needs. Teachers must adapt by acquiring new skills to help students gain real-world practical abilities. However, several challenges impede the growth of teacher expertise. Existing studies reveal shortcomings in Pedagogical Content Knowledge (PCK), effective teaching methods, and robust research skills among many instructors at application-oriented universities. These skills are essential for fostering practical student skills and supporting local development. Issues in teacher management further complicate the situation, highlighting the need for institutional reforms and clearer standards to support professional growth.

While valuable insights exist, much of the current research lacks a solid theoretical grounding. Limited research also connects students' professional skill needs directly to teacher development. Addressing this gap requires a competency-based framework to guide teacher development more effectively. Such frameworks help define and structure the specific skills required of faculty in application-oriented universities. In addition, frameworks like the European Qualifications Framework (EQF) and the ASEAN Qualifications Reference Framework (AQRF) offer valuable benchmarks for comparison, focusing on learning outcomes, knowledge, skills, and cognitive/functional competencies, helping China shape and implement its standards. National policy also plays a key role in driving this transformation forward. The "Modernization of China's Education 2035" (2019) outlines ambitious goals, emphasizing the establishment of a comprehensive policy system for the classified development of higher education institutions (Dunrong, 2022), urging universities to adopt scientific positioning, develop distinctive strengths, and promote innovation.

This plan stresses the cultivation of talents with practical skills and interdisciplinary knowledge. This demand, especially in fields like advanced manufacturing, digital technologies, and green industries, increases the responsibility of Application-Oriented Higher Education Institutions to adapt their educational models (Cheng et al., 2024). The demand for interdisciplinary knowledge and industry collaboration (Etzkowitz & Leydesdorff, 2000) highlights how competency-based education supports economic and technological advancements. Meeting these goals requires a professional competency model for teachers, enabling the quality of talent cultivation and student outcomes (Dan, 2019). A standardized framework for teachers and targeted training and assessment will address skill gaps and align teaching capabilities with industry needs. Grounded in empirical data and

theory, this study proposes a tailored teachers' professional competency model for application-oriented higher education institutions in Hainan, contributing to a clear understanding of the current status and serving as a framework to guide teacher recruitment, training, and evaluation. It aims to enhance teacher professional development and advance the regional higher education landscape.

Literature Reviews

Professional Capacity Development for Teachers

Teachers' professional competence mainly refers to the requirements to fulfil relevant tasks in educational and teaching activities. Scholars have analyzed teachers' professional competence from the dimensions of core competence and general competence, proposing that teachers' professional competence includes elements such as basic competence, teaching competence, educational competence, self-development competence and teaching innovation competence, which spiral upwards to form a complete hierarchical structure and run through the entire teacher career (Hu & Zhang, 2018). Basic competence mainly refers to the general competence of teachers, which is the communication and expression, logical thinking, implementation and operation, and regulation necessary for teachers' teaching; teaching professional competence, as a part of teachers' professional competence, is mainly formed in the process of teachers' teaching function and teachers' role development. It results from developing teachers' abilities, skills, and attitudes, which promotes the realization of teaching goals in the teaching process (Handini, 2024).

A closer look shows that teachers' professional competence is not a fixed concept. It evolves alongside educational reforms, technological progress, and changing societal demands. For instance, the growing emphasis on digital literacy within teacher competency frameworks demonstrates how new technologies constantly reshape the skills needed for effective teaching (Koehler & Mishra, 2009; Redecker & Punie, 2017). Furthermore, global movements like competency-based education (CBE) and the push for lifelong learning highlight the importance of teachers cultivating adaptable and forward-thinking abilities (Mulder, 2017). Application-oriented universities may prioritize competencies in industry collaboration and innovation over traditional academic research skills, demonstrating the necessity for a context-sensitive understanding of teacher professional development. While scholars' understanding of teacher professional competencies is not entirely uniform, these professional competency standards serve as an important milestone in the quality training of the curriculum and provide an external assessment for continuing teacher training. These standards define some of the competencies necessary for teachers, and students are better able to receive a high-quality education from their teachers, improving their professional performance.

Teacher Professional Development

After the 1980s, teacher professionalism gradually became the central theme of contemporary education. For example, in the United States, on 16 June 1980, an article entitled "At stake! Teachers Cannot Teach" was published in Time Magazine on 16 June 1980, which opened the prelude to the American public's concern about the quality of teachers, after which the United States actively carried out reform activities to enhance the professional development of teachers. 1986, the Carnegie Institute for the Advancement of Education published a report entitled "The Nation's Preparation of Teachers for the 21st Century", and the Holmes Association published a report entitled "Tomorrow's Teachers" in that period respectively, both articles focusing on the issue of the teacher's professionalism, and both articles emphasized the importance of teacher professionalism. Both articles focused on the issue of promoting the quality of teachers and mentioned the concept of professionalization of teaching in their reports, and considered it a necessary step in the development of public

schools in the United States. Regarding the promotion of teaching quality, they believe there is a need to work on two aspects: firstly, the establishment of the professional status of teaching and secondly, the establishment of a corresponding measurement standard, which matches the requirements of a professional career. Following this, the question of how to professionalize teachers began to enter the public consciousness. In Europe, Finland and Germany have strengthened teacher professional development by establishing structured education programs and rigorous qualification systems. In Finland, teacher preparation is deeply rooted in research, and all teachers must earn a master's degree (Sahlberg, 2011). Germany follows a two-phase model that blends university coursework with practical in-service training (Terhart, 2013). In England, reforms have emphasized standards-driven initial teacher education alongside performance-based certification (Wyatt-Smith et al., 2022). Singapore and Malaysia are making significant strides in teacher professionalization by upgrading preservice training, promoting continuous professional development, and creating clear career advancement pathways (Goh et al., 2008). These varied approaches highlight similarities and differences in the global efforts to elevate teacher professionalism.

Theories of teacher development in colleges and universities derive from and guide the development of teacher development practice. Since the 1990s, there has been an increase in research on effective teacher development in colleges and universities. However, some scholars have pointed out that there is still much work to be done in establishing and articulating a "clear theoretical foundation for faculty development" to advance the practice of faculty development in colleges and universities. Wilbert J. McKeachie, an American educational psychologist, believes that theories of teacher development in higher education have three primary roles: firstly, they can abstract and simplify complex educational and teaching activities; secondly, they can guide the analysis and diagnosis of teaching and learning activities; and thirdly, they can provide a basis for various strategies and methods of teacher development. Therefore, teacher development must acquire its theoretical foundation.

Teacher Career Theory

In the 1960s, American scholar Frans Fuller and his assistants opened the prelude to the theoretical study of teachers' professional development with the "Teachers' Concern Questionnaire", laying the foundation for studying teachers' development stages. They divided teacher development into four stages: Pre-Teaching Concerns, Early Concerns about Survival, Teaching Situations Concerns, and Concerns about Students. Concerns about Students. Fuller's research reflects the teacher development process pattern: the teacher's concerns shift and change at different stages of development. Empirical studies based on Fuller's framework, such as Hall & Loucks' (1978) research on stages of concern, have confirmed that teachers' professional growth tends to follow predictable shifts in focus, from self-survival to instructional improvement and student-centeredness. The model divides teachers' careers into eight stages: pre-service, early service, competence construction, enthusiasm and growth, career frustration, career stability, career decline, and career departure. Fessler (1985) expanded upon this model, proposing a life cycle theory of teacher development based on extensive case studies and longitudinal observations, grounding the stages in real-world career trajectories. Fessler was the first to realize that teachers' growth is a curvilinear development process, and that they will encounter setbacks or even stagnation in their long careers, thus providing a more complete theoretical structure that runs through the whole process of teachers' careers, which has high theoretical reference value.

"Career frustration" and "career decline" are particularly relevant today, as faculty retention and burnout have become significant challenges in application-oriented higher education institutions. Studies have shown that mid-career plateaus and emotional exhaustion are critical risk points leading to attrition among university teachers (Maslach & Leiter, 2016). Moreover, contemporary perspectives on lifelong learning and career adaptability emphasize

that teachers must continuously update their skills and mindsets to respond to evolving educational demands, technological changes, and societal expectations. Incorporating lifelong learning strategies into professional development models offers a dynamic view of career growth that aligns with today's complex and shifting educational landscapes.

Competence

Care & Kim (2018) described competence as a dynamic integration of knowledge, skills, attitudes, and values crucial for professional tasks and meeting broader personal and societal needs. Leiber (2019) emphasized the context-specific nature of competence, arguing that it involves effectively applying knowledge and skills in diverse and often unpredictable situations. Leiber's work highlights that competence is not merely about possessing specific abilities but also about knowing how and when to apply them in real-world scenarios. Adeoye et al. (2025) further expanded the scope of competence to include sustainability-related attributes. Their work emphasized the importance of global awareness and ethical decision-making in achieving professional and societal success. As sustainability becomes a critical focus across industries, including these competencies ensures that individuals are equipped to address the challenges of environmental and social responsibility.

The "Education Power Construction Plan Outline (2024-2035)" issued by the Central Committee of the Communist Party of China and the State Council provides fundamental guidance and an action roadmap for fully implementing the spirit of the 20th National Congress of the Party, the Third Plenary Session of the 20th Central Committee, as well as the national and provincial education conferences. It also serves as a foundation for cultivating more high-level application-oriented talents to support local economic development. Education policy frameworks emphasize aligning teacher development with industry needs, innovation capabilities, and societal challenges. These frameworks advocate practical teaching experience, interdisciplinary integration, and responsiveness to regional economic and social development demands. As a result, competence has been transformed into a comprehensive framework that predicts job performance and prepares individuals to contribute meaningfully to society.

Competency Model

Harvard professor McClelland (1973) established that competency encompasses the underlying characteristics of an individual. The resulting competency model combines attitudes, knowledge, and skills to affect an individual's job and job performance, capable of being measured and improved through training and development. Generally speaking, the professional competence of a teacher can be defined as the ability of a qualified individual to demonstrate competence in their job, encompassing knowledge, skills, professional attitudes, personality, and other qualities directly related to effective teaching. Some researchers propose that teaching ability for college teachers consists of specific traits enabling them to meet teaching objectives effectively. Others have constructed models focusing on innovation and entrepreneurship competence, identifying dimensions like personal traits, competence skills, and teaching management. Some have argued that attitude, knowledge, and entrepreneurial skills are key dimensions.

While such models offer insights, they also face criticism for rigidity, failing to adapt to the dynamic nature of teaching practices, and reducing complex abilities to simplified checklists (Obanya et al., 1998). Addressing these limitations is crucial for more flexible and holistic teacher development frameworks. Alternative models from Europe and America, such as the European Qualifications Framework (EQF) and the InTASC standards in the United States, emphasize technical expertise, critical thinking, adaptability, and intercultural competence. Teacher competency models provide a coherent, evidence-based foundation for improving teacher quality, instructional practice, and student learning and achievement.

Competency Theory

Because the competency model can be involved in human resource management, such as summarizing the personal characteristics of outstanding talents, analyzing the qualities and abilities required for a specific position, and providing references for recruitment, training and performance appraisal of talents, as a new type of human resource analysis and evaluation method, it has gradually become a fashionable concept that has taken human resource management by storm since the 1980s. It has been widely used in various enterprises and institutions worldwide. It has been widely used in all kinds of enterprises and institutions worldwide. The most famous in the field of competency theory are two classic models: the iceberg model and the onion model (McClelland, 1973; Hofstede, 1984).

Teacher Competence in Application-Oriented Higher Education Institutions

According to the scholar, teachers' competence in application-oriented higher education institutions is developed from university teachers' competence. There are four components of professional competence, namely, knowledge of learning and behavior, knowledge and mastery of the field of study in which one is trained, proper attitudes towards oneself, one's school, one's colleagues, and the field of study in which one is trained, and mastery of teaching skills. Professional teachers are people with exceptional competence and expertise in the field of education, which enables them to fulfil the duties and functions of a teacher (Sancar et al., 2021). From the dimension of teaching activities, teaching ability includes teaching cognitive ability, teaching design ability, teaching implementation ability, teaching evaluation ability, teaching innovation ability, and teaching research ability. Therefore, the constituent elements of teachers' professional competency are interconnected, interactive, and complementary, and together they constitute a relatively independent organic whole, aiming to promote the development of teachers' professional competency.

While foundational studies offer a solid basis for understanding teacher competence, there is still a noticeable gap in research focused on the specific needs of application-oriented higher education institutions. Unlike traditional research universities, these institutions prioritize developing practical skills, fostering industry partnerships, and promoting innovation-driven teaching methods. Teachers at application-oriented higher education institutions require enhanced abilities in establishing industry connections and integrating knowledge across disciplines.

Job Analysis Theory

Job analysis, also known as "career analysis" or "position analysis," systematically documents the nature of a job and related activities. It serves as the foundation for in-depth research on work. In the late 1960s, Canada began exploring scientific and effective teaching and training models. Research showed that the descriptions of job requirements by excellent employees were more accurate and better reflected actual job needs. In various professions, the job descriptions provided by high-performing employees often aligned more closely with real job requirements. This indicates that completing a task requires theoretical knowledge and the corresponding work attitudes and skills. Based on this scientific research, two companies from the United States and Canada collaborated to develop a systematic method for analyzing the capabilities required for various professional positions. Initially, the method was designed solely for developing training curricula, hence the name "Developing A Curriculum" (DACUM). As the application expanded, it gradually became a scientifically efficient method for job analysis, widely applied in different vocational fields.

Job analysis theory, primarily through the DACUM method, is crucial in shaping teacher training and curriculum development in application-oriented higher education institutions. By identifying the skills, knowledge, and attitudes needed for specific teaching positions, job analysis helps ensure that training programs are closely aligned with professional requirements. Several application-oriented universities in China have used DACUM to create

detailed competency frameworks for engineering and technology faculty, providing clear guidance for teacher development and curriculum design. Higher education institutions in Canada and Germany have adopted DACUM-based models to outline the practical competencies required of vocational education teachers, further strengthening the link between academic preparation and industry needs.

Multi-Stream Theory

After the founding of New China and through socialist transformation, the higher education system has seen continuous improvement and gradual enrichment of its internal structure. The Multiple Streams Theory suggests that problem, policy, and political streams are important factors driving policy adjustment. The convergence of these factors can create a "policy window," particularly relevant for application-oriented higher education institutions in China. Achieving the goals of these institutions requires addressing challenges, optimizing pathways, and fostering a supportive policy environment.

Current research on teacher competence in applied talent training in China has yielded results that provide theoretical support for the practical exploration of improving teacher competence in application-oriented institutions. These findings often focus on key areas such as curriculum, teaching behaviors, practical teaching methods, and internships. Ultimately, the central question becomes how to improve the "supply-side" of applied undergraduate teacher competence to meet local development's "demand-side" needs. This challenge is a primary focus for teacher competence improvements within applied undergraduate colleges and universities and forms the basis of this study.

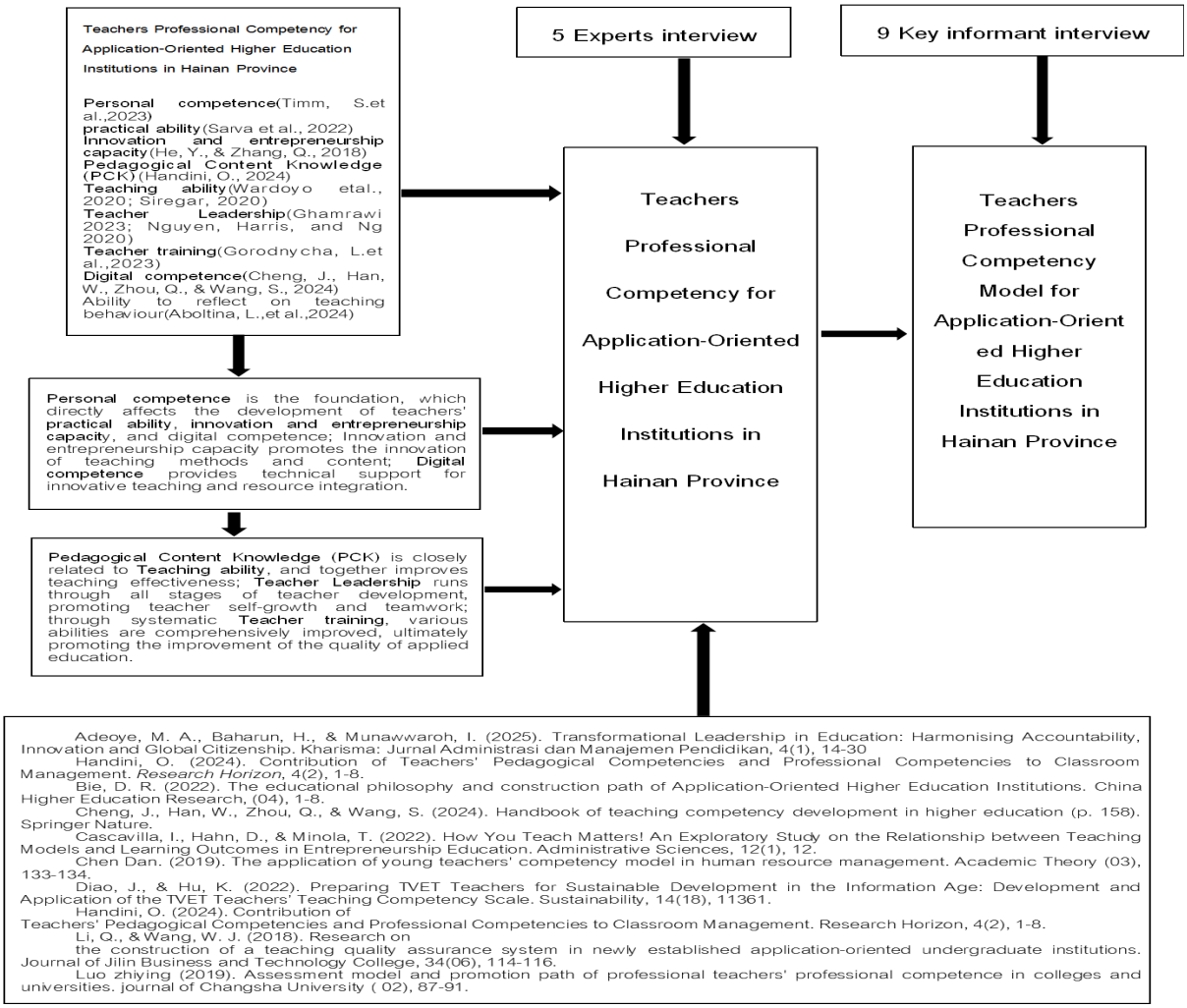

Figure 1 Conceptual Framework

Research Methodology

The population used in this research was administrators and teachers' application-oriented higher education institutions in Hainan. As of January 10, 2025, 19 Hainan application-oriented higher education institutions employ stratified and random sampling methods. The sample was stratified according to the size of each school, and individuals were then selected based on the proportion of each school's population relative to the total sample group.

Population and Sample

The researcher employed stratified and random sampling methods, distributed a questionnaire on the teachers' professional competency model for application-oriented higher education institutions in Hainan. The respondents included teachers and administrators. The researcher first divided the population into groups based on the type of institution (public or private universities) and their role (teacher or administrator). After that, individuals were randomly selected from each group, using proportional allocation to match the size of each subgroup within the total population, ensuring the sample was representative. To randomly select participants within each group, each person was assigned a number, and a random number generator was used to pick who would participate. The researchers hand out online and paper-based questionnaires (550), recovered 534 of them, of which 506 were eligible, with an effective recovery rate of 92%. The distribution of questionnaires was carefully managed to maintain a balance between online and paper formats, tailored to each higher education institution's access preferences and technological capabilities. After collection, researchers screened the questionnaires to verify completeness, logical consistency, and confirm that respondents were qualified, meaning they were currently serving as teachers or administrators in application-oriented higher education institutions.

Table 1 Results of frequency and percentage analysis of personal status of respondents

General basic information	Subgroup	Frequency	Percentage (%)
Gender	Male	233	46.05
	Female	273	53.95
Age	25 years old and below	31	6.13
	26-35 years old	162	32.02
	36-45 years old	157	31.03
	46-55 years old	112	22.13
	56 years old and above	44	8.69
Working experiences	5 years and below	183	36.17
	6-10 years	248	49.01
	11 years and above	75	14.82
Highest education level	Bachelor	91	17.98
	Master	268	52.97
	Doctor	108	29.05
Current professional title	assistant	76	15.02
	lecturer	284	56.13
	associate professor	102	20.16
	professor	44	8.69
Position	Administrator	238	47.04
	Teacher	268	52.96

Data Collection

This study employed a mixed-methods approach to data collection, utilizing both questionnaires and interviews to assess teachers' professional competency within application-oriented higher education institutions in Hainan. The questionnaire, designed to capture a

comprehensive range of competencies, was structured into two sections: personal information (gender, age, experience, education, position) and competency assessment. The questionnaire items were based on an extensive review of literature, documents, and related research. A new professional competency scale for teachers at application-focused universities in Hainan was created, consisting of 80 items divided into eight components (ranging from 7 to 17 items per component).

The questionnaire items were assessed using a five-point Likert scale (1 = Lowest Level to 5 = Highest Level). The Index of Item Objective Congruence (IOC) was used to validate the instrument, and the expert panel results confirmed that all 80 items met the acceptable threshold (IOC range: 0.6 - 1.0).

Data were gathered using a combination of online and paper questionnaires based on arrangements with each of Hainan's 19 application-oriented higher education institutions. In-depth interviews were conducted with 5 teachers to gain qualitative insights before a wider survey distribution. After this initial review, nine additional teacher interviews were performed to confirm and deepen findings from the quantitative data. Prior to recording all interviews, informed consent was obtained from participants.

Expert reviews ensured the questionnaire's content validity, verifying that the items effectively captured all relevant teacher competencies for application-oriented higher education in Hainan. Internal consistency, assessed using Cronbach's alpha with an overall α value of 0.97, confirmed a high level of reliability for the 80 measurement items, exceeding the accepted standard of 0.7.

Data Analysis

The collected questionnaires were reviewed for completeness and integrity. The data were then analyzed using statistical software to identify the multivariate variables' underlying structure and reduce dimensions by synthesizing common factors. The data analysis process involved the following steps: assessing suitability for factor analysis, determining the number of factors, extracting common factors, naming common factors, and incorporating interview insights. Specifically, principal component analysis was employed to determine eigenvalues and cumulative variance, with components having eigenvalues greater than 1 considered principal components. The study's conceptual dimensions, methods, design, data collection tools, processes, and report were comprehensively examined by a lecturer with expertise in the research subject and an independent investigator.

Exploratory factor analysis (EFA) was used to analyze the data, as it allows for developing and estimating complex cause-effect relationship models involving latent variables (i.e., unobserved variables representing perceptions, attitudes, and intentions). EFA estimates correlations between latent variables to determine how well the model describes the constructs of interest. Furthermore, EFA investigates direct and indirect impacts on previously believed causal linkages (Hair et al., 2019). The validity of research materials (interview guides, questions, reports) was ensured through knowledge owner validation, soliciting review and comment from professionals or experts (Dillman, 2016). For this study, knowledge owners (the interview informants) affirmed the gathered information’s coherence with reality, improving the study's reliability and credibility. Finally, the dependability and consistency of qualitative data analysis were verified using parallel testing, which involved independent examination and coding of the data, followed by comparison for consistency. A minimum of 80% consistency between the independent analyses was required for the data to be deemed dependable.

Research Results

Respondents' Profiles and Studied Variables

The results showed that, it is found that all 80 items on the teachers' professional competency for application-oriented higher education institutions variable items have an arithmetic mean value ($\bar{x}$) equal to 3.74. The standard deviation (S.D.) is equal to 0.98. When considering each item, it is found that the level of importance is high in 72 items and 8 items at a moderate level. According to the scoring guidelines, an average between 4.51 and 5.00 shows the highest level, 3.51 to 4.50 means a high level, and 2.51 to 3.50 indicates a moderate level. Since 90% of the items (72 items) were rated highly important, the respondents saw most of the competencies as relevant and well-structured. The few items (8 items) rated at a moderate level highlight areas that might need extra attention or adjustments to fit the situation better. The mean ($\bar{x}$) is between 3.32 and 4.07, and the standard deviation (S.D.) is between 0.80 and 1.14. In this study, Table 2 shows that the 80 variable data items can be used in factor analysis. The KMO value was 0.94, demonstrating a high level of sampling adequacy. The KMO value ranges from 0 to 1, with values closer to 1 indicating stronger internal consistency.

A KMO coefficient above 0.7 is generally considered an acceptable threshold for validity. Additionally, Bartlett's test of sphericity yielded a chi-square value of 33714.24, with a degree of freedom of 3160 and a significance level of 0.000 ($p < 0.001$). These results confirmed that the data met the validity requirements and were suitable for subsequent factor analysis. The researcher employed factor analysis, specifically exploratory factor analysis (EFA), to identify and extract the significant variables defining the competency components. Therefore, it is confirmed that the survey questionnaire in this study has passed the basic tests and can proceed with further validity evaluation.

Table 2 KMO and Bartlett's Test of Sphericity values

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.94
Bartlett's Test of Sphericity	**Approx.Chi-Square**	33714.24
	df	3160
	Sig.	0.000

Communality value decides whether to include or exclude a variable in the factor analysis. A value above 0.5 is ideal (Hair et al., 2013). According to statistics, there are only 1 item less than 0.5. However, a communality value less than 0.4 typically indicates that the variable has low commonality with other variables, requiring further analysis to determine whether to retain or adjust the analytical method. The measured variance analysis shows that all items' load coefficients are more than 0.4. According to the communalities, all extracted values of the items are greater than 0.4, indicating that the extracted common factors can effectively represent each item. During the exploratory factor analysis, the authors also applied the principal component analysis method and extracted eight factors with eigenvalues greater than 1.

The results showed that the total variance explained by these eight common factors exceeded the standard of 60%, specifically reaching 64.93%. Therefore, it is concluded that the survey questionnaire in this study has good structural validity.

Table 3 Total Variances Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	22.84	28.55	28.55	22.84	28.55	28.55	11.46	14.32	14.32
2	8.93	11.16	39.71	8.93	11.16	39.71	7.96	9.94	24.27
3	6.38	7.98	47.69	6.38	7.98	47.69	6.54	8.18	32.44
4	4.37	5.46	53.15	4.37	5.46	53.15	6.36	7.94	40.39
5	3.11	3.88	57.03	3.11	3.88	57.03	5.76	7.19	47.58
6	2.66	3.33	60.36	2.66	3.33	60.36	5.14	6.43	54.01
7	2.06	2.58	62.94	2.06	2.58	62.94	4.82	6.02	60.03
8	1.59	1.99	64.93	1.59	1.99	64.93	3.92	4.9	64.93

*Extraction Method: Principal Component Analysis. Components are those for which the number of variables is 3 or more, communalities are above 0.5, and factor loading is 0.50 or more.

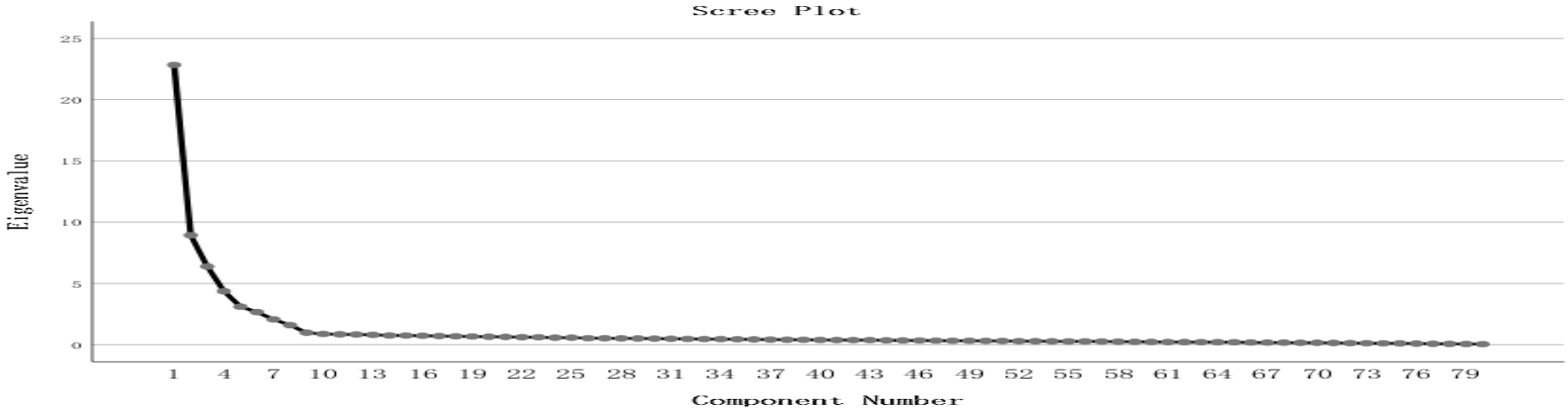

Figure 2 ScreePlot

Based on the scree plot results, 8 factors with eigenvalues greater than 1 were extracted from the 80 measurement items. After the 8th factor, the trend gradually levels off, consistent with the previously obtained factor analysis results.

The analysis of factor loadings determines the weight of each component, allowing the researcher to identify and describe the details of each factor. The researcher assigns appropriate labels to the extracted components based on the variable items associated with each element. Results of a research study an analyze the component of teachers' professional competency for application-oriented higher education institutions in Hainan. Through the exploratory factor analysis of 100 variable items, 20 items with substandard conditions were excluded, 8 common factors were finally extracted, and the dimensionality reduction of 80 variable items was formed into 8 components. The results are as follows: Component 1 Personal Competency (17 items), which has the highest eigenvalues of 11.46 and the variance got 14.32%; Component 2 Resource Integration Competency (10 items), which has the highest eigenvalues of 7.96 and the variance got 9.94%; Component 3 Teaching Competency (11 items), which has the highest eigenvalues of 6.54 and the variance got 8.18%; Component 4 Practical Competency (10 items), which has the highest eigenvalues of 6.36 and the variance got 7.94%; Component 5 Knowledge Competency (10 items), which has the highest eigenvalues of 5.76 and the variance got 7.19%; Component 6 Research Competency (8 items), which has the highest eigenvalues of 5.14 and the variance got 6.43%; Component 7 Reflective Competency (7 items), which has the highest eigenvalues of 4.82 and the variance got 6.02%; Component 8 Innovation and Development Competency (7 items), which has the highest eigenvalues of 3.92 and the variance got 4.90%, as shown in the Table 3.

A comparison was made with existing frameworks on teachers' professional competency to understand the extracted components better. Component 1 (Personal Competency) closely matches the key personal qualities emphasized in the European Qualifications Framework (EQF) and InTASC standards, such as responsibility, communication, and adaptability. Component 2 (Resource Integration Competency) highlights the growing need for higher education teachers to effectively coordinate internal and external resources, aligning with the professional practice areas outlined in Boyer's (1990) model of scholarship. Component 3 (Teaching Competency) reflects the traditional foundation of professional teaching frameworks worldwide, focusing on instructional planning, engaging students, and delivering outcome-based education. Component 4 (Practical Competency) resonates with Yang et al. (2015) advocacy for experiential learning, stressing the importance of applying knowledge in application-oriented institutions. Component 5 (Knowledge Competency) mirrors the emphasis on deep subject matter expertise found in Shulman's (1986) concept of Pedagogical Content Knowledge (PCK). Component 6 (Research Competency) supports the dual role university teachers play as both educators and researchers, consistent with the goals of the "Modernization of China's Education 2035" plan. Component 7 (Reflective Competency) aligns with Ross & Bruce's (2007) reflective practitioner model, which promotes continual growth through self-assessment and refinement. Finally, Component 8 (Innovation and Development Competency) matches 21st-century skills frameworks that stress creativity, problem-solving, and driving educational innovation.

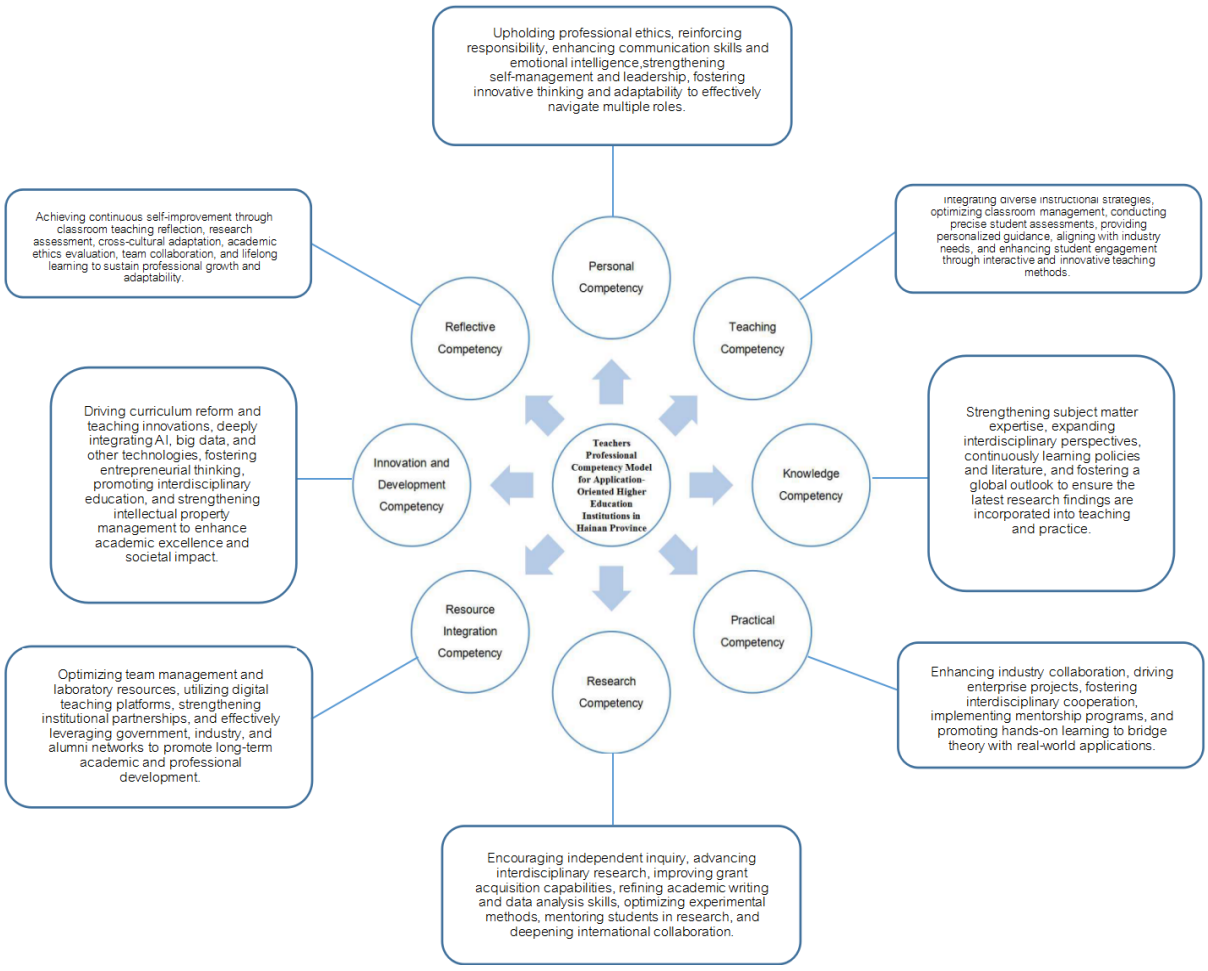

Figure 3 The teacher's professional competency model for application-oriented higher education institutions in Hainan

The authors propose the teacher professional competency model for application-oriented higher education institutions in Hainan based on the results of quantitative and qualitative analysis, as shown in Figure 3. In addition to factor analysis results, qualitative insights from expert interviews complemented and validated the model construction. Experts consistently emphasized critical themes such as interdisciplinary knowledge integration, industry collaboration, teaching innovation, and the importance of lifelong learning, which aligned with quantitative findings.

1) Personal Competency: Upholding professional ethics, reinforcing responsibility, enhancing communication skills and emotional intelligence, strengthening self-management and leadership, fostering innovative thinking and adaptability to navigate multiple roles effectively. Experts emphasize various aspects of teachers' competency essential for professional growth and effective teaching. These competencies contribute to a teacher's long-term development and effectiveness in fostering student growth.

2) Teaching Competency: Integrating diverse instructional strategies, optimizing classroom management, conducting precise student assessments, providing personalized guidance, aligning with industry needs, and enhancing student engagement through interactive and innovative teaching methods. Experts highlight that strong Teaching competencies are fundamental to student success and educational quality.

3) Knowledge Competency: Strengthen subject matter expertise, expand interdisciplinary perspectives, continuously learn policies and literature, and foster a global outlook to ensure

the latest research findings are incorporated into teaching and practice. Experts emphasize the necessity of mastering core subject theories, staying updated with industry trends, and integrating data-driven and international perspectives into teaching and research. By combining theoretical understanding with practical experience, teachers can continuously refine their knowledge and improve their effectiveness in education.

4) Practical Competency: Enhancing industry collaboration, driving enterprise projects, fostering interdisciplinary cooperation, implementing mentorship programs, and promoting hands-on learning to bridge theory with real-world applications. Experts emphasize that by integrating real-world case studies, practical projects, and innovative teaching methods, educators can bridge the gap between theory and practice, stay aligned with industry advancements, and better equip students for future careers.

5) Research Competency: Encouraging independent inquiry, advancing interdisciplinary research, improving grant acquisition capabilities, refining academic writing and data analysis skills, optimizing experimental methods, mentoring students in research, and deepening international collaboration. Experts emphasize the importance of independent research, interdisciplinary collaboration, and applied research in enhancing academic impact and addressing challenges. These insights underscore the significance of continuous learning, collaboration, and practical application in advancing academic excellence.

6) Resource Integration Competency: Optimizing team management and laboratory resources, utilizing digital teaching platforms, strengthening institutional partnerships, and effectively leveraging government, industry, and alum networks to promote long-term academic and professional development. These insights underscore the significance of strategic resource allocation and collaborative efforts in promoting academic and institutional excellence.

7) Innovation and Development Competency: Driving curriculum reform and teaching innovations, deeply integrating AI, big data, and other technologies, fostering entrepreneurial thinking, promoting interdisciplinary education, and strengthening intellectual property management to enhance academic excellence and societal impact. Experts' insights underscore the necessity of continuous adaptation to emerging educational and technological trends to maintain academic excellence and societal impact.

8) Reflective Competency: Achieving continuous self-improvement through classroom teaching reflection, research assessment, cross-cultural adaptation, academic ethics evaluation, team collaboration, and lifelong learning to sustain professional growth and adaptability. Experts emphasize the importance of self-reflection and continuous learning in enhancing teaching quality, research effectiveness, and professional growth. These insights underscore the necessity of continuous self-improvement and adaptability in achieving long-term success in education and research.

Conclusion and Discussion

Teachers' professional competency for application-oriented higher education institutions in Hainan proposed in this study redefines the role positioning of application-oriented higher education institutions' teachers by emphasizing Personal Competency, Teaching Competency, Knowledge Competency, Practical Competency, Research Competency, Resource Integration Competency, Innovation and Development Competency, and Reflective Competency. In particular, the emphasis on Resource Integration Competency challenges the traditional competency structure centered on "teaching ability & practical ability" (Diao & Hu, 2022).

The findings of this study contribute meaningfully to the existing body of literature on teachers' professional competency, particularly within the context of application-oriented higher education institutions. Consistent with previous research (Sulaiman & Ismail, 2020),

the study reaffirms that teachers' competencies are multidimensional and extend beyond traditional pedagogical skills to encompass industry collaboration, research capabilities, and continuous professional development. The relatively high level of competency found in this study aligns with national efforts to strengthen the quality of higher education in China, especially under initiatives such as the "the National Development and Reform Commission, and the Ministry of Finance jointly issued the "Guiding Opinions on Guiding Some Local Ordinary Undergraduate Colleges and Universities to Transform into Applie", which emphasizes the cultivation of applied talents.

The exploratory factor analysis conducted in this research revealed 8 key competency factors that emerged through data-driven statistical extraction based on the factor loadings and eigenvalues greater than one, this exploratory factor used 550 samples (Comrey & Lee, 1992), according to the results of exploratory factor analysis, 8 component of teachers professional competency model for application-oriented higher education institutions Hainan were finally formed, including 80 items. The 8 common factors could explain 64.93% of the variance in total, reaching the standard of 60% (Streiner, 1994), indicating that the explanatory power of the 8 common factors was sufficient, which, compared to prior competency frameworks, the extracted factors both align with and extend previous findings. For instance, while prior models often emphasized teaching ability and subject knowledge (Kholid et al., 2023), this study further underscores the importance of competency related to Resource integration competency, innovation, and development competency, a reflection of the unique demands placed on teachers in application-oriented institutions (He & Zhang, 2018; Cascavilla et al., 2022). The emergence of resource integration and innovation competencies highlights the need for faculty to operate across traditional academic boundaries, requiring close engagement with industry, applied research, and technological innovation. This insight suggests that professional development programs should move beyond conventional teacher training, incorporating opportunities for teachers to engage with industry practices, participate in applied research projects, and stay abreast of technological advancements. This finding reveals the necessity for faculty to undertake dual roles as "knowledge transmitters" and "regional development facilitators" in economic transformation.

Furthermore, this competency model can be integrated into various human resource management practices at application-oriented higher education institutions in Hainan, including faculty recruitment, performance evaluations, and professional development initiatives. For example, during the hiring process, universities could introduce an additional scoring metric emphasizing "industry work experience" to give preference to candidates with strong practical backgrounds. Regarding training programs, tailored modules like "Interpretation of Free Trade Port Policies" and "Cross-border Educational Collaboration" can be incorporated to strengthen faculty members' ability to contribute to the region's economic and social development objectives. Moreover, embedding these competencies into performance appraisal systems ensures that faculty efforts are closely aligned with institutional goals, particularly in advancing the strategic priorities of the Hainan Free Trade Port. While promoting applied skills, institutions must also carefully preserve strong academic standards in research. Upholding excellence in theoretical study and scholarly work is essential to maintaining a university's credibility and academic stature. To achieve this, universities should establish dual-track development models encouraging hands-on application and rigorous academic inquiry. Such frameworks ensure faculty can drive practical innovation without compromising core academic principles. Striking this balance will strengthen the proposed competency model's real-world impact and long-term success.

By weaving this model into key teacher workforce development, universities can better match faculty skill sets with the evolving needs of the local economy and society. It provides

a clear, evidence-based framework for designing teacher recruitment criteria, evaluation systems, and continuous training programs. The identified gaps in practical, research, and reflective competency highlight the imperative for higher education institutions to adopt more scientific, flexible, and targeted faculty development strategies (Sancar et al., 2021; Erdemir & Yeşilçınar, 2021). Specifically, institutions should prioritize implementing diversified initiatives, including international exchange programs to broaden global perspectives, interdisciplinary collaboration to stimulate innovative thinking, and establishing incentive mechanisms that encourage pedagogical innovation. By integrating these measures, institutions can address existing competency deficiencies and foster a sustainable pathway for continuous faculty development, thereby enhancing the overall quality and effectiveness of applied university education.

Overall, this study fills a gap in existing research by providing a localized and context-specific competency model for teachers in Hainan and offers actionable recommendations for institutional development. Incorporating mixed-methods research that blends qualitative case studies with quantitative competency assessments could provide deeper insights into how faculty members cultivate competencies in response to institutional and industry demands. Future studies could build on this work by conducting longitudinal analyses to assess how teachers' competencies evolve and by exploring the effectiveness of specific professional development interventions based on the proposed model.

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