

Jiangang Cheng · Wei Han ·
Qian Zhou · Shuyan Wang *Editors*

Handbook of Teaching Competency Development in Higher Education



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Editors

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Preface

With the rise of digital technologies such as big data, artificial intelligence, blockchain, and 5G, the production and lifestyle of human society have undergone profound changes. The accelerated development of digital industrialization and industrial digitization has put forward new requirements for the knowledge, skills, and abilities possessed by the labor force in various countries around the world. The development of the Internet has given birth to digital thinking, distributed cognition, virtual space knowledge dissemination, and interpersonal communication that leads to systematic changes in training concepts, methods, and governance systems. The digital transformation of higher education is imperative to address these changes and new requirements.

In this context, the International Center for Higher Education Innovation under the auspices of UNESCO (UNESCO-ICHEI) and the Institute of Education of Tsinghua University jointly launched a special research project. The project invited more than 50 Chinese, American, and Australian experts and scholars in educational technology, higher education, and other fields. They jointly compiled the *Digital Transformation of Higher Education Teaching and Learning Report* as well as *Handbook of Educational Reform through Blended Learning*, *Handbook of Teaching Competency Development in Higher Education*, and *Handbook of Technical and Vocational Teacher Professional Development in the Digital Age*. The research report focused on the trends of digital transformation in instruction, trying to provide international organizations, governments, higher educational institutions, enterprises, and other stakeholders with concepts, ideas, methods, and countermeasures to tackle the challenges of digital transformation. The three handbooks focused on providing blended learning reform, teaching competency development theories, standards, methods, and strategies for practitioners and researchers. Meanwhile, UNESCO serves as the platform to help countries around the world (especially developing countries) use digital technology to achieve the goal of 2030 education sustainable development advocated by UNESCO and create high-quality higher education systems that are inclusive, resilient, and open.

This handbook is the *Teaching Competency Development in Higher Education* that serves as references for higher education, government administrators, higher educational institutions administrators, and higher education instructors. The purpose is to develop high-quality instructors, provide high-quality higher education, promote digital transformation of education, and achieve the goal of connotative development of higher education. The handbook first introduced the background of the handbook, including digital transformation in education, higher education reform, and artificial intelligence. It then defined related concepts of teaching competency development and reviewed theoretical foundations of teaching competency development. The handbook also reviewed recent research on the standards framework of teaching competencies and proposed new standards framework of teaching competencies in higher education as well as suggestions for using the proposed standards framework and evaluation instruments. Next, it proposed a framework of teaching competency development in higher education and discussed how to develop teaching competencies at various levels, such as international, governmental, societal, institutional, and individual. Last, the handbook provided examples of current practices of teaching competency development.

Jiangang Cheng, Wei Han, Qian Zhou, and Shuyan Wang edited the handbook. The contributors for the original written in Chinese are as follows: (a) Chapter One with Jiangang Cheng, Shuyan Wang, Yuping Wang, Jihua Song, Xiaojing Bai, Yangyang Luo, Xiangyu Chen, and Meng Li; (b) Chapter Two with Mei Cao and Jieyuan Sun; (c) Chapter Three with Xibin Han, Wenshuang Ge, Shuyan Wang, and Qian Zhou; (d) Chapter Four with Qian Zhou, Mei Li, Yu Yan, Mingxuan Chen, Jing Wang, and Kaiyu Yi; and (e) Chapter Five with Enjing Guan, Yu Yan, and Qian Zhou.

Shuyan Wang managed the English version of this handbook and reviewed and revised the book. Taralynn Hartsell proofread the English version. Lin Zhong translated the Preface and Chapter One. She also reviewed the entire book. Sirui Wang and Yu Yan translated Chapter Two. Sirui Wang translated Chapter Three. Sirui Wang, Yu Yan, and Shuyan Wang translated Chapter Four. Guoqiang Cui translated Chapter Five. Sirui Wang, Yu Yan, and Guoqiang Cui cross-reviewed each chapter.

Relevant personnel of UNESCO Higher Education Innovation Center (Shenzhen) and Tsinghua University Education Research Institute have continued to support the compilation of this handbook. Our sincere gratitude goes to the leaders and teachers at colleges and universities who have provided cases, reform efforts, and results.

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Chapter 1

Introduction



Shuyan Wang, Jiangang Cheng, Yuping Wang, Jihua Song, Xiaojing Bai, Yangyang Luo, Xiangyu Chen, Meng Li, and Lin Zhong

Abstract The increasing affordances of new technologies provide both new opportunities and challenges for teaching in higher education. Equipping instructors with the necessary teaching competencies to overcome these challenges in the digital era is imperative. This handbook serves as a reference for higher education stakeholders. It aims to cultivate high-quality instructors, improve higher education quality, and drive digital education transformation. It covers the context, theoretical foundations, and standards for teaching competency development. The book provides a practical framework for fostering teaching competencies across various levels and includes real-world examples of current practices.

The increasing affordances of new technologies provide both new opportunities and challenges for teaching in higher education. Equipping instructors with the necessary teaching competencies to overcome these challenges in the digital era is imperative. This chapter introduces the handbook by providing background information

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(Sect. 1.1), explaining the purpose and scope (Sect. 1.2), and offering instructions on how to use this handbook (Sect. 1.3).

1.1 Background

1.1.1 *Digital Transformation in Education*

The digital transformation in education is not just the application of digital technology to education, but the optimization and transformation of the operation mode, strategic direction, and value proposition of educational institutions to adapt to the digital era. The goal of digital transformation in education is to enhance learning and develop students as digital citizens in the digital era.

The digital transformation in education brought many changes to education. First, the goal of education has gradually shifted to cultivating interdisciplinary personnel who possess cross-disciplinary knowledge, skills, and attitudes. As an important part of interdisciplinary knowledge, digital literacy includes not only basic digital technology knowledge and skills, information and data literacy, digital security, and digital ethics literacy, but also professional knowledge and skill in the digital era. It represents the ability to unify self-identity in both the virtual and real world. Second, students' learning and cognitive styles are undergoing fundamental changes. These changes brought challenges to traditional instruction that uses fixed space and static resources. The changes also put forward a new requirement for teaching competencies: the need for continuous development of digital teaching competencies. Instructors trained in the large-scale methods of the industrial age cannot meet the learning needs of the digital age. Therefore, improving instructors' teaching competencies, including the awareness, literacy, ability, and research of the integration of digital technology into teaching is necessary.

Teaching competency development is an ongoing process and a complex systematic project that is characterized by target differentiation, multi-party collaboration, content standardization, method diversification, and comprehensive evaluation. It requires concerted efforts from the government, society, institutions, and individual teachers. Lifelong learning can be an effective approach to develop instructors' teaching competencies. Lifelong learning provides high-quality vocational and technical education that enhances instructors' abilities in incorporating pre-service training and post-service development to guide students' development and career planning, helping students establish the habit of lifelong learning in post-service education.

Promotion of lifelong learning among higher education teachers are achieved through four methods. First, teachers should take full advantage of self-regulated learning and engage in lifelong learning from multiple perspectives. Teachers' teaching competency development requires the concept and strategy from the "five

books of learning” (Zhang, 2022) tailored to adult learners. Teachers should formulate and tailor their personal learning plans according to their individual learning needs, abilities, and specific circumstances. Second, teachers should consider adult learning theory. As adults, teachers’ learning styles are significantly different from children and adolescents. Learning should be problem-solving oriented, emphasizing the practical application of knowledge gained through real-world experience (Li & Zhu, 2016). Third, teachers must focus on the principles of professional learning and development. This involves focusing on developing self-regulation skills that enable teachers to assess the impact of their teaching on promoting students’ valuable learning. Fourth, post-employment training and professional practice play vital roles in lifelong learning. Teachers should fully utilize training and learning opportunities and actively engage in learning with organizational support.

1.1.2 Higher Education Reform

Higher education has been undergoing reform in many countries. In the United States (U.S.), the 2005 report titled “Teacher Induction of Approaching the Learning Community” mentioned that the U.S. would implement a comprehensive new teacher induction education, which was expected to play a fundamental role in the twenty-first century learning community (Fulton et al., 2005). In the United Kingdom (U.K.), in November 2015, the British government released the higher education green paper “Fulfilling Our Potential: Teaching Excellence, Social Mobility and Student Choice”, which proposed the implementation of the “Excellent Teaching Assessment.” The mechanism to achieve the three reform goals include (1) establishing a competitive higher education market; (2) creating more opportunities for students to choose schools; and (3) improving the management structure of higher education (Walker, 2016).

In China, the Ministry of Education issued the “Opinions on Deepening the Reform of Undergraduate Education and Teaching to Comprehensively Improve the Quality of Talent Cultivation” (The Ministry of Education, 2016). This document called for the comprehensive promotion of the construction of new engineering, new medical, new agricultural, and new liberal arts programs, all aimed at improving the capacity of colleges and universities to contribute to economic and social development, and establishing first-class foundations for training top-notch students in fundamental disciplines. This involved creating distinguished colleges, designing exceptional courses, and establishing academic excellence. In 2018, the Central Committee of the Communist Party of China and the State Council issued the “Opinions on Comprehensively Deepening the Reform of Teachers’ Team Construction in the New Era” (Xinhua News Agency, 2018). This document primarily focused on improving the ideological and political quality of teachers and comprehensively strengthening their moral and ethical standards. This initiative complemented the ideological and political work of strengthening colleges and universities. The document also aimed to improve the selection, training, and incentive mechanisms for

teachers and build a diverse and high-quality teaching workforce, including full-time and part-time educators. In 2020, as a supporting policy for implementing the “Opinions on Comprehensively Deepening the Reform of the Construction of the Teaching Staff in the New Era,” the “Guiding Opinions of the Ministry of Education and Other Six Departments on Strengthening the Reform of the Construction of the Teaching Staff in Colleges and Universities in the New Era” was issued. This guidance focused on four aspects (The Ministry of Education, 2020). Among the construction measures, the first one was to emphasize the construction of the ideological and political quality of college teachers and develop their moral and ethical standards as the primary goal. This entailed strengthening the “four histories” of education for college teachers, clarifying the institutional requirements, and ensuring that all teachers received training within a certain timeframe. These measures included incorporating various teacher ethics norms into the compulsory content of pre-service training for new teachers and professional development programs for in-service teachers. Only after completing a certain number of training hours and passing the assessment could individuals qualify as college teachers and engage in teaching activities. Teacher ethics and professional conduct should be the primary requirement and top criterion for teacher recruitment, title evaluation, position employment, mentor selection, commendations and awards, tenure assessment, project application, and other relevant procedures.

1.1.3 Artificial Intelligence

Artificial intelligence (AI) is the hallmark technology of the digital age and has been integrated into all aspects of life in recent years, profoundly changing the nature and methods of human activities involved. The application of AI in higher education consists of four stages (Yu, 2021): *initial contact* (using it as a tool for repetitive work processing), *gradually becoming proficient* (using it as a productivity tool to improve the efficiency of routine transaction processing), *collaborating* (delegating part of the work to AI, allowing teachers to focus on teaching innovation), and *mutual trust* (establishing a social partnership with AI and increasing the sociality between AI and teachers).

The rapid application of AI in higher education also poses challenges to teachers. Repetitive, monotonous, and routine teaching work, such as knowledge transfer, may be replaced by intelligent teaching systems, allowing teachers to focus on inspiring and facilitating creative activities. Human–machine collaborative teaching can become a development trend. The “intelligent + wisdom” learning environment using AI, situational awareness technology, cognitive technology, cross-media technology, and augmented and virtual reality technology can effectively improve teachers’ knowledge structure and competencies (Deng et al., 2021).

In terms of teaching competency development, the relationship between AI teachers and human teachers will be mutually reinforcing, shaping, and evolving. AI teachers can enhance the ability of human teachers to carry out teaching work

while human teachers can enrich the educational wisdom of AI teachers. The two can co-evolve and develop together in the process of mutual empowerment.

1.2 The Purpose and Scope of the Handbook

As a result of the collective wisdom of the International Centre for Higher Education Innovation under the auspices of UNESCO and experts across the world, this handbook represents a timely collection of resources focused on the development of teaching competency in higher education. It aligns well with the education vision set out by the Education 2030 Framework for Action. That is, we ensure that teachers and educators gain empowerment, appropriate recruitment, comprehensive training, professional qualifications, motivation, and support within systems that are efficiently governed and well-resourced.

This handbook draws upon relevant theories and approaches to teaching competency development, as well as innovative and inspirational teaching competency development practices in higher education. It provides insights into developing agile, flexible, and sustainable teaching competency development models and evaluation frameworks for both pre-service and in-service teachers. Individual teachers can use it as a reference to become more adaptable and resilient to new challenges, while identifying opportunities that are more aligned to new strategies. Moreover, the insights, models and evaluation frameworks can also inform the initiation of new teaching competency development programs and upgrade existing teaching competency development programs at an institutional level in higher education.

1.3 How to Use This Handbook

This handbook contains five chapters. This chapter introduces the background against which this book is written (Sect. 1.1). It also explains the purpose and scope of the handbook (Sect. 1.2) and how to use the handbook (Sect. 1.3). Chapter 2 defines related concepts (Sect. 2.1) and discusses theoretical foundations (Sect. 2.2) of teaching competency development. Chapter 3 proposes a standards framework for teaching competency development (Sect. 3.1) and reviews current evaluation instruments (Sect. 3.2). Chapter 4 proposes a sample framework for teaching competency development in higher education (Sect. 4.1) and then examines current achievement of teaching competency development at an international level (Sect. 4.2), governmental level (Sect. 4.3), societal level (Sect. 4.4), institutional level (Sect. 4.5), and individual level (Sect. 4.6). Chapter 5 presents current practices of teaching competency development, including international practices (Sect. 5.1), institutional practices (Sect. 5.2), and individual practices (Sect. 5.3).

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Chapter 2

Definitions and Theoretical Foundations



Mei Cao, Jieyuan Sun, Sirui Wang, and Yu Yan

Switching the emphasis from researching to teaching has accelerated the reformation of higher education. This switch is directly reflected in the establishment of the Center for Teaching and Learning in universities worldwide and has gradually become standardized and mature for faculty professional development. Teaching competencies have become essential in professional development in higher education. Boyer (1990) brought in the concept of “scholarship of teaching,” which included teaching competencies as part of the research. Faculty members must include teaching in their research projects, investigate teaching theories, and develop into specialists and scholars who analyze, enhance, and examine teaching.

This chapter first defined related concepts of teaching competency development, including teaching competencies (Sect. 2.1.1), digital teaching competencies (Sect. 2.1.2), and components of teaching competencies (Sect. 2.1.3). Then, the chapter reviews theoretical foundations of teaching competency development, including teachers’ knowledge structure (Sect. 2.2.1), TPACK framework (Sect. 2.2.2), personal practical knowledge (Sect. 2.2.3), scholarship for teaching (Sect. 2.2.4), theories of teacher learning (Sect. 2.2.5), teaching expertise in higher education (Sect. 2.2.6), and teaching competency development model (Sect. 2.2.7).

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2.1 Definitions

2.1.1 Teaching Competencies

Although there is no universal definition of teaching competency, many research studies have been conducted on what defines teaching competency is and what it entails (Gu, 1986).

From the psychological perspective, teaching competencies are a set of psychological features that teachers use to achieve teaching goals and engage in teaching activities smoothly. They consist of both general competencies and particular competencies (Gu, 1986). General competencies refer to the cognitive ability usually shown in teaching activities while specific competencies refer to teachers' specialized knowledge to engage teaching activities.

From the pedagogical perspective, teaching competencies come from the actual teaching process and combine teachers' teaching behaviors and abilities at the skill level. Pedagogical teaching competencies emphasize the effective use of different teaching skills at different teaching stages such as instructional design, teaching organization and implementation, reflection, and evaluation. Streifer (1987) believed those teacher competencies included effectively planning and implementing instructional plans, using appropriate instructional techniques, evaluating students, demonstrating knowledge, and meeting professional responsibilities.

From the sociological perspective, teaching competencies emphasize the interaction between teachers and students and social relationships. It believes that teaching competencies allow teachers to inspire students' learning interests and encourage students' engagement and participation in the teaching and learning process (Wang, 2010). It emphasizes teachers' arousal and interest in students' self-stimulation and the improvement of self-learning ability.

Teaching competencies are utilized as performance evaluation standards by some international organizations. For instance, the International Board of Standards for Training, Performance, and Instruction (IBSTPI) believes that teaching competencies are the knowledge, skills, and abilities that professionals require in their roles, whereas standards refer to a pre-defined level of quality or attainment of those competencies. Competencies and standards are critical factors in advancing professionals in this field (Martin & Ritzhaupt, 2020). Unlike ability and skills, teaching competencies compromise the dynamic changes of social contexts in teaching and emphasize "problem solving in real situation" and "practice in action" (Kiffer & Tchiboza, 2013). Teaching competencies support "effectively" and "successfully" teaching content and emphasize more on the high-quality teaching outcomes (Kiffer & Tchiboza, 2013).

There is no doubt that teaching competencies are intensely situational. There are also differences between traditional teaching competencies and digital teaching competencies. The development of information and communication technology (ICT) resulted in substantial changes to the classroom environment, necessitating the addition of new teaching competencies to support situated and online learning.

Queiroz (2003) listed several new competencies for teachers in the information age, especially for teaching online:

...to be able to use technology; to have skills to design and implement courses (depending on the applications to be used); to moderate, organize and archive asynchronous discussions; to establish ground rules, guide, and animate synchronous discussions; to integrate different teaching and learning styles to the course; to interact actively with students and give them constant feedback; to make students aware of cultural differences among members of a group, of Internet ethics and netiquettes, among others. (p. 3)

Therefore, teaching competencies in the information age should fully consider the influence of information technology on the change of teaching responsibility and teaching competencies as well as student learning process and outcomes.

2.1.2 Digital Teaching Competencies

In the information age, the teaching competencies of university teachers is a derivative notion based on the connotation of teaching ability. There are two key trends in the global reform of higher education today: the first is the pursuit of excellent undergraduate instruction, and the second is the effect of educational information technology on the educational and teaching process. Correspondingly, the current understanding of digital teaching competencies in higher education should be more result-oriented and process-oriented to construct its connotation. It emphasizes on the ICT-facilitated teaching competencies because of the integration of information technology and subject teaching.

The relationship between information technology and digital teaching competency development in higher education is reflected in two aspects. Information-based teaching ability is an integral part of teaching competencies, and information technology is the solution, method, and environment for improving teaching competencies. First, with the widespread application of various information technologies in teaching, digital teaching competencies have become an increasingly important part of teaching competencies in higher education. Improving digital teaching competencies in higher education involves setting up a long-term vision of technology integration, reflecting on current practice, mastering updated teaching pedagogies, understanding the impact of theory on practice, and cultivating teachers' learning community. Second, information technology is the solution to effectively and efficiently improving the teaching competencies in higher education. The application of information technology to enhance teacher teaching competence has the following advantages: (a) personalized online learning platform is more conducive for teachers to carry out personalized learning and reflection based on personal needs; (b) online communication tools realize the decoupling of time and space, which made the mutual learning and evaluation among teachers easier; (c) digital resources are helpful for universities to accumulate resources for the development of teacher teaching competence; (d) teachers' online learning data mining and learning analytics are beneficial to teacher development management and decision-making; and (e) the

learning community in a networked environment encourages the cooperation among teachers, experts, and peers.

Regarding teaching competencies and ICT-facilitated teaching competencies, there are two main viewpoints. The first viewpoint is the addition method. In addition to the general understanding of teaching competencies, ICT-facilitated teaching competencies have been added in the information age such as basic ICT ability, ICT-facilitated teaching design, teaching implementation, concept/ethics, etc. The second viewpoint is that of integration, which examines the relationship and interaction between information technology and other parts of the teaching process rather than analyzing information technology as a separate element. As a result, the general teaching competencies are turned into ICT-facilitated teaching competencies. At present, the integration viewpoint has gained increasing attention because teaching is a systematic process, and the role of technology is far from being played alone. It must be integrated with several elements of the teaching process to help each component of teaching and corresponding teaching activities be more effective. Similarly, the teaching competence that teachers should have is the ability to integrate information technology with subject content and teaching methods to effectively promote students' learning ability.

Therefore, we tend to integrate the process perspective of pedagogy. It is the result of perspective of teaching competence and the integrated perspective of technology application. It defines digital teaching competencies in higher education as teachers having the ability to use subject content to design teaching activities, use teaching skills to complete teaching tasks, and use information technology to promote learning and achieve the university's goals of effective teaching and high-quality talent training. Digital teaching competencies emphasize (a) the analysis abilities of learners, teaching design, resource construction, teaching implementation, learning evaluation, and technology application; and (b) the transformation abilities of "teaching content—teaching method—information technology." Its connotation is the ICT-facilitated teaching competencies of university teachers, and it is the "upgrade iteration" of traditional teaching competencies in the information age.

2.1.3 Components of Teaching Competencies

In view of the inconsistent understanding and definition of teaching ability, the starting point of research on teaching competency's structure is also different. The composition and structure of the teaching competencies of primary and secondary school teachers are relatively mature, which has significance for the teaching competency structure of teachers in colleges and universities.

The Components of Teaching Competencies in K-12. Based on the relatively stable personal characteristics or psychological characteristics of teachers, teaching competencies. These may include thinking and planning ability, introduction ability, questioning ability, inquiry ability, encouragement ability, and learning ability; cognitive ability, design ability, teaching ability, organization ability, and social skills

(Meng, 1990); and at the same time, the intellectual foundation necessary of teaching competencies (Shen & Wang, 2000).

If considering teachers' responsibilities, teaching competencies may also include the capacity to transit knowledge, plan teaching tasks, apply interpersonal ability (Simpson, 1966), monitor teaching, teach cognitive and operation ability (Shen et al., 2000), conduct instructional design, implement instruction, and reflect on teaching behaviors (Lu & Hong, 2009). According to Chen and He (1988), teaching competencies can be divided into teaching abilities and teaching management abilities. Teaching abilities include selecting instructional resources, developing teaching materials, and communication skills, whereas teaching management abilities include organizing classroom activities, encouraging personalized learning, and diagnosing and reflecting on the teaching experience.

Teaching activities are an important perspective and foundation for assessing teaching competencies. According to the process of teachers' participation in teaching activities, Lu and Hong (2009) divided teaching competencies into three parts: instructional design, implementation, and evaluation and reflection. Each part involves many elements such as content, students, media and tools, learning environment, and more. Therefore, it can be refined into the abilities such as teaching content analysis, communication, teaching planning, selecting teaching methods, organizing class activities, managing students, customizing learning, teaching diagnosis and feedback, and test proposition and evaluation (An, 2007).

The teaching competencies standards presented in IBSTPI 2004 combined the above preceding viewpoints and described competency as "a knowledge, skill, or attitude that enables one to effectively perform the activities in teaching" (p. 26). It divides competencies into two categories: professional foundation and teaching management. The professional foundation includes composite components of teachers' psychological traits, intellectual foundation, subject knowledge, and values and attitudes. Teaching management encompasses parts from four different aspects of professional foundations, planning and analysis, design and development, and implementation and management.

The teaching competency structure varies as the shift from a teacher-centered approach to a learner-centered approach occurs over time. The researchers believe that teaching ability in research-based learning scenarios should include innovative teaching design, guiding students to learn, foresight, new knowledge acquisition, rational thinking, application of information, creative reflection, cooperative teaching, comprehensive management, comprehensive evaluation, and other abilities. Essential components of teacher teaching abilities include effectively promoting learning, strengthening teacher-student interaction, stimulating students' inherent desire for knowledge, satisfying learners' needs and diversity, stimulating students' awareness of problems, and guiding learners' autonomous learning. "How to teach better" and "how to encourage students to learn better" should be two equally significant aspects of primary and secondary school teachers' teaching ability.

The Components of Teaching Competencies in Higher Education. According to Streifer (1987), teaching competencies in higher education should be divided into five categories: teaching planning, teaching skills, assessing, and evaluating,

professional knowledge, and responsibilities. Simpson and Smith (1993) believed that teaching competencies were divided into six categories: academic skills, planning skills, management skills, presentation and communication skills, assessment and feedback skills, and interpersonal skills. Fink (2003) thought that teaching competencies in higher education were divided into four categories: professional knowledge, curriculum design, communication skills, and teaching implementation and management. Chu (2007) believed that teaching cognitive ability, instructional design ability, teaching operation ability, and teaching monitoring ability should be included in the faculty's teaching competencies. Teaching competencies have distinct emphases from the perspectives of pedagogy and psychology. It comprises instructional design, teaching management, and teaching research when seen from a pedagogical standpoint. From a psychological standpoint, it contains teaching cognitive capacity, teaching operational ability, and teaching monitoring ability. If viewed from a sociological perspective, it includes the ability to promote collective participation, interaction, and harmonious relationships in the class. This participation requires the ability to respond appropriately to individual students both inside and outside the classroom, arouse students' interest and stimulate their involvement in learning, continue self-education, and the practical ability to adapt to social changes such as internationalization and informatization. Molenaar et al. (2009) proposed a structured way of thinking about teaching competencies including competence base, organizational level, and teaching domain. Knowledge, skills, and attitudes are included in the competency-based dimension; the corporate level includes macro-level leadership, meso-level coordination, and micro-teaching capabilities. The teaching domain dimensions include development, organization, implementation, guidance, evaluation, and evaluation.

Based on the preceding discussions, higher education teaching competencies can be divided into four categories: basic professional competencies, micro/course-level competencies, meso/curriculum level competencies, and macro/general competencies. It can be further divided into sub-dimensions from the pedagogy dimension, as shown in Fig. 2.1. Every category can be further subdivided, especially micro/course level competencies, which include the most abundant parts.

As discussed above, although many similarities and overlaps between K-12 and higher education teaching competencies exist, there are differences. They both emphasize the components of a teaching system and teaching process such as instructional design, teaching implementation, evaluation and reflection, presentation and communication, and teaching methodology and technology integration. However, K-12 and higher education are quite different in the mission, educational goals, and individual students. There are also many differences in the composition of teaching competencies. Higher education focuses more on professional knowledge, medium-level curriculum, and macro-level professional vision and literacy while K-12 focuses more on micro-course teaching.

The components of teaching competencies reflect different teaching philosophies. People who emphasize "teaching" pay more attention to the content, methodology,

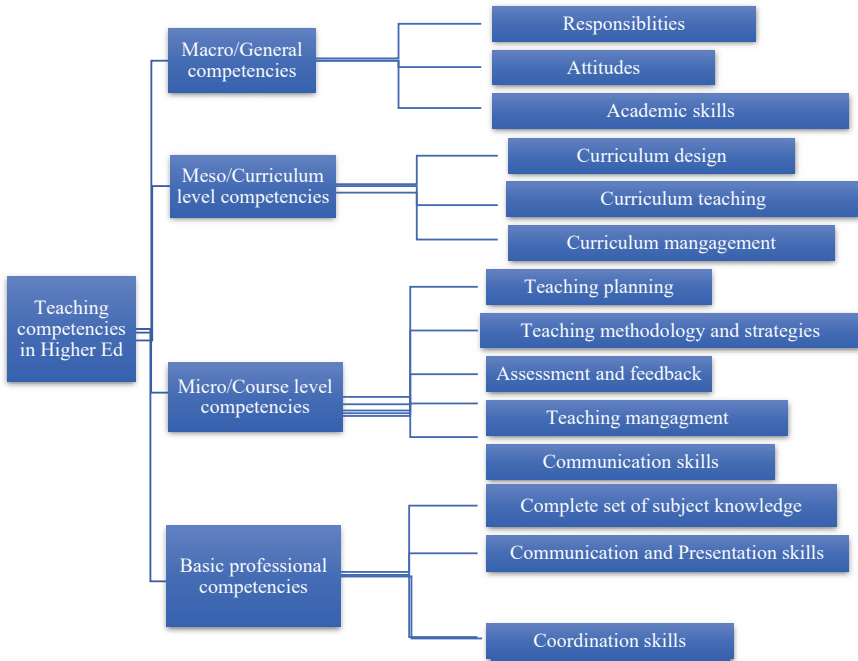


Fig. 2.1 Components of teaching competencies in higher education

and other elements in the teaching system. They focus more on teachers’ own activities, such as creating a course syllabus, selecting appropriate teaching methodologies, and flexibly using teaching media. People who emphasize “learning” pay more attention to the status and importance of students in the teaching activity system. They focus more on the elements revolving around student development, learning motivation, engagement, learning needs, diversity, and more.

According to the relevant literature on the teaching competency research, pedagogy, and psychology researchers (Christ & Potter, 1998), teaching media is an important element in the teaching system, and it interacts with elements such as content, teachers, and students to affect the teaching process and effect. However, current understanding of information technology is limited to teaching media, teaching aid design, and teaching tools. There are comprehensive changes brought by information technology as a new learning environment to the learning process and learning methods. Therefore, teaching competencies in the information age should increase and expand the corresponding content such as media application ability or information technology application ability. Researchers and practitioners (Joy & Carcia, 2000) in the field of educational technology tend to examine the impact of information technology on various elements of the teaching process from a systems theory perspective, as well as the interaction between various elements in the teaching process in a digital learning environment. Correspondingly, there are corresponding

changes in each component of the teacher's teaching competency structure, resulting in new content and requirements.

2.2 Theoretical Foundations

Theoretical foundations discussed below provide lens through which to understand and value how to integrate scholarship into the practice of teaching competencies in higher education, including teacher's knowledge structure, TPACK framework, teacher's practical knowledge, scholarship for teaching, theories of teacher learning, teaching expertise in higher education, and the teaching competency development model.

2.2.1 *Teachers' Knowledge Structure*

If teaching is regarded as a profession, it first requires teachers to have specialized knowledge and skills. Teachers should learn what to teach and how to teach them effectively. Then, finding out what kind of knowledge and skills a teacher should have is next. It is mainly deepened along two trajectories: one is the teacher's knowledge structure framework represented by Shulman (1987) and based on the content orientation of teachers' knowledge, and the other is founded on teachers' professional and practical knowledge.

Shulman's Categories of the Knowledge Base and Its Development.

Shulman is one of many researchers who attempted to use various frameworks and models to investigate the necessary knowledge to teach efficiently. Shulman (1987) presented seven categories to organize a teacher's knowledge in his knowledge structure framework.

- (1) Subject matter knowledge is the domain knowledge and content of the subject taught.
- (2) General pedagogical knowledge refers to general principles and strategies for classroom organization and management beyond specific disciplines.
- (3) Curriculum knowledge refers to the mastery of teaching materials and plans as teachers' "professional tools."
- (4) Pedagogical content knowledge (PCK) refers to the organic integration of the subject content taught and the principles of pedagogy to organize, express, and adjust specific topics and styles to suit learners. Different interests and abilities and understanding of how to teach are a fusion of subject content knowledge and educational expertise.
- (5) Knowledge of learners and their characteristics, and knowledge about educational objects.

- (6) Knowledge of context (or background), including the operation of classes or groups, school district management and finances, community, and cultural characteristics.
- (7) Knowledge of other curricula is about knowing the aims, objectives, values, and philosophical and historical origins of education.

Among the seven categories listed above, PCK is a significant innovation from Shulman. Many other scholars consider PCK the most critical component and the “core of teachers’ knowledge” in the category of teachers’ knowledge. It distinguishes the teaching knowledge group from other subjects and reflects the relationship between subject knowledge and specific content. One of the most critical distinctions between subject matter experts and teachers is the integration of pedagogy and content. PCK bridges the gap between content and pedagogy in the classroom.

Many scholars have added to the concept of subject pedagogy since then. For instance, Cochran et al. (1993) modified Shulman’s categories and proposed Pedagogical Content Knowing (PCKg). In PCKg, they defined four categories: knowledge of the subject matter, knowledge of pedagogy, students, and knowledge of environmental contexts. Magnusson and others also identified and described the five aspects of PCK: science curriculum, student understanding of specific science topics, assessment, instructional strategies for teaching science, and orientations toward science teaching.

Functional-oriented Teacher Knowledge Structure. Teacher knowledge can be structured based on the functions. From the perspective of the function of teacher knowledge, Xin (1999) and Lin classified teacher knowledge into four categories: subject-involved knowledge, cultural knowledge, conditional knowledge, and practical knowledge. Subject-involved knowledge refers to the specific subject knowledge that teachers possess such as language knowledge, mathematics knowledge, and mechanical knowledge. In Shulman’s (1987) framework, this category of knowledge is the same as subject matter knowledge. Teachers’ best knowledge structure comes from the subject they are teaching, but this is not the only factor influencing students’ learning performance. Cultural knowledge is also helpful in assisting students with their learning. Teachers’ extensive cultural knowledge and the breadth and depth of their cultural knowledge have a direct impact on students’ overall development. Conditional knowledge refers to teachers’ pedagogical and psychological knowledge, which concreate into three aspects: knowledge of students’ physical and mental development, teaching and learning knowledge, and student performance evaluation. Practical knowledge refers to any related situational knowledge in a classroom during teaching practices. It is the result of years of teaching experience. Teachers’ teaching is situational. Teachers’ knowledge in these situations comes from personal education and teaching practice, and it is empirical. This knowledge is expressed in individual languages and contains a wealth of details.

Practice-oriented Knowledge Structure. Chen (2003) divided teachers’ knowledge into two categories: theoretical knowledge and practical knowledge. Theoretical knowledge includes subject content, subject teaching methods, curriculum,

pedagogy, psychology, and general culture. Practical knowledge provides educational beliefs, self-knowledge, interpersonal understanding, situational knowledge, strategic knowledge, critical reflection knowledge, and more. Theoretical knowledge is typically explicit and shared between teachers and professional theorists. It is expressible and straightforward to understand. Practical knowledge is difficult to comprehend because it is concealed, unsystematic, and silent. However, both are necessary and sufficient conditions for teachers' teaching competency development, and they complement and influence each other. Chen (2003) believed that practical knowledge was more important than theoretical knowledge in that it was in a dominant position and played a significant role in teaching.

The Composite Structure of Teacher Knowledge. Teachers' knowledge should be organized in a hierarchical and multi-layered manner. Ye et al. (2001) believed teachers' knowledge is divided into three layers. The primary layer includes the basic knowledge of contemporary science and humanities and a solid foundation of instrumental disciplines, and proficient use of skills and technics. The second layer, with specialized knowledge and skills in one or two fields, is the basic knowledge for teachers to be competent in teaching work. Teachers should have a broad and deep understanding of their disciplines' basic knowledge and skills and master relevant skills and principles. The third layer consists of education subject knowledge that aids teachers in comprehending educational objects, educational and teaching activities, and research skills. Pre-service teachers should strengthen their knowledge and skills in understanding learners, developing their teaching philosophy, designing teaching activities, implementing classroom management strategies, incorporating educational technology into teaching and learning, and conducting academic research.

Gilbert et al. (1987) created a four-level taxonomy to classify teaching knowledge. The first level of their taxonomy is knowledge of the school as an institution, including knowledge of educational history, philosophy of education, professional ethics, public policy, school legislation, and school organization. The second level is the student's knowledge, which includes knowledge of multicultural education, socio-economic considerations, instructional psychology, learning theories, and human development. The third level is teaching knowledge, which provides curriculum development, teaching methodologies, educational technology, assessment and evaluation, and learning styles. The fourth level is knowledge of decision-making, also known as knowledge of clinical application, which includes understanding interpersonal interactions, educational management, evaluation, and forming models.

SECI-Knowledge Transformation Framework. Knowledge is classified into tacit knowledge and explicit knowledge. This distinction also applies to the teachers' professional knowledge owned by a teacher, who could gain rich tacit knowledge from experiences and practice. Japanese scholars Nonaka and Takeuchi (1995) proposed a knowledge conceptual model called SECI (Socialization; Externalization; Combination; Internalization) to describe the rigorous and efficient process of generating, transforming, and recreating knowledge in an organization. Socialization is a process of sharing knowledge, including observation, imitation, and practice through apprenticeship. Externalization is the process of making tacit knowledge

explicit, wherein knowledge is crystallized and is thus able to be shared by others, becoming the basis of new knowledge. Combination involves organizing and integrating knowledge, whereby different types of explicit knowledge are merged (for example, in building prototypes). Internalization involves the receiving and application of knowledge by an individual, enclosed by learning-by-doing. This theory has been widely used in teaching competency development in explaining the knowledge generation and development of teaching competencies.

Four Modes of Knowledge Transformation. Socialization (tacit to tacit) refers to the process of knowledge socialization. In this process, people can generate tacit knowledge such as shared mental models and skillsets by sharing experiences. For example, when working with masters, apprentices can learn skills through observation, imitation, and practice.

- *Externalization* (tacit to explicit) refers to how people articulate tacit knowledge into clear knowledge.
- *Combination* (explicit to explicit) describes the connection of knowledge. People combine evident expertise into a more systematic, detailed knowledge system and connect related knowledge through sorting, classification, summarization, and reflection.
- *Internalization* (explicit to tacit) is the process by which people embody clear knowledge and build their abilities through practice. Practice is the best way to understand internalizing.

This knowledge transformation is a process of “spiral” evolution. The four modes of change complement each other and together develop knowledge to a new level. New knowledge is created in the process of knowledge transformation. For example, community knowledge can be generated during the socialization process, conceptual understanding can be generated during externalization, systematic knowledge can be generated in the combination process, and procedural knowledge can be generated in internalization.

BA: Knowledge Transfer Place. Nonaka and Konno (1998) proposed that the transformation of knowledge is inseparable from the “knowledge transfer place (*ba*).” The concept of “*ba*” was first used to describe the shared social interaction spaces between people. The “place” in the SECI model refers to the shared space required for knowledge creation. The four transformation modes require different *Ba*. The *socialization* of knowledge is carried out in the “*Originating ba*.” Individuals communicate with each other based on mutual trust to reveal their feelings, emotions, experiences, and mentality. This is the starting point in the process of knowledge creation. The real-time interaction between individuals is significant for tacit knowledge transformation. The *externalization* of knowledge requires a “*dialoguing ba*” of knowledge necessary to form groups of people with expert knowledge and abilities and then interact to adhere to the principle of openness. During the interaction, people would transfer tacit knowledge into explicit knowledge and, at the same time, reflect on and analyze their ideas. The *combination* of learning occurs in the “*systemizing ba*” of knowledge, or the connection and systematization of explicit knowledge promoted based on media such as language, writing, conferences, databases, and the

Internet. The internalization of learning occurs in the “*exercising ba*.” Through practice, knowledge subjects digest their explicit knowledge and internalize it into their feelings, experiences, and experiences. The knowledge generated by each *ba* is eventually shared and becomes the community’s knowledge assets, such as conceptual knowledge, and systematic knowledge. The knowledge asset becomes the resource for the organization to create new value, which helps the process of knowledge transformation.

From the SECI model, the professional development of the teacher community is a process of mutual transformation between explicit knowledge and tacit knowledge and between theoretical knowledge and practical knowledge. The teacher community is developed based on the accumulation of community knowledge assets. The teacher community achieves the goal of knowledge innovation and continuous learning in different *bas*: action-experience in originating *ba*, problem-dialogue in dialoguing *ba*, problem-reflection in systemizing *ba*, and new action-experience in exercising *ba*.

The SECI model has been widely used in teacher professional development research. For example, the SECI model analyzes the knowledge innovation cycle of expert and novice teachers in the teacher community. This research may shed useful light on the ways in which teacher community functions, the design of the knowledge place (*ba*), and the functions of information technology. Zhong (2008) proposed the sequence of teachers’ teaching practice activities and teachers’ knowledge development may be offered in a 4D cycle: (1) “designing” (instructional design) based on the knowledge of teaching materials, (2) “doing” (teaching practice) based on implicit instructional knowledge, (3) “discussing dialogue” based on explicit knowledge, and (4) “documenting” based on the understanding of classroom events and student learning trajectories. The 4D cycle is the process of cooperative construction of teachers’ “practical knowledge.” At the same time, teachers’ knowledge creation is only achieved by solving complex teaching problems in the school setting, which is also a process of action research.

2.2.2 TPACK Framework

Koehler and Mishra (2005) proposed the TPACK (Technological Pedagogical and Content Knowledge) theoretical framework, which explained the technical knowledge required by teachers. It studies how to develop this knowledge needed through design-based activities in authentic contexts.

The TPACK framework is built on Shulman’s pedagogical content knowledge (PCK). It integrates technological expertise into the subject-teaching framework while also interacting with subject content and pedagogy. The TPACK framework addresses seven essential components. First, three knowledge elements that include subject content, pedagogy, and technology work together. We should pay attention to not only these three elements simultaneously during the teaching process, but also the complex interaction between these three elements, which results in four types

of new knowledge: Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPACK). Among them, TPACK is the one that creatively blends technology, pedagogy, and subject content and goes beyond. TPACK is the highest form of teachers' knowledge structure (Mishra & Koehler, 2006).

TPACK framework first presents an integrated perspective. There are three levels of integration. First, it highlights pedagogical knowledge, technological knowledge, and content knowledge as critical integration components. Second, it emphasizes that to help teachers use technology to improve student learning, these three knowledge domains should not be separated, but should form a whole total PACKage (Thompson & Mishra, 2007). Third, TPACK is an entire development process, which consists of four core elements (Niess, 2005): (1) a holistic view of integrating technology to teach a specific subject, (2) knowledge of the subject's curriculum and course materials that integrate technology and learning, (3) knowledge of students using technology to understand and reflect about learning, and (4) knowledge of instructional strategies and presentations for using technology to teach specific topics.

TPACK also highlights the interdependence of the three fundamental components. According to Bull et al. (2007), the "threefold frame" could be formed in "multiple ways" (p. 131). For example, one could look at Pedagogy and how it interacts with the technology and content. We could also examine Content and "how technology and pedagogy can be best utilized to develop student understanding of core content ideas" (p. 131); Or, we could look at the interaction between the efficacy (or limitation) of one particular technology and the content and pedagogy within the same subject. Furthermore, there are priorities among interactions in developing teachers' practical knowledge. Richardson (2009), for example, discovered that the relationship between technology and pedagogy took primacy. In a Chinese language classroom case study, Huseh (2008) also revealed that content knowledge dominated interaction over technological and pedagogical expertise. However, teachers also considered technical and pedagogical knowledge at the same time.

In addition, TPACK can be used as a paradigm for knowledge transformation. Cox and Graham (2009) discussed how the teacher's TPACK structure was technically mysterious. When a new technology was widely accepted, the teacher's technological knowledge transformed into pedagogical or content knowledge. This transformation caused the TPACK structure to vanish, only to be re-established when another new or newer technology appeared (Cox & Graham, 2009). TPACK, the pedagogical and technological idea related to the knowledge base for instructors to utilize technology to educate, should thus be seen as a direction rather than a set knowledge base (Bowers & Stephen, 2011).

TPACK framework significantly affects education and digital teaching competency development. It is a theoretical achievement based on the perspective of knowledge structure to examine teachers' information-based teaching ability and the culmination of contemporary teachers' knowledge classification research. Two main applications of TPACK framework lie in evaluating teachers' digital teaching competencies and teachers' TPACK development strategies and approaches.

First, TPACK offers a conceptual analysis viewpoint. It examines all components of teachers' professional knowledge, which provides a direct theoretical basis for evaluating teachers' teaching competencies based on the elements involved in technology integration. At present, many well-developed TPACK evaluation scales have been designed for reference. Simultaneously, numerous studies have broadened evaluation methodologies, such as measuring teachers' actual performance on different design tasks, concept maps, card sorting, and drawing works to investigate teachers' inner beliefs and knowledge inclinations.

Second, TPACK is used to integrate technology with teaching. It aids in analyzing the law of teachers' training and development in the integration of technology and education, the design of complementary strategies to promote the development of teachers' TPACK, and the exploration of effective development approaches. For example, Koehler et al. (2007) adopted the "learning by design" approach to help teachers create a contextual awareness of technology. Angeli and Valanides (2009) developed a technology mapping (TM) methodology for developing teachers' ICT-TPACK and pre-service teachers' TPACK created through micro-teaching. Focusing on TPACK in teachers' practice has become the direction of current research. Numerous factors in the teaching practice situation affect the level and development of teachers' TPACK, and teachers face many challenges in practice.

2.2.3 Personal Practical Knowledge

Since the 1980s, teachers as reflectors and practitioners of teaching practices have emphasized teacher education. Teachers' knowledge or so-called practical knowledge becomes the core of teachers' professional quality (Clandinin & Connelly, 1987). Practical knowledge is a type of situational knowledge that dominates teachers' thoughts and behaviors and plays a role in their daily teaching. It is the teacher's knowledge in the teaching situation, the teacher's knowledge of problem-solving in the classroom, and the "clinical" teacher's knowledge. Focusing on teachers' practical knowledge reflects the knowledge transformation in teaching competency development (Van Driel et al., 2001).

The Concept of Personal Practical Knowledge. Connelly and Clandinin (1997) proposed the notion of a teacher's private practice knowledge and viewed the teacher as a knowledgeable and cognitive individual. They stressed the importance of experience in a teacher's knowledge. They believed knowledge was not objective nor learned and inherited by teachers independently of teachers. Teachers' knowledge comes from personal experience, which is how teachers' practical knowledge is oriented. Teachers' practical knowledge is embedded into their work practice, as well as in their previous experience and current physical and mental actions, and in their future teaching plans and activities. Local knowledge, case knowledge, situated knowledge, and personal knowledge are all related notions that emphasize the same concept of teachers' intimate practical knowledge from different viewpoints.

Categories of Teachers' Practical Knowledge. Chen (2003) categorized teachers' practical knowledge into six groups.

- (1) Teachers' educational beliefs include their understanding of the goal of education, the education that students should obtain, the qualifications of good education, education implementation and evaluation, and teaching from a professional perspective.
- (2) Teachers' self-awareness encompasses self-concept, self-evaluation, self-teaching efficacy, self-regulation awareness, and more. Mainly represented as whether teachers recognize their characteristics and teaching styles, moderately develop their strengths while avoiding weaknesses, and quickly learn from mistakes and adjust their attitudes and behaviors.
- (3) Teachers' interpersonal skills includes perception and understanding of students, enthusiasm (willingness to help students), and passion (thirst for knowledge, desire to seek answers and explain to others, whether to use this passion to infect students).
- (4) Teachers' situational knowledge. Primarily reflected in the teacher's teaching wit, a behavioral inclination of swift judgment, and rapid decision-making that depends on the teacher's sensitivity to the situation, quick thinking, cognitive flexibility, and student perception.
- (5) Teachers' strategic knowledge refers to teachers' demonstration of theoretical knowledge in teaching activities. It includes an understanding of subject content, subject teaching methodologies, and pedagogical theories, as well as the ability to integrate knowledge from these fields into teaching, apply strategies in the classroom, proper selection and arrangement of course content and teaching methods, integrate technology and teaching methods, and use assessment and evaluation of students' performance.
- (6) Teachers' critical thinking abilities are represented in their daily "conscious" actions in three aspects: reflection on practice, reflection in practice, and reflection for practice.

Teachers' educational beliefs play the central role in teachers' practical knowledge, and they have the most significant impact on teachers' behavior and are more difficult to change. At the same time, all knowledge contents are interconnected and mutually influenced. For instance, the deepening of teachers' critical reflective knowledge is conducive to renewing educational beliefs. The growth of teachers' interpersonal knowledge is conducive to the enrichment and automation of teachers' situational knowledge.

The Characteristics of Teachers' Practical Knowledge. The first characteristic of teachers' practical knowledge is experience, which comes from the teacher's own teaching practice. Elbaz (1981) proposed the concept of teachers' "practical knowledge" (p. 46). They divided the content of practical knowledge into five categories: (1) knowledge of the subject matter, which is the subject content; (2) knowledge of curriculum, which is about how to organize and plan teaching content and learning; (3) knowledge of instruction, which includes classroom routines, teaching management, and student's learning needs; (4) knowledge about the self, which is about the

teaching individuals, such as personality, age, attitude, value, belief, and goals; and (5) knowledge about the milieu of schooling, which includes schools' structure and the community around. Those categories of knowledge are intertwined, and much of the practical knowledge is not recognized by teachers but reflected through teachers' behaviors and beliefs.

Scholars who focus on the situational characteristics of teachers' practical knowledge are also prevalent. From the standpoint of learning theory in psychology, Lave and Wenger (1991) proposed that social practice was a method to develop personal practical knowledge, emphasizing the situational nature of personal knowledge. They believed that the learner's knowledge was composed of both propositional and situational knowledge acquired through social practice and specific settings. Brown et al. (1989) emphasized that knowledge was the outcome of individuals' activities and social and physical situations. Knowledge application is not only limited by its laws, but also by specific cultures, activities, and conditions. As knowledge is applied to new problems, it evolves in content (Brown et al., 1989).

2.2.4 *Scholarship for Teaching*

The neglect of teaching and the decline of quality student learning have become important issues in higher education. Such problems have resulted in increased attention by the government, society, and scholars. In this context, American Scholar Boyer (1990) wrote the book *Scholarship Reconsidered: Priorities of the Professoriate*. He proposed the idea of "scholarship of teaching" based on his deep understanding of the meaning of teaching in higher education. Advocated by the Carnegie Foundation for the Advancement of Teaching, the "scholarship of teaching" initiative has had a worldwide impact on teaching competencies in higher education.

In this book, Boyer (1990) pointed out that "...We believe the time has come to move beyond the tired old 'teaching versus research' debate and give the familiar and honorable term 'scholarship' a broader, more capacious meaning, one that brings legitimacy to the full scope of academic work" (p. 16). He explained that besides engaging with academic research, a scholar should also look for connections among questions, build bridges between theory and practice, and convey their knowledge to students. Furthermore, he classified a faculty's work into four separated and overlapping functions of "...the scholarship of *discovery*; the scholarship of *integration*; the scholarship of *application*; and the scholarship of *teaching*" (p. 16).

In his book, Boyer (1990) pointed out that "scholarship" was no longer a term dedicated to "scientific discovery" or academic research that happened at the university. The activity of teaching in a university was also considered "scholarship" because a faculty's work would be fruitful only if others understood it. In this way, Boyer (1990) positioned the meaning and value of teaching in higher education from a higher level, reversing the long-standing traditional view of university teaching. By eliminating the binary opposition between research and teaching, he was trying to

reconstruct the concept of scholarship, thus emphasizing the importance of teaching and drawing people's attention to the teaching activity in university.

Late in 2004, Lee Shulman, the eighth president of the Carnegie Foundation for the Advancement of Teaching, further elaborated and developed the meaning of scholarship in college teaching in his book *Teaching as Community Property*. He believed that scholarship of teaching expressly referred to the systematic study of teaching and learning issues, which had the following characteristics: (a) be open to criticism and evaluation, and (b) use a form that allows others to construct and reflect on the results. These characteristics build a teaching community to share ideas with other academic community members, thus leading to the meaning of teaching scholarship.

Traditionally, university teaching is a private activity, and teachers often maintain a kind of "teaching isolation." This "teaching isolation" makes teaching not receive the deserved attention in universities. The way to break this "teaching isolation" is to make the teaching visible and public through artifacts that others can judge, evaluate, and easily construct. Specifically, we can use a variety of formats to document teaching activities and outcomes such as recording the teaching process in the classroom or building teaching portfolios to allow peer review. In addition, teachers can summarize and share their experiences during teaching innovation and communicate with their peers.

At the same time, Shulman (2004) believed that treating teaching as a form of scholarship required to view teaching as an activity and discovery process. Like other forms of scholarship, teaching is an outcome that manifests itself over a long process. Teaching becomes scholarship when teachers make their work public, be open to peer evaluation and critique, and communicate with other members of their professional community to strengthen their work. All different kinds of scholarship share these characteristics.

Regarding how universities could create an environment for the scholarship of teaching, Shulman (2004) admitted that the emergence of university teaching and academic culture would not be achieved overnight. He emphasized the need to change how future teachers were trained, to increase the scrutiny of teaching ability during the hiring process, to create a unit to support the growth of the scholarship of teaching, and most importantly, offer teachers a proper and respectable place in a research university.

The theory of "scholarship of teaching" profoundly reveals that the dissemination of knowledge within a discipline has the same academic value as its production and application. Universities should emphasize best practices in teaching as student learning is the focus. A university teacher should conduct research on teaching that enhances best practices. To advance knowledge dissemination to academic research means moving away from teaching techniques and methods to a research level where teachers focus on problem discovery and problem-solving. Teachers emphasize the following activities: collecting data to evaluate teaching, iteratively improving teaching methods, continually reflecting on the teaching activity, making teaching artifacts visible and easy to exchange, extracting general teaching rules, and developing a new understanding of teaching.

2.2.5 *Theories of Teachers Learning*

Regarding teaching competency development, the terms “teacher training,” “teacher education,” and similar words spring to mind. These are all vital approaches for teachers to grow professionally. In fact, “teacher learning” is also a form of teaching competency development, but it has a different notion and meaning than “teacher training” and “teacher education.” Teacher learning is classified into two categories: active learning and passive learning. Teacher training and teacher education are more associated with passive learning, whereas teacher learning promotes active learning by teachers and based on constructivist learning theory, resulting in a shift in teacher education’s fundamental paradigm. Teachers actively develop personal, situational knowledge from their own experience and educational and teaching practice rather than passively receiving experiences from other academic experts.

Case-based Situational Learning Theory. Situational learning theory is a popular topic in contemporary learning theories. It combines both social constructivism and anthropological perspectives. According to the constructivist view of learning, learning is not about acquiring cognitive symbols, but about participating in real-world activities. Advanced learning is the ability to transfer new, complex, and poorly structured knowledge to new situations flexibly. This process requires the creation of context at various times via multiple methods to support the visit and recognition of the same materials from various perspectives (Spiro, 1988).

Situational learning theory state that learning is the process of social collaboration and the essence of learning is the gradual transition from marginal participation to core participation in the community of practice. The core concepts of this theory include situation-based action, legitimate marginal participation, practice field and practice community, cognitive apprenticeship, and more (Li, 2006). Brown et al. (1989) argued that knowledge was contextual and part of activities, backgrounds, and cultural products. Learning knowledge, thinking, and context are closely inter-linked. Knowledge and action are mutually dependent; knowledge is delivered within a certain context, and it develops further through behavior. Therefore, researchers discovered the effective situational learning method of cognitive apprenticeship, whereby novice teachers are allowed to observe and imitate the behaviors and operations of skilled people and experts. Novice teachers can gradually master the tools to develop and utilize real situations to learn in-depth and acquire relevant skills in the given field (Brown et al., 1989).

As a result, successful teacher learning necessitates situational learning in the context of vivid examples. Different people can blend their own unique experiences, comprehend them to varying degrees and perspectives, and as a result, establish a variety of educational concepts and teaching methods. It bridges the gap between expert theoretical discourse and teacher practice. Teacher training should be linked with the actual situation of the school and teachers themselves, producing varied scenarios and directing them with cases. Teaching films, real teaching cases, and self-designed teaching cases are the three most common techniques to generate a case-based setting for teachers.

Learning Community for Teachers' Collaborative Learning. According to social constructivism, learning is the social negotiation of knowledge, and the learning process is a cooperative and communicative activity. Teachers' cooperative groups are reciprocal learning resources in a learning community. Hu (2005) summarized three types of cooperative learning for teachers based on the learning community for teachers in the primary education in China: (1) guided cooperative learning, which refers to the guidance from teaching-research staff, subject experts, and university experts to teachers such as mentoring and teaching partners; (2) showcase-based cooperative learning such as open courses, teaching achievement presentations, reading clubs, and other types of sharing-based learning; and (3) research-based cooperative learning such as teaching salons, seminars, and project research. Different types of learning communities exist. They can be offline learning organizations with teaching and research groups at their core or virtual learning teams such as blog groups; they can also be problem-solving, reading club-based, or subject-based or subject-based research. To summarize, the learning community is more practical than rigid. It is not disorganized or disjointed. It, in contrast, necessitates a set of norms and institutional safeguards.

Based on the importance of teachers' practical knowledge and influenced by situational learning theory, teachers' cooperative learning is further defined as "participation in the community of practice," and the community of practice has become a prominent concept. According to Lave and Wenger (1991), a Community of Practice refers to people who gather to achieve individual and group goals by sharing a common concern, a set of difficulties, or a common interest. They gain knowledge and experience over time due to their ongoing contacts in pursuit of common goals. Compared to standard formal organizations, communities of practice have three required components (Lave & Wenger, 1991). The first required component is the domain that includes a shared area of interest, competence, and commitment that sets them apart from the competition. Members initially identify with the shared environment, then invest time and experience in developing a shared sense of identity. The second required component is the community, or a social framework that encourages people to communicate and share their idea. This platform's development is based on mutual respect and trust, and it promotes idea exchange, exposing ignorance, challenging challenges, and patiently listening. The third required component is the practice, in which community members adhere to a common set of methods and standards to set a foundation for their activities, communication, problem-solving, practical operation, and critical communication. This effective practice is a group effort that organizes pertinent knowledge and norms to benefit the practitioner.

A community is more than just a group of people working together on the same project. The duration of the mission or the size of the group is not a mitigating factor. The key is to engage with society and offer students a meaningful role or mission through community of practice (Wenger, 1999).

In the past, attending lectures was seen to be the primary method of education for teachers. In fact, teachers' learning in practical situations has a more substantial impact on teachers' concepts and behaviors. Situational learning is a major way and model of training teachers (Li, 2022). Teachers observe and imitate other teachers in

daily teaching practice, face and solve various problems, interact with experts and colleagues, and continuously expand new knowledge and methods. The learning principle behind it fits well with the main points of situational learning theory, so in recent years, situational learning theory has been widely introduced into the professional development of teachers (Nonaka & Takeuchi, 1995).

Community of Practice has lately become a trend. Various forms of teacher learning organizations have emerged such as discussion groups for regular teaching and research, reading clubs, online webinars, and cooperative practice research. The common feature of these organizations is to provide teachers with practice-based cognitive sharing opportunities. Based on the general theory of “learning community,” “community of practice” emphasizes the role of practice and teaching situations on teachers’ learning, highlights learning in action, and reinforces the mutual transformation of different types of teachers’ knowledge and the “exercising *ba* (practice field)” on which they depend.

Reflective Practice Theory. The constructivist paradigm emphasizes the importance of “introspection” or “reflection” in teacher education and argues that reflection is an important form of professional development for teachers as it may increase teachers’ instructional engagement and professional development. Teachers’ reflective actions play a larger role in the difference in teaching competencies between experienced and inexperienced teachers. Reflective teaching has also become a modern benchmark for identifying exceptional educators (Xiong, 1999).

In his book, *The Reflective Practitioner: How Professionals Think in Action*, Schon (1983) carefully studied two types of reflection. One type is a reflection for action, in which teaching can take place before or after class in the form of preparation and reflecting on classroom teaching. The second type is a reflection in action, which occurs during the teaching process. Teachers change their education in response to observations of phenomena or difficulties in the classroom, implying that teachers are always on the lookout for and solving problems in the school. Schon emphasized more on the “reflection in action” and believed that its outcomes were more significant for developing practical knowledge.

Based on Schon’s (1983) dichotomy, Griffiths and Tann (1992) developed five reflection dimensions: rapid reflection, revision, retrospective, research, and theoretical reconstruction. While other studies fault teachers for always trying to stay at the brief review and revision level, they claimed that the most practical consideration was hypothetical reconstruction and reconstruction.

Osterman and Kottkamp (1993) split teacher reflection into four parts: concrete experience, observation and analysis, abstract reconceptualization, and active experimentation. Teachers actively reflect on and improve their teaching during this learning cycle. Handal and Lauvas (1987) thought that teachers’ reflective practice could be divided into three levels or processes: (1) regular teaching actions, which were evident and easy to observe; (2) planning and reflection, which included pre-teaching thinking and preparation, as well as post-teaching reflection; and (3) ethical thinking of teaching practice, which was a continuous reflection on teaching ethics such as whether it helped to promote the equality and justice for all students.

The most common reflection format is to write reflective articles on their teaching such as examining teaching cases, keeping teaching logs, and such. It enables teachers to assess their comprehension of educational and teaching principles, and how these concepts affected their problem-solving abilities. Micro-teaching is also a good way for teachers to reflect on and analyze their teaching.

Valli (1993) concluded that there were five reflection models. A technical reflection required teachers to assess their teaching practices against external benchmarks such as the expert-developed norms and standards formulated. The reflection-in and on-action allowed teachers to reflect based on their particular teaching scenarios, values, beliefs, classroom, and students' circumstances. Adeliberative reflection emphasized that instructional decisions were based on balancing multiple sources of knowledge such as research, experience, and suggestions from other teachers. Teachers consider a wide range of pedagogical issues such as students, curriculum, teaching strategies, and classroom organization and principles. Personalistic reflection was concerned with the voice of teachers, personal growth, and professional development issues. It emphasized students' personal development rather than academic performance. Critical reflection encouraged teachers to become reformers and social actors. Teachers who engage in critical reflection are more likely to adapt their teaching techniques and school structures to minimize social injustice and inequality and listen to the perspectives of marginalized people. These types of reflection models provide new possibilities for teacher education.

Action Research. Research starting from the problems teachers face in the classroom is crucial to help teachers grow. The goal of action research is to help teachers reflect on their teaching behavior and improve their teaching by solving problems in the classroom. Action research is teachers' reflective exploration of the basic education and teaching situation. Its primary goal is to answer specific work-related issues. It stresses the integration of research and teaching activities, in which teachers' study, think, attempt, and try to solve problems. According to Kemmis and McTaggart (1988), action research was self-reflection research undertaken by teachers and other educational practitioners. It encouraged teachers to reflect critically on their practice.

Kemmis and McTaggart (1988) adopted Lewin's action research and believed action research was a spiral development process, with four interrelated and interdependent links in each spiral development circle. The method first includes a plan, which starts with a need and an assumption to address a problem, with the premise being a synthesis of the action researchers' (teachers') understanding of the situation and the information, theories, methodologies, and techniques they possess that are also helpful for problem-solving. The next involves an action, which entails putting the plan into action or acting in accordance with the goals and objectives. In their research, action researchers gained a better grasp of specific situations and allowed other researchers and participants to monitor and review their work. The next step is to investigate, which entails looking into the process, outcomes, background, and personality traits of researchers and encouraging the use of a variety of successful technical tools and methodologies. The last step is reflection, which synthesizes the numerous feelings experienced during the plan's formation and implementation.

Meditation also helps describe the cycle's process and outcomes, evaluate and explain phenomena and reasons, point out gaps between goals and results, and develop basic assumptions and plans for the following steps.

It should be noted that not every teacher can conduct action research. Teachers need to have a theoretical foundation, and at the same time, they should be able to keenly discover the problems existing in their own teaching. In addition, some teachers may conduct a comprehensive action research with the help of their mentors or colleagues.

Evaluation Theory. How can the teachers' learning outcomes be evaluated to give positive feedback? There are three sorts of evaluation methods. The first is authenticity evaluation, which occurs in real-life circumstances, and is procedural and diagnostic (Wiggins, 1998). The goal of evaluation is to support teachers' ongoing development rather than to identify advantages and disadvantages. The second is to emphasize comprehensive evaluation. Unlike traditional evaluation, it does not consist of a single written examination, but instead encourages a diversity of methodologies and approaches for evaluation. At the same time, two crucial indications of formative and summative evaluation (Angelo & Cross, 1993) should be supplied. Participatory evaluation is the third option. Teachers must grasp the process and foundations of teaching assessment and receive timely and appropriate feedback to support their active learning. Teachers and students should be encouraged to participate in the participatory evaluation such as negotiating evaluation standards, methods, and processes, and undertaking self-evaluation or mutual evaluation.

2.2.6 Teaching Expertise in Higher Education

Expertise refers to "expert knowledge or skill in a particular subject, activity or job." There are individuals who have distinguished themselves from the ordinary person in their specialty in every discipline. Examples include medical experts, chess masters, and physics experts. In teaching, these people are often referred to as "expert teachers." Research on teaching expertise can help us better understand the characteristics of expert teachers' knowledge and skill and the acquisition and development of such knowledge. In addition, research on teaching expertise can provide practical insights for teacher education, support the assessment of successful teaching, and provide materials for teacher education curriculum design. At the same time, research on teaching expertise can encourage novice teachers to acquire new knowledge and new skills through the experts' guidance and thus helps the novice teachers to understand the complex nature of teaching (Tsui, 2003).

The Knowledge Base of Expert Teachers. Turner-Bisset (1999) expanded Shulman's (1987) pedagogical content knowledge (PCK) by adding general pedagogical knowledge, knowledge/models of teaching, learning of learners, knowledge of self, understanding of educational contexts, knowledge of educational ends, purposes, and values. In summary, Turner-Bisset's teachers' knowledge base inherited most of the components in the teacher's knowledge structure proposed by

Shulman. Turner-Bisset added two more types of knowledge: models of teaching and theoretical expertise and self-cognition knowledge. The addition helped demonstrate that expert teachers could have more superior knowledge of instructional methods and maintain self-reflection and cognition.

Characteristics of Teaching Expertise. Different from the paradigm of knowledge classification, Bond et al. (2000) identified 13 features of teachers' teaching expertise from the perspective of teacher behavior as follows:

1. Use of knowledge.
2. A large amount of subject pedagogical knowledge, including a profound representation of subject knowledge.
3. Good problem-solving strategies.
4. Set and adjust goals for different students and have better improvisation skills.
5. Make better decisions.
6. Propose more challenging goals.
7. Create a better classroom atmosphere.
8. Greater insight into classroom practice and better ability to interpret information cues provided by students.
9. Greater sensitivity to the situation.
10. Better monitoring of student learning and more appropriate feedback to students.
11. Test the plausibility of assumptions more often.
12. More respect for students.
13. Demonstrate a higher passion for teaching.

Acquisition and Development of Teaching Expertise. Teacher teaching development aims to help novice teachers grow into expert teachers as soon as possible. The question is how to attain teaching expertise.

Theory of Practice. Manross and Templeton (1997) believed that expert teachers were not born but made through practical exercises. Teaching expertise is gained through experience, practice, and knowledge. The acquisition of teachers' teaching expertise does not put too much emphasis on deliberate training. The method of intentional training is more used in the addition of internship teachers' expertise. Teachers' teaching practice and accumulation of teaching experience can be regarded as the process of training.

Manross and Templeton (1997) recommended acquiring teaching expertise by developing planning skills and insights, focusing on individual students, developing teaching strategies, and using reflective practices. When developing planning skills, teachers should regularly refer to excellent lesson plans and effective strategies from other peers and reflect on reviewing and improving the classroom. When developing insights, teachers should pay attention to students' behavior, classroom situations, and teaching behavior. Wisdom is not easy to set, but it can be practiced. For paying attention to individual students, teachers should practice paying attention to 1–2 students at the beginning to analyze and understand their behavior. With more practice, teachers can gradually pay attention to more students. Teaching strategies should be developed by seeking new teaching methods and teaching theories with the help of other teachers' teaching cases, professional books, and periodicals. In terms of

classroom reflection, teachers need to make a certain amount of deliberate effort. They should actively communicate and interact with other teachers, observe their classrooms, and promptly review and reflect on their teaching after class.

Theory of Situational Training. Teachers often complain that learning outside the classroom does not make sense because it is separated from daily teaching practice. Teachers' practical knowledge is situational and empirical. The development of teachers' teaching experience needs to be completed in actual teaching situations (Flick & Lederman, 2001). The result of teaching expertise also happens in the process of an authentic teaching setting. In view of the importance of situational factors on the development of teacher teaching competencies, situational training theory has been greatly discussed.

Situational training theory can be roughly divided into practical situation acquisition and reflective situation acquisition. We have discussed valuable situation acquisition in the previous section. Thoughtful situation acquisition is also a meaningful way to promote professional development. These two viewpoints are not opposites but have different emphases. Teachers' teaching expertise is often achieved through both practice and reflection at the same time.

Schon (1987) pointed out that the proposed reflective practice also emphasized reflection in the process of training. According to Schon, teachers are reflective practitioners. Considerations in practice include six methods: recognition of the problem, recognition of the incongruent factors, reconstruction of the problem, proposing new solutions, testing new solutions in action, and evaluating results.

2.2.7 Teaching Competency Development Model

The process of teaching competency development is a process of growing from a novice teacher to an expert teacher. Studies of expertise in chess, physics, mathematics, music, history, and more have proven that it takes at least 10 years of work experience for a novice in any professional field to become an expert (Robertson, 2001). In this process, he/she has experienced different stages of development with different characteristics. Representative theories include the following people.

Glaser's Three Phases of Monitoring and Support. The shift from relying on external support to depending on internal tracking is known as expertise. Based on this assumption, Glaser (1996) provided a three-stage professional internalization development hypothesis, ranging from external support to intermediate transition and internal monitoring. During the external support phase, novices must rely on the external environment's framework to learn the basic skills they require, and beginners are impacted by their devotion, enthusiasm, and practitioners and other significant figures in the area of their mentors and parents. Social learning and organizational training are particularly crucial at this stage. As the novice progresses to the intermediate transition stage, they begin to utilize less "scaffolding" and gradually becomes an apprentice, requiring more supervision and training. As apprentices, they can concentrate on learning self-monitoring and self-regulation skills and summarizing

a set of behavioral standards. Apprentices have gradually turned into experts in the final stage of internal monitoring and have begun to regulate their learning environment and undertake purposeful training to adjust their status. They begin to receive the feedback they require and select a training difficulty level appropriate for their developmental stage (Fuller & Brown, 1975).

Berliner's Five-Stage Development Theory. Berliner (1994) identified five levels of teacher development: novice level, advanced beginner level, competent level, proficient level, and expert level. He believed that all teachers began from the novice level. They progressed to the advanced beginner level after 2–3 years of accumulating knowledge and experience, and then advanced to the competent level after another 1–2 years of teaching practice and professional training. This was the overarching goal of teacher teaching development. Some teachers may progressively become proficient over the next year, while some continue to develop and become an expert over time. Teachers have various personalities at different levels too. For example, novice teachers are usually cautious, stereotyped, and rigid; advanced beginner teachers have more insight; and competent teachers are more reasonable and have a far higher feeling of drive and responsibility. Only a tiny percentage of teachers progress to the proficient stage, where they approach cognitive automation in their teaching abilities and develop teaching intuition. Only a few teachers can achieve the expert level, and those who do will be fundamentally distinct from others. Expert teachers are irrational when dealing with problems, and they do things quickly, rarely need analysis or thought, and can complete instruction solely via experience.

Fuller and Brown's Three-stage Model of Teacher Development. According to the varied objects that teachers pay attention to at different phases, Fuller and Brown (1975) divided teacher teaching development into three stages. During the survival stage, most of the teachers are trainees and novices. They prioritize on job survival and adaptability. They devote a significant amount of time to topics other than teachings, such as dealing with interpersonal relationships and family ties. Their professional development is still severely limited. In the situational stage, teachers start to pay attention to their students' grades while also paying close attention to their classroom teaching content and effect. Their teaching skill has been developed and improved. The final stage is the student stage. Teachers begin to pay attention to students' unique peculiarities and explore how to teach them by those differences. Teachers' teaching skills have been fully established at this point.

Deliberate training is required to grow teachers' knowledge and skills, but it is also vital to train in the environment, which requires teachers to engage in active reflection. Teachers need a specific amount of time to gain expertise, which can be separated into distinct stages. Each step's different qualities and laws must be grasped to promote it from one location to the next as quickly as possible through teacher training, teaching practice, and teaching reflection. The methods and consequences are still being debated.

In summary, the review of the theoretical foundations of teaching competency development revealed that no single theory or model can guide the design of developing teaching competencies in higher education since learning has adopted many educational paradigms. Based on the theoretical foundations discussed in this chapter,

we proposed a standards framework of teaching competencies in higher education in next chapter with the aim of taking full advantage of current scholarship of teaching competencies. We believe that taking multiple perspectives rather than a single theoretical approach, is essential for designing effective training programs for teaching competency development because the broad range of design features requires a broad theoretical foundation.

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Chapter 3

Standards Framework and Evaluation Instruments



Xibin Han, Wenshuang Ge, Sirui Wang, Shuyan Wang, and Qian Zhou

As dramatic changes of information and communication technologies (ICTs) in higher education occur, the learning environment has gradually blended the traditional face-to-face environment with online learning, distributed learning, blended learning, and other situational elements. The change of learning environment in higher education has expanded the connotation of teaching competencies that teachers should not only integrate technology into instruction, but also integrate technology into complex and diverse learning environments. The new requirements of teaching competencies call for new standards framework and evaluation instruments.

This chapter first reviews recent research on the standards framework of teaching competencies (Sect. 3.1.1) and then proposes a new standards framework of teaching competencies in higher education (Sect. 3.1.2), as well as suggestions for using the proposed standards framework (Sect. 3.1.3). Evaluation instruments are also reviewed to conclude this chapter, including behavior observation scale (Sect. 3.2.1), digital teaching competency questionnaire (Sect. 3.2.2), single-item knowledge skills assessment (Sect. 3.2.3), and teaching competency self-assessment scales (Sect. 3.2.4).

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3.1 Standard Framework

3.1.1 *Recent Research on Standard Framework of Teaching Competencies*

Objectives and Principles of the Teaching Competency Standard Framework.

Objectives of Teaching Competency Standards Framework include improving the recognition of college teacher teaching competency standards. Teachers, as a critical factor in the development of the quality system of higher education, are confronted with a series of challenges because of the digital transformation of higher education. Building a standard of teacher teaching competencies compatible with education reform, as well as strengthening the recognition of college teachers' teaching as a professional skill, has become critical. In November 2021, UNESCO released *Reimagining Our Future Together: A New Social Contract for Education*, which suggests "to shape peaceful, just, and sustainable futures, education itself must be transformed" (UNESCO, 2021, p. 1). The key to ensuring the professional recognition and reputation of college teachers' teaching is to develop a recognized standard framework for teacher teaching competencies, guide college teachers to participate in effective professional training and teaching practice activities at different development stages of higher education and improve teaching literacy and key capabilities. Building a standard suitable for teachers' professional development has also become a guarantee of high-quality college teacher development.

Identifying the typical characteristics of teacher teaching competencies at different developmental stages of higher education is important. The purpose of formatting a teaching competency standard framework applicable to the scope of higher education globally is to promote the professional development of college teachers teaching in the information age. It aims to urge every college teacher to continuously pursue "teaching excellence," and identify various types of typical characteristics of teachers (novice, advanced, and expert teachers) based upon the competency standard framework. It also aims to help teacher development centers and other institutions at colleges enhance and improve teachers' professional development. To identify the current level of college teacher teaching competence, three areas need to be developed: (1) teacher teaching qualification certification programs, (2) teacher education and training course resources, and (3) teacher teaching competence diagnostic tools based on the competence standard framework and the idea of international competence micro-accreditation.

Promoting the professional development of digital teaching competencies in higher education can help. With the innovative use of technologies such as the Internet, artificial intelligence, and big data in education, online and face-to-face teaching has shown a trend of blurred boundaries and mutual integration. After large-scale remote teaching became true during the COVID pandemics, the combination of online and face-to-face teaching gradually became a teaching direction. Facing the information era, college teachers must consciously explore and improve their teaching knowledge and skills in the new intelligent learning environment, as well

as demonstrate professionalism and teaching leadership. The standard framework for digital teaching competencies aims to better: (1) guide teaching development institutions at the colleges and universities to further promote professionalization of teaching; (2) explore teaching methods and strategies for the new era, new environment, and new problems; (3) explore more intelligent, precise, and personalized teacher training and development system; and (4) guide college teachers in doing practice-based research on teaching development tailored to the information era.

Principles of Teaching Competency Standards Framework include practicality and guidance. The purpose of a standard framework for college teacher teaching competencies is to evaluate teachers and their teaching practice. Whether it fits teachers' actual teaching demands is an essential basis to validate the effectiveness of the standard framework. In this sense, the competency standard framework should fulfill the actual needs of teachers' teaching. The primary principle for developing the competency standard framework is to emphasize the practical knowledge and skills of teaching. The standard should not only address current teaching practice issues, but also investigate teachers' actual expectations (McMahon, 2021). That is to say, the standard framework for teacher teaching competencies should place a strong emphasis on the ability level of their specialization and provide specific direction and demonstration for teachers' teaching. The standard framework guides college teachers in the process of teaching practices and ensures that they continue lifelong learning as practicing individuals in practice communities.

Systematicity and sustainability is also part of the framework. The process of teachers' teaching requires the coordinated operation of multiple subsystems such as school organization, curriculum resources, and the like. These subsystems are interdependent. From a systematic standpoint, the teachers' teaching process is a collection of different teaching element subsystems (Miao et al., 2020). As a result, teacher teaching competency framework requires a logical and systematic structure. According to UNESCO's (2018) "ICT Competency Framework for Teachers," teacher teaching competencies are divided into six categories: understanding ICT (information and communications technology) in education, curriculum and assessment, pedagogy, application of digital skills, organization and administration, and teacher professional learning, which forms a systematic framework. At the same time, the framework must be sustainable and capable of providing continued guidance to novice teachers, advanced teachers, competent teachers, and expert teachers at various stages of their professional development. Taking the ICT Competency Framework as an example, it focuses on the three stages of knowledge acquisition, knowledge deepening, and knowledge creation. As a result, developing a competency standard framework based on systematic and sustainable principles can be consistent with the features of the development of the times, and continue to add value and play a role in educational reform and development.

Adaptability and accessibility are important. Adaptability is the ability or willingness to change in order to suit different conditions (Cambridge Dictionary, 2021). UNESCO (2009) is dedicated to ensuring accessibility and equal access for all people. As a result, when developing the framework of college teacher teaching competency standards, it should provide references for the standards and training programs in

different countries (regions) and be adaptable. At the same time, the culture and context of different countries (regions) should be considered while developing the competency framework to ensure the easy application of the competency framework and provide greater convenience for the broad application of the competency framework.

Basics for Developing Competency Standards. To develop teaching competency standards, we must first consider two issues: (a) how to define the successful teaching behavior of teachers, or that is, what fundamental teaching competencies teachers should possess, and (b) what important changes have taken place in the connotation of teacher teaching competence structure under the process of technology change.

Most teaching competency standards include the enhancement and support of human performance behavior, and they are used to indicate a level of professional qualification. McLagan (1997) defined competency standards from six aspects: tasks, results, outputs, knowledge, skills, and commitments/affects (KSC's), and bundles of attributes. Competency standards are defined more precisely by the International Board of Standards for Training, Performance, and Instruction (IBSTPI), as a set of relevant knowledge, skills, and attitudes that enable individuals to effectively perform specific occupations or job responsibilities by professional standards (Klein et al., 2004). As a result, competency standards are highly correlated with job performance and can be measured to a great extent. Developing competency standards for related occupations, it must start with a clearly defined occupational role and describe a set of performance indicators for ability growth on several dimensions or levels. Generally, the first-level dimension of occupational role competency must be determined initially and be focused upon. Determining the secondary core indicators, and finally, refining each secondary indicator's tertiary performance indicator occurs.

Research and Analysis on the Structural Framework of College Teacher Teaching Competencies. Many scholars have presented different and applicable definitions of teacher teaching competencies based on both psychological and behavioral perspectives. In particular, the teaching competencies in higher education have different structural characteristics from that of primary and secondary school teachers. Streifer (1987) focused on the division of teaching competencies of college teachers and split them into five dimensions: academic skills, teaching skills, skills for evaluating students, professional knowledge, and professional responsibilities. Simpson and Smith (1993) divided the teaching competencies of college teachers into six areas: scholastic skills, planning skills, management skills, presentation and communication skills, evaluation and feedback skills, and interpersonal skills.

Fink (2003) further grouped teaching competencies in higher education into four categories: professional knowledge, instructional design, interpersonal communication skills, and teaching implementation and management. Tigelaar et al. (2004) believed that the teaching competencies of college teachers should include the following domains: (a) personal professional competencies of the teacher, including being communicative, tolerant and understanding of students, and respectful for all students; (2) teachers' professional content knowledge, including subject professional knowledge and subject professional frontier knowledge; (3) ability to promote

the learning process, including curriculum design and development, problem consultation and feedback, learning effect evaluation, and teaching management; and (4) lifelong learning/academic competencies, including the ability to reflect on teaching effectiveness, innovate, and reform instruction.

Guasch et al. (2010) pointed out that college teachers should possess the following functions and roles: (a) design/planning function that helps teachers organize and manage their courses, create and follow teaching objectives, motivate learning, manage teaching activities, and assess teaching; (b) social functions, which necessitate teachers' ability to improve the relationship with students, achieve emotional expression, and use both verbal and non-verbal communication; (c) instructive function, which is strongly tied to teachers' professional knowledge and skills; (d) technological domain, which includes the use of information technology and information-based teaching; and (e) management domain, which allows teachers to carry out and modify planned actions. Based on teachers' values, behavior, communication, and teaching practices, Selvi (2010) proposed universal standards of teacher teaching competencies that included nine competencies, "field competencies, research competencies, curriculum competencies, lifelong learning competencies, social-cultural competencies, emotional competencies, communication competencies, information and communication technologies (ICT) competencies, and environmental competencies" (p. 168).

Xu (2012) categorized the teaching competencies in higher education into five categories: fundamental professional knowledge, teachers' personality and characteristics, teaching attitude, construction ability, and teaching ability. Hu (2021) also proposed that teacher teaching practice ability includes instructional design ability, teaching implementation ability, teaching reflection ability, teaching evaluation ability, classroom teaching management ability, and information technology and teaching integration ability.

Many organizations and institutions have set standards for teaching competencies to encourage the growth of college teacher teaching competencies. The competencies reflect the knowledge, skills, and attitudes that competent teachers should have. The International Board of Standards for Training, Performance, and Instruction (IBSTPI) (2004) issued the Instructor Competencies, which construct professional standards of five core competency dimensions, 18 secondary competency indicators, and 97 performance indicators for face-to-face, online, and hybrid teaching environment. The Society for Research into Higher Education (SRHE) issued "The U.K. Professional Standards Framework (UKPSF)" as the world's first professional teaching competency standard in higher education. UKPSF uses the British National Information Accreditation Center (NARIC) information on the international education framework and qualifications. As a guiding standard for teaching staff to carry out teaching and training, it has been widely used in faculty professional development in the Commonwealth countries. The standard framework sets 15 secondary competency dimensions for teachers' activity areas (A), core knowledge (K), and professional values (V). According to the typical characteristics of professional teaching and learning practice, it is divided into four levels of associate fellow, fellow, senior fellow, and principal fellow (UKPSF, 2009).

The following tables classified and analyzed the key components of the above theoretical research and associated standards to effectively examine the frame structure of teaching competencies in higher education. The findings reveal that:

- (1) From the professional attitude, professional responsibilities, emotional attitude, maintenance of professional reputation, and other related abilities, the first-level dimensional competencies can be summarized as teachers’ professional value cognitive dimensions (see Table 3.1). Many scholars have made a relatively broad definition in terms of professional responsibilities, emotional attitudes, and professional values. IBSTPI and UKPSF provide detailed description of behavioral ability from teachers’ professional ethics, professional emotional ability, professional attitude, and professional belief. The comparative analysis of Table 3.1 shows the cognitive dimension of teachers’ professional value. It can be classified into two ability indicators: (1) professional belief and spirit, and (2) professional ethics and legal knowledge.
- (2) Based on the teacher’s professional teaching knowledge, professional basic knowledge, professional technical knowledge, teaching methodology and strategy knowledge, teaching expression, and communication skills, the second first-level dimensions of competencies can be summarized as the essential knowledge and skills of teaching (see Table 3.2). The comparative analysis of Table 3.2 shows that the essential knowledge and skills of teaching include teachers’ professional technical knowledge and skills, field knowledge, teaching methodology and strategies, and communication and presentation skills. It can be summarized into three ability indicators: effective communication skills,

Table 3.1 A comparative analysis of cognitive dimensions of teachers’ professional value

Researchers	Teachers’ professional value cognition
Streifer (1987)	A broad definition of professional responsibilities
Tigelaa et al. (2004)	A broad definition of teachers’ professional competencies
Guasch et al. (2010)	Professional attitude Professional value
Selvi (2010)	Emotion competencies Social cultural competencies
Xu (2012)	Professional attitude
IBSTPI (2022)	Comply with established ethical and legal standards (Professional Foundations, Competency 3) Establish and maintain professional credibility (Professional Foundation, Competency 4)
UKPSF (2011)	V1. Respect individual learners and diverse learning communities. (UKPSF 2011, p. 27) V2. Promote participation in higher education and equality of opportunity for learners (UKPSF 2011, p. 27) V4. Acknowledge the wider context in which higher education operates recognizing the implications for professional practice. (UKPSF 2011, p. 27)

- professional content knowledge and skills, and teaching methodologies and strategies.
- (3) Based on teachers' academic skills, teaching skills, planning skills, management skills, curriculum design skills, teaching implementation skills, information technology application skills, curriculum management skills, and other related skills, the third first-level dimensional competencies can be summarized as the core competencies of teaching practices (see Table 3.3). The comparative analysis of Table 3.3 shows that the core competency dimensions of teaching practice include competencies such as curriculum design, teaching management, teaching implementation, development of learning environment, evaluation of teaching, reflection on learning, promoting the retention and transfer of knowledge and skills, application of information-based technology, teaching research, and life-long learning. Six competency indicators have emerged, including curriculum design competencies, teaching management competencies, teaching evaluation and reflection competencies, information, and communication technology (ICT) competencies, and teaching research competencies.

Table 3.2 A comparative analysis of the dimensions of teachers' essential knowledge and skills

Researchers	Essential knowledge and skills of teaching
Streifer (1987)	Professional knowledge
Simpson and Smith (1993)	Communication skills, interpersonal skills
Fink (2003)	Communication skills, field knowledge
Tigelaar et al. (2004)	Professional knowledge, Knowledge of enhancing the learning process
Guasch et al. (2010)	Social function, instructive function
Selvi (2010)	Communication competencies Emotion competencies Field competencies
Xu (2012)	Professional knowledge
IBSTPI (2022)	Effective presentation skills (competency 8) Communicate effectively (professional foundations, competency 1) Update and improve one's professional knowledge and skill (competency 2)
UKPSF (2011)	K1. The subject material (UKPS 2011, p. 6) K2. Appropriate methods for teaching, learning, and assessing in the subject area in the subject area and at the level of the academic program (UKPSF 2011, p. 6) K3. How students learn, both generally and within their subject/disciplinary area(s) (UKPSF 2011, p. 6)

Table 3.3 A comparative analysis of the core competency dimensions of teaching practice

Researchers	The core competencies of teaching practice
Streifer (1987)	Research competencies Teaching competencies Assessment competencies
Simpson and Smith (1993)	Research competencies Planning competencies Management competencies Evaluation and feedback
Fink (2003)	Curriculum design competency Teaching management
Tigelaar et al. (2004)	Scholar/lifelong learner Improve learning
Guasch et al. (2010)	Technological domain Design/planning function Management domain
Selvi (2010)	Scholar/life-long learning; ICT competencies; curriculum competencies; environmental competencies
Xu (2012)	Professional development competencies; teaching competencies
Hu (2021)	Information technology integration competencies; instructional design competencies; classroom management and teaching implementation; teaching evaluation and reflection competencies
IBSTPI (2022)	<ol style="list-style-type: none"> 1. Academic research: Stimulate and sustain learner motivation and engagement (comp 7); promote retention of knowledge and skills; promote transfer of knowledge and skills 2. Information technology: Use media and technology to enhance learning and performance; manage the instructional process through the appropriate technology; plan instructional methods and materials 3. Prepare for Instruction 4. Teaching and learning management: Demonstrate effective questioning skills; manage an environment that fosters learning and performance; manage the instructional process through the appropriate technology 5. Teaching and learning evaluation and feedback: Provide clarification and feedback; assess learning and performance; evaluate instructional effectiveness
UKPSF (2011)	<ol style="list-style-type: none"> 1. Academic studies: A5. Engage in continuing professional development in subject/disciplines and their pedagogy; K6. The implications of quality assurance and quality enhancement for academic and professional practice with a particular focus on teaching; and V3 Use evidence-informed approaches and the outcomes from research, scholarship and continuing professional development. (UKPSF, 2011, p. 6) 2. Information technology: K4. The use and value of appropriate learning technologies. (UKPSF, 2011, p. 6) 3. Instructional design: A1. Design and plan learning activities and/or programs of study. (UKPSF, 2011, p. 6) 4. Teaching and learning management: A2. Teach and/or support learning; A4. Develop effective learning environments and approaches to student support and guidance. (UKPSF, 2011, p. 6) 5. Teaching and learning evaluation: A3. Assess and give feedback to learners; K5. Methods for evaluating the effectiveness of teaching. (UKPSF, 2011, p. 6)

3.1.2 A Standards Framework of Teaching Competencies in Higher Education

The Structure of the Framework. Based upon the literature reviewed above, this section proposed a standards framework for teaching competencies in higher education, which includes three first-level dimensions and ten competency standards. It covered teachers’ professional value cognition, the essential knowledge and skills of teaching, and the core competencies of teaching practice (see Fig. 3.1).

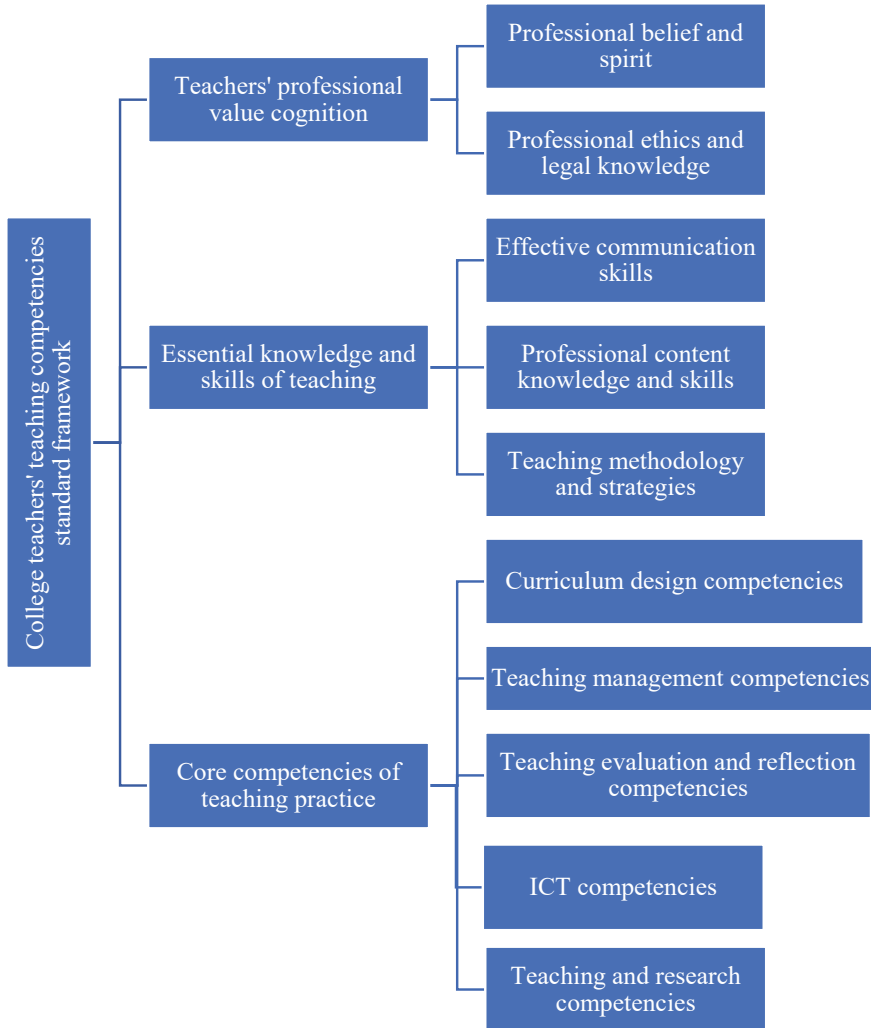


Fig. 3.1 The structure of college teacher teaching competency standard framework

Teaching Competency Indicators

As shown in Table 3.4, the proposed standards framework has three first-level dimensions, 10 s-level standards, and 40 third-level indicators.

Dimension 1: Teachers' Professional Values Cognition. The dimension of teachers' professional value cognition includes two second-level standards for teaching and taking teaching as a profession, which are the professional belief and spirit and the professional ethics and legal knowledge. There are eight third-level indicators in the teachers' professional value cognition dimension.

Dimension 2: Essential Knowledge and Skills in Teaching. The essential knowledge and skills of the teaching dimensions include three second-level standards and 15 third-level indicators, which are effective communication skills, professional knowledge skills, and teaching methodologies and strategies.

Dimension 3: Core Competencies of Teaching Practices. The teaching ability of college teachers in the process of teaching practice prompts teachers to continuously pursue teaching excellence and teaching specialization. The core competencies include five second-level standards: curriculum design, teaching management, teaching evaluation and reflection, information-based teaching ability, and research.

Teaching Competency Indicators in Different Development Stages. Teaching competency development consists of three stages: application, advancement, and innovation. Each development stage has different indicators of teaching competencies, details of which are discussed below.

Application Stage. This application stage is for pre-service teachers and new teachers. It includes ten second-level standards and 28 third-level indicators, as shown in Table 3.5.

Advancement stage. The advancement stage focuses on in-service and advanced teachers' teaching competency development. In addition to the 28 indicators required in the application stage, it also includes another eight indicators, as shown in Table 3.6.

Innovation Stage. The innovation stage aims to help teachers achieve teaching excellence by providing guidelines and methods for them to use in the classroom. In addition to the 28 indicators from the application stage and eight indicators in the advancement stage, teachers should also consider another four indicators as shown in Table 3.7.

3.1.3 Suggestions for Using the Standards Framework of Teaching Competencies in Higher Education

National Level

Constructing a local standards framework of teaching competencies. Different countries or regions might construct local teaching competency standards to guide

Table 3.4 Teaching competency standard framework with indicators

Dimensions	Standards	Indicators	
Teachers’ professional value cognition	1. Professional belief and spirit	1.1 Passion for education, belief in professional ideals 1.2 Adhere to the principle of educating and cultivating students, following the law of education, and improving teaching quality 1.3 Adhere to academic integrity, abide by academic norms, and resolutely oppose the abuse of academic resources and influence 1.4 Adhere to professional ethics, establish and maintain a professional reputation, and respect and understand the diversity	
	2. Professional ethics and legal knowledge	2.1 Have a basic knowledge of educational laws and regulations 2.2 Teach with following relevant policies and rules 2.3 Respect the national code of ethics for teachers and ensure equal teaching for all students 2.4 Be aware of intellectual property protection, respect confidentiality, and anonymous agreement, and avoid social conflicts	
	Essential knowledge and skills in teaching	3. Ability to effectively communicate	3.1 Communicate with written expression based on learners’ characteristics, context, and culture 3.2 Use properly written languages for teaching 3.3 Seek and absorb different viewpoints from multiple resources to achieve effective communication 3.4 Active and effective listening skills for different situations 3.5 Use appropriate information and communication technologies including the Internet to communicate
		4. Professional knowledge and skills	4.1 Knowledge of learning principles and teaching strategies 4.2 Possess subject knowledge, establish and maintain a professional network, and participate in professional development practices 4.3 Connect teaching with context and institutional goals, be positive about education and teaching reform

(continued)

Table 3.4 (continued)

Dimensions	Standards	Indicators
	5. Teaching methodology and strategies	4.4 Create a teaching and research portfolio, keep up to date with subject content
		5.1 Plan and prepare to teach, diagnose and analyze issues during teaching and learning, prepare teaching content, and collect and develop teaching resources and tools
		5.2 Encourage students' participation and engagement, maintain learning focus, help learners to set reasonable learning goals and expectations, and provide opportunities to participate in learning activities
		5.3 Effectively present content, select proper presentation format, use combinations of formats to present concept and content, and allow students to be part of the demonstration
		5.4 Possess effective questioning skills, guide students with reasonable direction, follow up on students' questions, use a variety of questions to guide and connect learning, and monitor and adjust learning activities
		5.5 Promote the consolidation of knowledge and skills
		5.6 Ability to transform knowledge and skills, demonstrate the application of knowledge and skill in a real context, provide opportunities to practice, explore together with students on any possible challenges and transformations, and plan together for the future with students
Core competencies of teaching practices	6. Curriculum design competencies	<p>6.1 Knowledge of teaching design and methodology, analyze the characteristics of students, participants, and teaching environment, design reasonable teaching presentation formats, select proper teaching media, and set effective evaluation of teaching</p> <p>6.2 Ability to do curriculum design, select appropriate teaching methodology, strategy, and presentation format</p> <p>6.3 Design customized teaching content, teachers' manual, evaluation tools, and supporting materials, and utilize information technology to design proper teaching activities and resources</p>

(continued)

Table 3.4 (continued)

Dimensions	Standards	Indicators
	7. Teaching management competencies	<p>7.1 Manage teaching environment, assure students have sufficient resources, handle factors that might affect students' learning efficiency, format learning rules and regulations, set proper learning expectations, and rationally allocate and regulate teaching progress</p> <p>7.2 Use appropriate means to manage classroom teaching behavior, and process issues during a teaching in a timely and fair manner</p> <p>7.3 Ability to use information technology to manage to teach, search, and share resources</p> <p>7.4 Use information technology to save and reuse teaching resources, and protect students' privacy and data safety</p>
	8. Teaching evaluation and reflection competencies	<p>8.1 Ability to evaluate learning performance, monitor and analyze students' individual and group learning progress, and evaluate students' reactions, and learning outcomes</p> <p>8.2 Reflect on teaching and learning, use multiple strategies to provide learners opportunities to exchange ideas and demonstrate information, and provide clear and detailed feedback</p> <p>8.3 Use proper information technology to evaluate teaching, including evaluating teaching materials, teaching methodologies, teaching performance, and teaching environment</p> <p>8.4 Ability to reflect on teaching, improve and summarize teaching based on teaching feedback, learning performance, and teaching outcome</p>
	9. ICT competencies	<p>9.1 Understand information technology policy, be consistent with the development of educational policy when using information technology, and clarify the value of the integration of information technology and teaching</p> <p>9.2 Understand the effect of using technology for teaching and evaluation, ability to apply information technology, and select and apply effective methods of integration</p>

(continued)

Table 3.4 (continued)

Dimensions	Standards	Indicators
		9.3 Apply a variety of digital media tools for teaching, manage and organize teaching equipment, classroom activities, and digital resources, and conduct specialized learning practices
	10. Teaching and research competencies	10.1 Apply knowledge of curriculum system construction and subject professional development to culture talented students, and provide support for effective professional content and methods for teaching
		10.2 From the perspectives of different disciplines, evaluate learning situations and course teaching contexts to conduct evidence-based teaching research
		10.3 Use new analytics to improve teaching, integrate and apply advanced technologies to educate and manage, design and intervene in curriculum design based upon learning analysis, and encourage teachers' professional development

Table 3.5 Indicators of teaching competencies in application stage

Dimension	Standard	Indicator
Teachers' professional value cognition	1. Professional belief and spirit	1.1; 1.2; 1.3; 1.4
	2. Professional ethics and legal knowledge	2.1; 2.2; 2.3; 2.4
Essential knowledge and skills of teaching	3. Ability to communicate effectively	3.1; 3.2; 3.3
	4. Professional knowledge and skills	4.1; 4.2; 4.3; 4.4
	5. Teaching methodology and strategy	5.1; 5.2; 5.3; 5.4; 5.5
Core competencies of teaching practice	6. Curriculum design	6.1
	7. Management	7.1; 7.2; 7.3
	8. Teaching evaluation and reflection	8.1; 8.2
	9. ICT	9.1
	10. Teaching and research	10.1

Table 3.6 Indicators of teaching competencies in advancement stage

Dimension	Standard	Indicator
Essential knowledge and skills of teaching	3. Ability to communicate effectively	3.4; 3.5
	5. Teaching methodology and strategy	5.5; 5.6
Core competencies of teaching practice	6. Curriculum design	6.2;
	7. Teaching management	7.4
	8. Teaching evaluation and reflection	8.3
	9. ICT	9.2
	10. Teaching and research ability	10.2

Table 3.7 Indicators of teaching competencies in innovation stage

Dimension	Standards	Indicators
Core competencies of teaching practice	6. Curriculum design	6.3
	8. Teaching evaluation and reflection	8.4
	9. ICT	9.3
	10. Teaching and research ability	10.3

instruction in different learning environments or locations. The local standards framework can facilitate the local education departments to conduct research and construct standards in conjunction with local needs, thereby speeding up the establishment of local competency standards. In general, establishing a standard certification system in a country or region takes a lengthy time.

Assessing teaching qualifications via the teaching competency standards framework. An authoritative and credible teaching professional competence certification system for college teachers is formed by examining knowledge and skill, oral and written communication of teaching language, and demonstration of teaching practice. Different countries or regions can create national or regional teacher qualification assessment and certification projects based on the college teacher teaching competency standards and improve the assessment indicators based on competency standards.

Institutional Level

Developing teacher professional development training programs. Based on the competency standard framework, colleges and universities can construct personalized teaching competency development training programs and develop the teachers' professional development systems based on their own resources and needs. For instance, they can evaluate teacher teaching competencies before starting the program, address their competencies and characteristics, explore their needs, and provide personalized support and training services.

Conducting teaching research or policy advice. Colleges and universities can use the competency standards framework to conduct research to improve policies

regarding teaching and consultation for adapting to the digital transformation in higher education.

Developing digital resources for teacher education. Colleges and universities can establish a curriculum resource system for the development of college teachers' education. Resources can include, but not limited to, high-quality resource courses, video open courses, and open educational resources to support college teachers' self-regulated study and online training. At the same time, colleges and universities can further expand curricular resources at the university level to encourage teachers to participate in their online community for training.

Individual Level. Individual teachers, trainers, administrators, and researchers, as the direct beneficiaries of the standards framework of teaching competencies in higher education, can help improve teaching practices from different roles.

Teachers in higher education. Teachers in higher education can utilize the standards framework as a starting point for thinking about their students, teaching context, and cultural backgrounds. Their thoughts on instructional design and teaching activities assist teachers in developing their own teaching professional ability, improving teaching performance, and growing into reflective and professional teaching practitioners.

Teaching and training providers. With the goal of improving the performance of teaching and training, the training and professional development units can provide targeted teachers with professional development solutions for teachers' practical teaching problems. Teaching and training providers can use the standards to develop teachers' professional development projects.

Administrator/human resources. Administrators and human resources can use the standard of teaching competencies to put together basic job requirements when hiring teachers in higher education, which aids in the selection and hiring process.

Education researchers. Education researchers can create assessment tools to help teachers improve their teaching skills in accordance with the requirements. They can undertake both quantitative and/or qualitative analyses to guide the development and construction of education-related curricula.

3.2 Evaluation Instruments

Evaluation is an essential part in the application of the standards framework of teaching competencies in higher education. This section introduces the relevant evaluation methods and tools including the behavior observation scale, digital teaching competency questionnaires, single-item knowledge skills assessment, and teaching competency self-assessment scales.

3.2.1 *Behavior Observation Scale*

According to the standards framework of teaching competencies in higher education, the “University Teachers’ Teaching Behavior Observation Scale” was compiled from two first-level dimensions: “teaching necessary knowledge and skills” and “teaching core practical ability.” The scale was mainly designed from eight indicators: effective communication ability, professional content knowledge and skills, teaching method and strategy, curriculum design ability, teaching management ability, teaching evaluation and reflection, information teaching ability, and teaching research ability. It rated teachers’ teaching practices and classified them into three levels of excellent, good, and average (see Table 3.8).

3.2.2 *Digital Teaching Competency Questionnaires*

Ge et al. (2018) created a competency measurement questionnaire for technology integration into the teaching process that used four competency dimensions: awareness, literacy, strategy, and research. Indicators of *awareness* include teachers’ perceptions and readiness to incorporate ICT into curriculum design, as well as their understanding of related policies and standards. *Literacy* refers to the extension of teaching technology tools such as simple subject technology, resource development, and network teaching platform to the application of various lightweight intelligent terminals to achieve ubiquitous lifelong learning of “every time, everything, everyone, and everywhere.” Literacy is embedded into the learning, workplace, and daily environments. Teachers are becoming role models for digital work and learning. *Strategy* refers to the integration and application ability of technology and course teaching to form the integration and application ability of technology and course teaching focusing on problem-solving. *Research* refers to teachers’ ability to conduct refined research and analysis on the entire process of the analysis, design, development, implementation, and evaluation of the integration of information technology into curriculum teaching. This area also includes testing the effectiveness of teachers’ teaching practical knowledge development, and scientifically and effectively innovating a variety of teaching modes, methods, and strategies. The questionnaire employs Likert’s five-point scale format with 1 being extremely poor and 5 being extremely good. Teachers can self-score the items in the questionnaire. A total score of the four dimensions reveals teachers’ competencies of technology integration into teaching, as shown in Table 3.9.

Table 3.8 Teachers' knowledge, skill, and teaching practices scale in higher education

Observation dimension	Items	Point	Level
Communication	<ul style="list-style-type: none"> • Effectively communicate through written expression based on learners' characteristics, context, and culture • Active and effective listening in different contexts • Use the Internet and other appropriate information and communication technologies to communicate 	15	A. Excellent (12–15) B. Good (9–11) C. Average (below 9)
Knowledge and skills	<ul style="list-style-type: none"> • Possess knowledge of the teaching subject, communicate and maintain a network with subject-related organizations, and participate in professional development activities • Connect teaching with institutional goals, and maintain a constructive attitude toward educational reform • Create a teaching and research portfolio, and keep subject knowledge up to date 	15	A. Excellent (12–15) B. Good (9–11) C. Average (below 9)

(continued)

Table 3.8 (continued)

Observation dimension	Items	Point	Level
Strategy	<ul style="list-style-type: none"> • Prepare and design teaching lessons, diagnose students’ learning problems and challenges, concentrate on the essential knowledge, and prepare teaching materials and relevant educational technologies • Motivate students in learning activities, maintain students’ learning focus, set realistic learning milestones, and provide opportunities for students to participate in learning activities • Demonstrate knowledge effectively, choose the appropriate content presentation format, use a range of approaches to illustrate concepts and situations, and invite students to join the lecture discussion • Use effective questioning approaches to direct students in their learning, ask clear and relevant questions, guide and connect learning activities using various types of questions, and dynamically monitor and adapt teaching • Consolidate knowledge and skills, connect knowledge with learning activities, encourage the refinement of knowledge, and provide opportunities to integrate information and practice teaching skills • Promote the transfer of knowledge and skills, demonstrate the application of knowledge and skills in real situations, provide practice opportunities in real situations, explore with students the situations that may or may not hinder the transfer of knowledge and skills, and plan for students’ future 	20	A. Excellent (17–20) B. Good (12–16) C. Average (below 16)

(continued)

Table 3.8 (continued)

Observation dimension	Items	Point	Level
Curriculum design	<ul style="list-style-type: none"> • Know about related curriculum design and methodologies, identify students and teaching environment characteristics, analyze teaching goals and tasks, develop reasonable content presentation forms, select appropriate teaching media, and perform successful teaching assessment • Practice instructional design, and choose the proper teaching methodology, strategy, and presenting a structure of the learning content • Design personalized teaching content, teachers' manuals, evaluation tools and supporting materials, and use information technology to design appropriate teaching activities and resources 	10	A. Excellent (9–10) B. Good (7–8) C. Average (below 6)
Management	<ul style="list-style-type: none"> • Manage the teaching environment, ensure the availability of resources for students, resolve issues that might affect learning effectiveness, formulate learning rules and regulations, set achievable learning expectations, allocate and regulate teaching progress, use appropriate methods to manage teaching behaviors, and deal with teaching issues fairly and promptly • Use information technology to manage the teaching process, support teaching management, search for and share of information • Use information technology to preserve and reuse educational resources, and protect the students' privacy and data safety 	10	A. Excellent (9–10) B. Good (7–8) C. Average (below 6)

(continued)

Table 3.8 (continued)

Observation dimension	Items	Point	Level
Reflection	<ul style="list-style-type: none"> • Assess the learning effectiveness, use standards to monitor individual and group learning, and evaluate students' attitudes, emotions, reactions, and learning performance • Provide students clear and detailed feedback on their learning and utilize various strategies to allow students to communicate and demonstrate what they have learned • Use appropriate information technology to assess the teaching process, which includes assessing teaching materials, teaching methodology, teaching effectiveness, and the impact of the environment on teaching • Reflect on teaching, provide prompt feedback for teaching and learning effectiveness, teaching toward outcomes, and consider ways to improve and optimize course quality 	10	A. Excellent (9–10) B. Good (7–8) C. Average (below 6)

(continued)

Table 3.8 (continued)

Observation dimension	Items	Point	Level
ICT	<ul style="list-style-type: none"> • Understand the policy on the application of technology in education, align the priorities of technology and education development policies, and clarify the value and purpose of the integration of technology and teaching • Understand the role of technology in curriculum objectives and teaching assessment, apply information technology applications, and choose and employ effective teaching integration strategies • Apply digital media tools to teach processes, manage and organize teaching equipment, course activities, and digital resources, and conduct professional practices 	10	A. Excellent (9–10) B. Good (7–8) C. Average (below 6)
Research	<ul style="list-style-type: none"> • Apply knowledge of curriculum system construction and subject professional development to culture talented students, and provide support for effective professional content and methods for teaching • From the perspectives of different disciplines, use learning situations and course teaching contexts to conduct evidence-based teaching research • Use new analytics to improve teaching, integrate and apply advanced technologies to educate and manage, design and intervene curriculum design based upon learning analysis, and encourage teachers' professional development 	10	A. Excellent (9–10) B. Good (7–8) C. Average (below 6)

3.2.3 Single-Item Knowledge Skills Assessment

The single-item knowledge assessment is to evaluate the first two dimensions of the standards framework of teaching competencies in higher education. This evaluation instrument is usually organized around teacher qualifications by national or local

Table 3.9 Digital teaching competency questionnaire

Dimension	Item
Awareness	(1) Willing to use ICT to improve my teaching (2) Appropriate teaching method can improve efficiency and quality (3) Course has a great effect on students' development
Literacy	(1) Using the internet to retrieve and query teaching resources (2) Using office software (3) Using classroom multimedia digital equipment (4) Choosing an appropriate technology to present different content (5) Using knowledge management tools such as Mindjet Mindmanager
Strategy	(1) Using web-based learning platform course and learning unit construction (2) Designing and developing courseware resources suitable for a variety of digital terminals (3) Uploading teaching resources such as micro-video and text to the platform (4) Adding a discussion, investigation area, and other teaching activities to the platform (5) Designing the blended teaching for the course (6) Using appropriate technology to provide personalized guidance for different levels of students (7) Providing feedback to students in time (8) Using a variety of online assignments and testing to evaluate course effects (9) Implementing multiple evaluations on project cooperation tasks (10) Organizing teaching activities through a mobile APP (11) Application of cooperative learning or project-based teaching (12) Using blended teaching, flipped classroom, and other teaching methods (13) Proficiency in implementing an online course (14) Using social media to organize learning interactions
Research	(1) Using data to analyze students' knowledge and skills (2) Using electronic evaluation to analyze learning behavior and effect (3) Using reflection to improve personal ICT teaching (4) Communicating with instructors on teaching problems (5) Using various techniques and methods to enrich professional development

educational government agencies. It generally has two parts: (1) pre-service theoretical knowledge training and professional knowledge and skills, including four sub-competencies; and (2) professional beliefs and professionalism, teaching ethics and legal knowledge, effective communication and expression, and knowledge of teaching pedagogies and strategies.

Here is an example of the teaching qualification examination for college teachers in S province in China. The teaching qualification examination for college teachers is organized by the provincial education departments that deliver the “Provincial College Teacher Qualification Examination Measures” and “Provincial Teacher Qualification Examination.” The examination content mainly involves the four courses: Educational Policies and Regulations, Teachers’ Professional Ethics, Education in Higher Education, and Educational Psychology. Exam questions include single choice, multiple choice, terminology, short answer, and essay questions. The exam uses a hundred-point system. Experts first reviewed examination, then tested

for the difficulty and distinction levels, and finally delivered the examination to students. In addition to the four examined courses, the examinees are also required to take training and test their Mandarin language proficiency levels guided by the latest revision of the Chinese Ministry of Education's Putonghua Proficiency Test Management Regulations. The language proficiency level test is usually conducted in two formats: a test on the system machine evaluation and onsite evaluation by Putonghua testers.

3.2.4 *Teaching Competency Self-Assessment Scales*

Some higher education institutions have developed teaching competency self-assessment scales.

Teaching competency scale. Swank et al. (2021), from the University of Florida, developed the Teaching Competency Scale (TCS) from the teachers' perspective. This study identified four factors through an exploratory factor analysis with 288 individuals and encompassed 67 items within four domains (knowledge, skills, behaviors, and dispositions). It first examined instruction and evaluation with 18 items, focusing on teachers' competencies of course instruction and evaluation. It studied knowledge, ethics, and preparation with 15 items, focusing on teachers' knowledge about theories, accreditation and best practices, ethical and research considerations, and preparation for course instruction. Teacher dispositions included nine items, focusing on teachers' personal characteristics. Finally, behaviors and technology were examined with six items, focusing on "professional and ethical behavior and the use of technology" (Swank et al., 2021, p. 489).

The TCS uses a five-point Likert scale to measure overall and subscale scores for each domain/area, ranging from none/not competent to Strong/Very competent. As a subjective psychological measurement tool that evaluates teachers as teaching professionals, TCS gives a new evaluation notion or approach to teachers' teaching performance (Swank et al., 2021).

Evaluation of teaching performance questionnaire. Moreno-Murcia (2015) from the University of Miguel Hernandez de Elche in Spain developed the Evaluation of Teaching Performance questionnaire (CEID) from the subjective perspective of students' evaluation on teaching performance. It assessed and evaluated teacher teaching competencies dynamically. By performing exploratory and confirmatory factor analyses, the data confirmed a suitable psychometric structure for the CEID scale, which comprises of three dimensions: planning, development, and result. CEID includes 28 items grouped into three factors: (1) planning, which consists of four items such as "He/she provides information about objectives, bibliography, tutorials, content and assessment methods in the subject's curriculum" (p. 57); (2) development, which consists of 17 items such as "he/she promotes teamwork" (p. 57); and (3) result, which includes seven items such as "he/she applies the assessment criteria of the activities as established in the subject's curriculum" (p. 58).

The CEID questionnaire uses a five-point Likert scale, with a scoring range from 1 (completely disagree) to 5 (completely agree). As an effective and reliable teaching evaluation tool for students, CEID can be adopted by universities' teaching centers to assess and evaluate teachers' teaching performance.

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Chapter 4

Teaching Competency Development



Qian Zhou, Mei Li, Yu Yan, Mingxuan Chen, Jing Wang, Kaiyu Yi, Xibin Han, Sirui Wang, and Shuyan Wang

Higher education's overall educational quality depends on effective teaching competencies. Teaching competencies are more than just knowledge and skills; they involve capabilities to meet complex demands by drawing on and mobilizing psychological resources in a particular context (Nessipbayeva 2012). Therefore, systematic planning and actions are required to develop teachers' teaching competencies.

This chapter first proposes a framework of teaching competency development in higher education (Sect. 4.1) and then discusses how to develop teaching competencies at an international level (Sect. 4.2), governmental level (Sect. 4.3), societal level (Sect. 4.4), institutional level (Sect. 4.5), and individual level (Sect. 4.6).

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4.1 Framework of Teaching Competency Development

Teaching competency development in higher education is a complex systematic project that not only involves the overall development of higher education and teacher development policies in the countries, but also includes expectations of and investment on teaching development, commitment to teachers, and teachers’ intrinsic motivation. The framework of teaching competency development includes action goals, action subjects, action object, action content, action method, and action evaluation (see Fig. 4.1).

Action Goals. The demand for developing teaching competencies includes teachers’ desire, higher education institutions’ needs for innovative teaching, and society’s expectations for the quality of higher education. Therefore, the development should consider three action goals: (1) providing quality education and cultivating talents based on society’s needs, (2) developing quality courses and implementing teaching plans to enhance teaching competencies, and (3) the self-development of teachers in universities.

Action Subject. The subject in developing teaching competencies include international organizations, government education authorities, higher education institutions, social organizations, and individual teachers. International organizations are primarily responsible for initiating measures to develop teaching competencies in higher education and launching international cooperation projects. The government is responsible for developing standards and norms, creating policies and processes, allocating finances, and conducting quality assessments. Colleges and universities

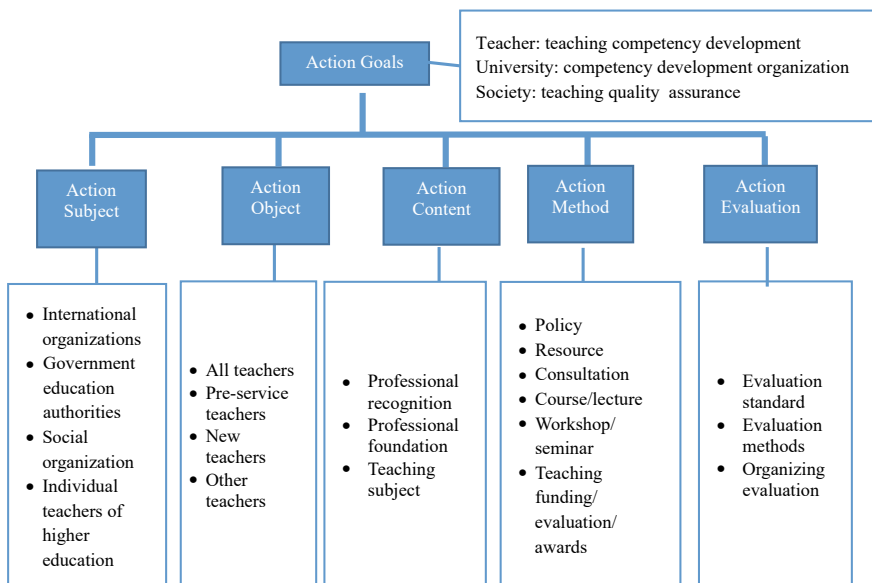


Fig. 4.1 Framework of teaching competency development

implement development actions including establishing organizations, formulating rules and regulations, managing funds and human resources, and developing competency improvement projects. Social organizations such as foundations, societies, and private institutions mainly provide support in terms of funds, organizational implementation, resources, and platform construction.

Action Object. Teachers are not the only goals and main body of the action of improving teaching competencies but also the object. Teachers at different stages have different status quo and development characteristics, and the content, methods, and evaluation of their teaching competency development are different. Although studies do not always agree on how to divide its stages, teaching competency development in higher education is commonly classified into pre-service and in-service stages. Newly hired teachers are objects during the in-service stage. The actions to develop teaching competencies in the pre-service stage mainly involve courses, internships, and seminars for pre-service teachers who are still at universities.

Action Content. The content construction of teaching competency development was guided by the standards framework and teaching competency standards at the national, regional, and university levels provided in Chap. 3. The content includes professional value recognition, the required teaching knowledge and skills, and the core competencies of teaching practice. The development process consists of three stages: application, deepening, and innovation. The application stage mainly aims at pre-service teacher training and new entry-stage teachers by developing teachers' essential teaching competencies. The deepening stage primarily concentrates on teachers' post-service professional growth process, improving the teaching ability development of in-service teachers, providing them with necessary knowledge and skills, and promoting the gradual formation of teachers' professional abilities suitable for professional development. Finally, the innovation stage is oriented toward the target needs of teachers' excellent teaching and provides teaching paths and methods for teachers to innovate teaching practice and cultivate future learners.

Action Method. To ensure the effect of enhancing the teaching competencies of teachers in higher education, educational institutions, and higher education authorities need to issue relevant policies and measures to support the activities of teaching competency development. They must also establish standards and norms to guide the progress of teaching competency development and evaluate the effectiveness.

Teaching competency development in higher education includes the domain knowledge and skills and applying and reflecting relevant knowledge and skills in teaching practice. With the differences among action subject and the development stages, various formats for teaching competency development are used such as consultation and guidance, course lectures, workshops, seminars, support services (resources, technology), teaching awards, teaching evaluation, and teaching funding. Panels to discuss specific topics in a field are options. Workshops to introduce teaching methods and educational technology training to teachers can be used, especially for new teachers and teaching assistants.

Universities should consider the technological tools and resources required in training and applications in teaching practice to promote teaching competency development in higher education. In the digital environment, stakeholders should also consider building training websites to provide digital resources, training lectures, pedagogical books and literature, educational technology software, and training courses.

Action Evaluation. Teaching competency improvement includes evaluating the quality of action. The quality evaluation includes developing evaluation standards, determining evaluation methods, and organizing evaluation. External, internal, peer, and self-evaluation are classifications of evaluation methods into. Please refer to Part III of this handbook for evaluation criteria, methods, and tools.

External Evaluation. External evaluation is to evaluate the effectiveness of the teaching competency development program by institutions outside the main body of action. Generally, external evaluation assesses the improvement actions implemented by the main body such as international organizations, social organizations, and universities. Certification, award, qualifying examinations, and project closing are some of the most used formats for evaluation. A third-party evaluation agency or an educational authority conducts the assessment.

Internal Evaluation. Internal evaluation aims to improve action whose implementation subject is organizational type. The implementation subject and the evaluation subject are both from the same organization. For example, colleges and universities organize training programs to improve teaching competencies and evaluate teachers after the program. Evaluation can use measuring scales and feedback from experts.

Peer Review. Peer review is highly versatile for various improvement actions, especially teaching and research. Usually, teachers from the same subject or field observe each other's education and provide feedback.

Self-evaluation. Self-reflection and evaluation are necessary for teaching competency development. Self-evaluation is informal and uses informal structures such as scales, tests, and questionnaires.

The Kirkpatrick Model includes four levels of evaluation of reaction, learning, behavior, and result. The four evaluation levels evaluate the implementation difficulties from easy to complex and low to high cost. The most commonly used level is the reaction evaluation, and the most practical level is the result evaluation. The importance of teaching competency development determines whether to evaluate and which evaluation levels.



Advanced Reading 4-1-1

Kirkpatrick Model

Kirkpatrick Model was first proposed by Professor Donald L. Kirkpatrick at Wisconsin University in 1959. It is the most widely used training evaluation tool globally today. It mainly includes four levels of evaluation:

Level 1—Reaction, which evaluates the satisfaction of the trainee. It mainly includes the response to the design of learning content, response to the learning content and quality, answer to the organization of learning activities, and whether the knowledge and skills learned can be used in future work.

Level 2—Learning, which measures the learning acquisition process of the trainee. This level involves whether teachers have improved or changed their knowledge, skills, and attitudes at the end of their learning.

Level 3—Behavior, which examines the degree of knowledge application of the trainee. This level involves whether teachers have improved their behaviors at the end of the learning.

Level 4—Result, which calculates the economic benefits created by training. It helps understand the effect of changes in educational organizations and systems brought about by learning from the enormous scope of the teacher's department, university, region, country, and more.

(<https://www.kirkpatrickpartners.com/the-kirkpatrick-model/>)

4.2 Teaching Competency Development at International Level

International organizations have taken many actions to develop teaching competencies in the global higher education. Some nations' education authorities and social institutions have established several international cooperation programs to develop teaching competencies. Regarding how to carry out international cooperation in enhancing the teaching competencies in higher education, this handbook suggests the actions from the following dimensions (see Table 4.1).

Table 4.1 Dimensions of international cooperation actions to develop teaching competencies

- | |
|---|
| 1. Propose actions and suggestions for developing teaching competencies |
| 2. Establish specialized international organizations to enhance teaching competencies |
| 3. Guide the formulation of policies and standards for the development of teaching competencies in specific regions |
| 4. Develop digital teaching resources and platforms to improve teaching competencies |
| (1) Develop digital teaching resources to enhance teaching competencies |
| (2) Build a digital platform for teaching competency development and communication |
| 5. Conduct international cooperation projects to develop teaching competencies |
| (1) Conduct training programs |
| (2) Exchange information through conferences and projects |
| 6. Provide financial support for teaching competency development |

4.2.1 *Teaching Competency Development in UNESCO*

UNESCO has proposed a variety of teacher development suggestions and plans, established specific organizations, and guided and participated in establishing regional teacher professional development policies.

Teacher Development Initiatives and Advice. Both ILO/UNESCO Recommendation concerning the Status of Teachers (1966) and UNESCO Recommendation concerning the Status of Higher-Education Teaching Personnel (1997) emphasized the importance of teaching competency development. They included specific recommendations for teaching competency development (International Labor Organization, 2008). First, the improvement of education depends largely on the qualifications and competencies of all teachers and individual teachers' pedagogical and technical abilities. Second, teaching is a profession and a form of public service that requires teachers to acquire and maintain professional knowledge and skills through rigorous and continuous learning. Third, when considering the educational policy and purpose, allowing collaborative, systematic, and constant research and effort in teachers' preparation and in-service training is essential such as developing joint projects and exchanging research results at the international level. Fourth, teachers' professional practice should provide students with sufficient grants or financial assistance for their studies, and the competent authorities should establish a possible teacher training institution system. Fifth, students and others interested in teaching should always access information on teacher preparation opportunities, grants, or financial aid.

Governments and teachers should recognize the value of in-service education and ensure that the quality and content of education and teaching techniques are systematically improved. Teacher training goals should develop each student's general education and unique culture, lead toward teaching and educating others, be to understand the fundamental principles of good interpersonal interactions, and ensure a sense of responsibility to contribute to the social, cultural, and economic growth through teaching practice. Teacher training programs should include: (a) general research;

(b) research on educational philosophy, psychology, sociology, educational theory and history, comparative education, experimental pedagogy, school management, and pedagogies for various subjects; (c) research related to the subject teaching area; and (d) the teaching practice and extracurricular activities under the supervision of competent teachers. In-service continuous education should consider different aspects that can lead to success. First, governments must collaborate with teachers to develop a free comprehensive in-service education system for all teachers. The system provides a variety of arrangements and allows the participation of teacher training institutions, scientific and cultural institutions, and teachers' organizations. Second, the need to structure a curriculum that enables teachers to enhance their qualifications allows growth. Teachers can change or expand their working scope to advance in their careers and stay current on the latest innovations in their topic and field of education in terms of content and approach. Supplying books and other materials to teachers can help in professional development. Teachers should also have opportunities and incentives to participate in courses and use facilities.

Further, schools should make efforts to ensure that teachers have opportunities to apply research findings to the subject and teaching methods. Encouraging and supporting teachers, as a group or as individuals, to receive education both in and abroad to facilitate professional growth. Finally, developing and complementing financial and technical cooperation on an international or regional basis could expand professional opportunities.

Teacher Development Organization. UNESCO has formed several organizations to help teachers enhance teaching competencies. UNESCO established the Teacher Education Center (UNESCO TEC) in Shanghai in 2015. UNESCO TEC strives to encourage the development of teacher education worldwide, focusing on developing countries such as Asia–Pacific and Africa to improve teacher quality and education quality. With the support of UNESCO, TEC is devoted to becoming a global service provider, standard setter, and research and resource management center in the field of teacher education. TEC would have four essential functions of knowledge production, capacity building, technical service, and information sharing.

Teacher Development Policy and Standards. The UNESCO Regional Directorate for Education for Latin America and the Caribbean (OREALC/UNESCO Santiago) implements the Regional Strategy for Teacher Policy. It aims to facilitate the development of professional policies for teachers in Latin American and Caribbean countries through generating and disseminating expertise. The Centre for Research supports this strategy in Educational Policy and Practice (CEPE) of the Catholic University of Chile (UNESCO, 2015). The UNESCO Joint Committee recommends that the ILO Governing Body and the UNESCO Executive Board encourage member states to make ICT competencies a core component of the teaching profession and at all teachers' levels. It suggests integrating ICT into all aspects of professional activities such as teaching, research, planning activities, administration, relationships with students, colleagues, parents, and other partners, and school management. Member States should also include ICT pedagogies into their pre-service and in-service teacher education programs. The Joint Committee recommends that the ILO Governing Body and the Executive Board of UNESCO

encourage ILO, UNESCO, Member States, higher education institutions, and other relevant organizations to organize events and joint regional workshops, seminars, and symposia. They will follow the 2008 Convention to reach a consensus, share experiences, and provide advice. Maintaining higher education teaching specialization, from onboarding to lifelong professional development, requires higher education teaching staff to develop new teaching skills that emphasize improving instruction for junior higher education teaching staff. It advises the Member States to promote a culture of quality teaching in higher education by developing teaching skills for higher education teaching staff and college students to prepare for careers in higher education through courses, workshops, and teaching/learning centers. Establishing platforms that deliver the best teaching practices also promote quality teaching. Co-teaching opportunities can lead to better results, especially among junior and senior higher education teaching staff. Implementing mechanisms to retain outstanding teachers in the classroom is part of this move to sustain quality teaching.

In terms of standard-setting, UNESCO published three versions of the “Teacher’s ICT Competency Framework” in 2008, 2011, and 2016. The focus is always on using emerging technologies to cultivate teachers’ ICT capabilities. Teachers’ information technology competency framework must evolve dynamically to adapt to the changing technological environment and teaching ecology.

International Cooperation Projects to Promote Teaching Competencies.

Supported by the Global Partnership for Education, UNESCO and Education International jointly implemented the program “Improving Teacher Support and Participation in Local Education Groups.” It includes the “Strengthening Teacher Education, Bridging the Education Quality Gap in Africa” project funded by China Trust, “Capacity Building of Teacher Trainers and Curriculum Support Teachers” project funded by the United Arab Emirates, as well for “Outstanding Academic Performance” project supported by the Hamdan bin Rashid Al Maktoum Award (UNESCO, 2018).

4.2.2 Teaching Competency Development in Other International Organizations

In addition to UNESCO, other international organizations, government education authorities, social organizations, and higher education institutions also develop teaching competency development in higher education through various cooperation projects.



Case Study 4-2-2-1

Higher Education Institutions Institutional Cooperation Instrument (HEI-ICI)

The Finnish National Board of Education released the *Higher Education Institutions Cooperation Instrument* to support the cooperation between Finnish universities and universities in developing countries. The agency promotes the improvement and development of higher education for both parties. It also provides opportunities for Finnish universities to participate in the strengthening of higher education in developing countries. The Ministry of Foreign Affairs of Finland from the Finnish Development Cooperation Fund funds the program, and the Ministry of Education and Culture manages it. Between 2017 and 2020, Finnish universities and institutions in partner countries worked together to develop and reformed nearly 30 degree-related programs and more than 50 individual courses in different fields of study. It enhanced teacher teaching methods and abilities and focused on learner-centered innovative approaches. The HEI-ICI plans to use distance learning platforms to enhance teacher teaching competencies in online teaching between 2020 and 2024 (<https://www.oph.fi/en/programmes/hei-ici-programme>).

4.3 Teaching Competency Development at Governmental Level

Teaching competencies in higher education significantly affect the quality of classroom learning. Consequently, many countries and regions' education authorities have produced a series of policy statements, requirements, and suggestions to improve teaching competencies in higher education. At the same time, many national and regional education authorities have also developed various and specific plans and programs for teaching competency development. This handbook suggests that government education authorities can implement actions from the following dimensions (see Table 4.2).

4.3.1 Teaching Competency Development Laws and Policies

Regarding laws and policies, the development of teaching competencies shows a trend from voluntary to obligation. For instance, most EU countries require teachers

Table 4.2 Dimensions of government's efforts in improving teaching competencies

1. Formulate laws and policy systems
(1) Formulate laws to support and guarantee the improvement of teacher teaching competencies
(2) Introduce policies and systems to improve teacher teaching competencies
(3) Introduce policies and systems to promote the establishment of teacher development centers in higher education institutions
(4) Introduce a policy guarantee system for social institutions to improve the teaching competencies of college teachers
2. Issue competency standards and norms
(1) The introduction of college teacher teaching ability standards
(2) Promulgating college teacher teaching ability training standards
3. Establish an organization to improve teacher teaching competencies
(1) Establish a teacher development center
(2) Set up a teaching development base for teachers
4. Launch competency improvement projects and plans
(1) Comprehensive projects
(2) Teacher training programs
(3) Competition and honorary projects
5. Build digital teaching resources and platforms to improve teacher teaching competencies
(1) The construction of open educational resources to improve teacher teaching competencies
(2) The construction of an information exchange platform to improve teacher teaching competencies
6. Conduct the evaluation and qualification certification system of teaching and teaching competencies of college teachers

to complete professional development activities and assess the number of hours needed. Promotion, pay raises, and awards in countries that do not require professional development hours help recognize teacher efforts. In Latin America, teachers voluntarily participate in the activities such as networking, innovation, or expeditions. In China, novice teachers must receive orientation training arranged selectively based on the teachers' current progress. The following sections discuss related laws and policies of teaching competency development in different countries.

China. The Chinese government has long emphasized developing teaching competencies in higher education. Over time, the government has issued several policies to advance teaching staff and enhance teaching competencies. The Outline of the National Medium and Long-term Education Reform and Development Plan (2010–2020 http://www.gov.cn/jrzq/2010-07/29/content_1667143.htm) proposed to develop teaching competencies through training, academic exchanges, project funding, and more. It also encouraged the collaboration among college teachers, interdisciplinary and across-unit, to form high-quality teaching and research groups. The *Key Points of the Ministry of Education's Work in 2011* first proposed to strengthen the “construction of teacher development centers (http://www.moe.gov.cn/jyb_sjzl/moe_164/201102/t20110210_114836.html).” In 2016, the Ministry of Education published *Suggestions on Promoting the Reform of the Assessment and Evaluation System for College Teachers* that emphasized the following teacher development

requirements: (a) implementing a training system for all staff every five years, (b) strengthening teachers' basic teaching skills and information technology application training, and (c) encouraging young teachers to take part-time training in enterprises and institutions by visiting high-ranked universities and research institutes in and abroad, and taking on-the-job training (http://www.moe.gov.cn/srcsite/A10/s7151/201609/t20160920_281586.html).

In 2018, the Ministry of Education issued Suggestions on Accelerating the Construction of High-level Undergraduate Education and Talent Training, which emphasized increasing teachers' competencies to teach and educate people. It also proposed to strengthen the establishment of teaching development centers for teachers in colleges and universities, conducting comprehensive teaching competency development training, and implementing the national training programs for newly recruited teachers in the central and western regions and the visiting scholar program for young backbone teachers.

(http://www.moe.gov.cn/srcsite/A08/s7056/201810/t20181017_351,887.html).

In 2020, six departments including the Ministry of Education issued the Guidance on Strengthening the Reform of College Teacher Development in the New Era. The third point is to build a development platform for college teachers and improve teachers' professional quality and ability, which stated that colleges and universities should: Improve the teacher development system, enhance the teacher development training system, as well as the security, incentive, and supervision systems, and create an environment that is beneficial to teachers' long-term development.

- Actively respond to the challenges of new technology in terms of personnel training and improve teachers' competence in using information technology to enhance teaching.
- Encourage and support college teachers to conduct domestic and foreign study tours and participate in international exchanges and cooperation.
- Continue to implement the demonstration training project for young teachers in colleges and universities and the construction project of a teaching innovation team for higher vocational teachers.
- explore the management of teacher training credits and incorporate training credits into the content of teacher assessment.

(Chinese Ministry of Education: http://www.gov.cn/zhengce/zhengceku/2021-01/27/content_5583070.htm, paragraph 8)."



Case Study 4-3-1-1

Policies related to the development of the teaching competencies of college teachers in Shanghai

Shanghai has issued a series of plans to develop teaching competencies in higher education and stipulated the training methods and duration, especially for young and middle-aged teachers. The government created an Overseas Study Program, which stated that outstanding young and middle-aged teachers with teaching, scientific research, and management background would have the chance to visit and study in high-level foreign universities and scientific research institutions every year (http://edu.sh.gov.cn/xxgk2_zdggz_jsgz_02/20201015/v2-0015-gw_406112012002.html). The Overseas Study Program benefits three types of scholars: senior research scholars, general visiting scholars, and core courses. Senior research scholars and visiting scholars generally have one year (or not less than nine months) for their study. At the same time, the enrollment in core courses is not less than one semester according to the requirements of the receiving school.

The Domestic Visiting Scholars Program for Young Backbone Teachers in Shanghai Universities plans to have 300 people as visiting scholars to visit and study in high-level colleges and universities nationally every year (http://edu.sh.gov.cn/xxgk2_zdggz_jsgz_02/20201015/v2-0015-gw_406112012001.html). The visiting scholars and their advisors jointly discuss and develop a study plan. Participants will join the scientific research and course teaching activities with the tutor's guidance according to their study requirements and purposes. The duration of visiting study is generally one academic year.

The changes and focus of the relevant policy on teaching competency development in higher education in China have the following characteristics:

- The Chinese government has long placed a high value on pre-service training for newly hired teachers, viewing it as a crucial component of teaching competency development.
- The government places a high value on young and middle-aged teachers' professional development and provides various forms of support.
- The government establishes related training programs for teachers at various stages, focusing on the long-term sustainability of teaching competency development.
- The government prioritizes the influence of information technology development on teaching competency development, provides comprehensive educational technology training for college teachers, and improves teachers' competencies and proficiency with current educational technology.

United States. In the United States, the federal government's role in education is limited. The state and local governments set the majority of education policies. The United States government also highly values developing young teacher teaching competencies and has enacted several laws and regulations to encourage this growth. As early as the 1980s, the American higher education field began to pay attention to how university teaching promotes student learning. In 1984, The National Center for Education Research (NCER) published the famous report, *Put into Learning*. It advocated for the efforts of colleges and universities across the country to explore expressive teaching reformation measures that would allow students to make significant progress or changes in abilities, skills, and attitudes and increase their knowledge. The Higher education Law of 1998 emphasized the financial support for young teachers' development of teaching competencies. The Beginner Teacher Induction: The Essential Bridge in 2001 brief noted that we should increase the intensity of induction training for young teachers. Induction into Learning Community in 2005 mentioned that the induction education of young teachers was vital responsibility in a learning society (Xiong & Liu, 2015).

The U.S. government had put forth standards and support for online teaching skills training for college teachers in response to the gradual penetration of information technology in education. Clinton suggested a new requirement to train 100,000 teachers to be ready to teach online in his State of the Union address in February 1997. Obama established a Chief Technology Officer position in the federal government to provide technical assistance to college teachers who taught online (Kitty & Han, 2009).

United Kingdom. The white paper called The Future of Higher Education, issued by the British government in 2003, stated that teaching competencies were crucial in promoting the high-quality development of higher education. The white paper suggested a national organization to develop professional standards for teachers' teaching and requiring colleges and universities to provide teaching competency training, particularly new teachers hired after 2006.

The British government also released the higher education green paper called "Fulfilling Our Potential: Teaching Excellence, Social Mobility and Student Choice", advocating the implementation of the Teaching Excellence Framework (TEF). The three reform goals of the TEF framework were to establish a competitive higher education market, give students more options for institutions, and strengthen the management structure of higher education. In May 2016, the British government formed the higher education white paper called Success as a Knowledge Economy: Teaching, Social Mobility, and Student Choice. The white paper highlighted the TEF framework's three reform goals and emphasized the necessity of applying it in identifying and motivating high-quality university teaching and helping students make better university choices. Then in 2017, the Higher education and Research Act included the TEF framework and the newly established Office of Students under the Ministry of Education in England to conduct the evaluation (Hou, 2018).

4.3.2 *Teaching Competency Standards and Regulations*

Because of the various types of institutions and disciplines in higher education, the teaching competencies that teachers must possess are highly diverse. As a result, national and regional education authorities' relevant standards and norms of teacher teaching competencies usually appeared as standards and regulations.

The U.K. Higher education Research Association officially promulgated the *U.K. Professional Standards Framework for Teaching and Supporting Learning in Higher Education* (UKPSF) in 2011. The standard explicitly identifies three categories used as the outcomes and evaluation of teaching competency development in higher education including the activity field, core knowledge, and professional value (Advance HE, 2019).

In 2017, the European Commission Joint Research Center released the *European Digital Competence Framework for Educators* (DigCompEdu) to guide and enhance teachers' digital teaching competencies to empower learners and develop competitive digital citizens (Zheng et al., 2021).

4.3.3 *Teaching Competency Development Organizations*

National and regional education authorities can promote the development of teaching competencies by establishing national and regional teacher development centers, bases, and other organizations.

In July 2011, the Ministry of Education of China and the Ministry of Finance decided to build 30 demonstration centers for teacher development in higher education to develop teaching competencies. In April 2012, the Ministry of Education of China (2012) promulgated the *Guidelines on Comprehensively Improving the Quality of Higher Education*. It proposed "promoting the establishment of teacher development centers in colleges and universities and focusing on building several national-level teachers teaching development demonstration centers" (p. 27). In 2012, 30 research universities applied for and approved to establish "National Teacher Teaching Development Demonstration Center."

To further strengthen the teaching competency development in Beijing, the Beijing Municipal Education Commission has established municipal college teacher development bases at seven universities in Beijing: Peking University, Tsinghua University, Beijing Normal University, Renmin University of China, Beijing Foreign Studies University, Beijing Jiaotong University, and Beijing University of Aeronautics and Astronautics (http://jw.beijing.gov.cn/jyzx/jyxw/201801/t20180112_650387.html). Since 2011, those bases have admitted nearly 650 young backbone teachers from municipal colleges and universities for one-year training.

4.3.4 Teaching Competency Development Projects

Teaching competency enhancement projects are essential for the education authorities to promote the implementation of policies and standards. The development projects should target teachers' needs and be implemented correctly. The project not only can be specialized for a particular type or stage of sustainable development, but also focus on specific aspects of teaching competencies. Education authorities usually have precise goals, particular functions, refined content, and diversified project evaluation.

Comprehensive Teaching Competency Development Program. The national and regional education authorities can build a complete teacher development project by combing various efforts and programs such as training, practice, competition, exchange, development of a teaching environment, and building teacher development organizations.



Case Study 4-3-4-1

Piloting artificial intelligence (AI) to boost the construction of teacher teams in China

Based on the *Guidelines on Comprehensively Deepening the Reform of Teacher Development in the New Era* proposed by the Central Committee of the Communist Party of China and the State Council, the Ministry of Education launched a pilot project using artificial intelligence to boost the construction of teacher teams. According to the *Guidelines*, the Ministry of Education would promote the integration of new technologies such as artificial intelligence into the building of teacher teams. It will also support teachers in adapting to the changes in new technologies such as informatization and artificial intelligence, which vigorously and effectively support the development of education and teaching.

The pilot was implemented in two batches. Ningxia Hui Autonomous Region (Ningxia) and Beijing Foreign Languages University participated in the first batch. As Ningxia is the country's first *Internet + education* example province (region), the Ministry of Education implemented the first batch of AI-assisted teacher team-building pilot work in primary education there. Specifically, the pilot activities include: (a) the application of intelligent assistants for teachers, which selected a group of qualified schools as the experimental school for artificial intelligence to enhance the development of teachers; (b) future teacher training innovation initiatives, which established teacher education innovation bases in Ningxia University and Ningxia Normal University, and created

labs in collaboration with critical enterprises and high-level universities of artificial intelligence; (c) teachers' intelligent training that involves upgrading the Ningxia teacher network training platform, and the establishment of a teacher development evaluation system; and (d) education literacy improvement that includes selecting a group of outstanding principals with solid information management capabilities and backbone teachers with solid information technology application ability to carry out intelligent education leadership training and teaching competence training respectively. In addition, it also implements AI assistance for teachers in poverty-stricken areas and supports the construction and application of big data for teachers in Ningxia.

At the same time, as speech recognition and natural language processing is essential areas for applying artificial intelligence technology, Beijing Foreign Languages University is conducting a pilot artificial intelligence program to construct their teacher teams. The pilot program at Beijing Foreign Languages University includes: (a) constructing several smart classrooms, (b) operating intelligent education literacy training for college teachers, (c) establishing a competent laboratory for college teacher development, (d) conducting intelligent evaluation and diagnosis of education and teaching, collecting information on teachers' instruction, scientific research, and management, (f) building big data of college teachers, and (g) establishing digital portfolios of teachers (Ministry of Education of China, 2018).

The second batch of the pilot has been implemented at Peking University and other units. The relevant matters are notified as follows:

1. Strengthen top-level design and coordinate the promotion of pilot work. Each pilot unit should actively promote the integration of new technologies such as artificial intelligence, big data, and fifth-generation mobile communication technology (5G) with the construction of teacher teams. This batch of the pilot aims to explore new paths and models for new technology integration to boost the construction of teacher teams. The achievement of the goals requires efforts from colleges and universities and the local government. Colleges and universities should focus on promoting the following four tasks: creating an AI educational environment, improving teachers' technical literacy and application ability, enabling the construction and application of teachers' big data, and serving local education and teaching reform and innovation. Cities, districts, and counties should focus on promoting the following six tasks: promoting teachers' application of AI assistants, innovating teacher training models, conducting teacher AI training, improving teachers' AI education literacy, building, and applying teacher big data, and leading the development of teacher competence in rural schools and underserved schools with AI, and so on (Paragraph 2).
2. Adhere to the problem-orientation and determine the main development direction of the pilot project. Each unit should:

- a. motivate teachers and students to utilize AI-assistants (e.g., platforms, systems, resources, tools), promote the reform of teaching methods and learning methods, reduce the burden on teachers, and empower teachers.
- b. rely on the AI education platform system to explore and promote the “dual-teacher classroom” with human–human collaboration and human–machine collaboration; solve the problem of unbalanced education between regions, schools, and urban and rural areas; and explore new ways to alleviate the shortage of teachers’ supply.
- c. explore the use of platform systems to improve teachers’ homework design and evaluation capabilities and reduce students’ homework burden.
- d. explore the establishment or application of a teacher competence diagnosis and evaluation system, diagnose teachers’ learning and development needs, and carry out specific training.
- e. build and apply teacher big data, collect dynamic data, form teachers’ profile, support teachers’ accurate management, and support evaluation reforms (Paragraph 3).

Teacher Training Program. Education supervising departments can conduct national and regional training programs to develop teaching competencies in higher education.



Case Study 4-3-4-2

Teacher Classroom Project in Brazil

Assessments of developmental programs and ongoing teacher training activities made by educational institutions supported the project. To ensure the consistency of training, academic, professional development, and training providers are responsible for the policy continuity. Professional Development Groups are another strategy involving Education Departments in Brazil. Operational since 2009 in Minas Gerais, there are now 850 projects in existence. They are implemented through meetings held at educational institutions, and the activities completed reflect the practice that positively influence teaching quality. Problems in the development of these projects relate to bureaucracy in program administration. The project is now managed under the Poços de Caldas Regional Superintendency for Teaching to avoid those bureaucratic issues. The Teacher’s Room project serves as an intermediary body, and teaching quality is reviewed using semi-structured interviews as part of a qualitative assessment (UNESCO, 2015)



Case study 4-3-4-3

Higher education teacher training programs in Beijing, China

Beijing Higher Education Teacher Training Center (<https://gaoshi.cnu.edu.cn/>), found in 1992 under the Beijing Municipal Education Commission, is affiliated with Capital Normal University. It is responsible for training, organizing, coordinating, and consulting for college teachers in Beijing. In addition, the center has domestic training programs and overseas training programs. The domestic training programs include pre-job training for college teachers, educational technology (exam) training, domestic visiting scholars training, master tutor training, teacher development base training, young teachers teaching ability training, scientific research ability, teacher ethics training, management leadership training, and foreign language training. The overseas training programs include foreign visiting scholars training, bilingual teaching training, bilingual domestic advanced training, English teaching training, in-depth cooperation with tutors, and so on.

Competition and Honorary Program. Teaching competition and honorary programs are vital to comprehensively cultivating and improving teacher teaching competencies and professional quality. First, teaching competition allows teachers to re-examine their courseware, the logic of knowledge delivery, case selection, and other teaching aspects that tremendously benefit their work. Second, it provides mutual communication and learning among teachers. The teaching competition offers an open platform for teachers to learn through observation. Teachers can learn teaching skills and methods from excellent teaching models. Teachers can also reflect on failed teaching experiences and assess their flaws to avoid repeating the same mistakes.

Education authorities can motivate colleges, universities, and teachers to improve teaching competencies through competitions and honorary program. The demonstration of competition works, and examples provide directions for teaching competency development in higher education.



Case Study 4-3-4-4

Teaching Competition for Young Teachers in Chinese Colleges and Universities

The teaching competition for young teachers in Chinese colleges and universities is hosted by the National Committee of the China Education, Science, Culture, Health and Sports Trade Union—All-China Federation of Trade Unions. The fundamental task of the teaching competition is to cultivate a culture of developing outstanding teachers. It contributes to the development of teachers' character and basic teaching skills and plays a vital role in improving the quality of teachers. Through the teaching competition, young teachers in colleges and universities can keep their educational concepts up-to-date, master modern teaching methods, and strive to develop a teaching group of high-quality and professional teachers with ideas and beliefs, moral sentiments, solid knowledge, and a warm heart, ultimately promoting the modernization of higher education in China. The competition divides the participants into five groups, which are liberal arts, science, engineering, medicine, and ideological and political courses. Young teachers under the age of 40 who are engaged in education and teaching in various institutions of higher learning across the country are eligible to participate

(<https://www.acftu.org/lmgj/rybz/gxqnjsjxjs/?7OkeOa4k=qAqUqaqFDfLFdFLFD9itpGqbOU0lmX4X6UOxujPDBsgqqqqqqqqqqqDG>).

4.3.5 *Teaching Competency Development Resources and Platforms*

Education authorities can lead and promote the development of teaching competencies by building digital teaching resources and informatization learning exchange platforms to improve the teaching competencies in higher education.



Case Study 4-3-5-1

China's Higher Education Virtual Teaching and Research Platform

With 3–5 years of effort, China is planning to develop virtual teaching and research information platform in higher education with several advanced, comprehensive, and well-equipped virtual teaching and research sections. The platform will forge high-level teaching teams, cultivate a group of teaching staff, develop research and practice results, build a teaching development community and quality culture, and comprehensively improve teacher teaching competence.

The specific tasks include:

- (1) Innovating the form of teaching and research. This task encourages the full use of information technology, exploration of teaching and research model that breaks through time and space constraints, development of a combined format of online and offline teaching and research, finding new methods and paradigms for teaching organization construction and management, improving teacher teaching enthusiasm, and ultimately cultivating teacher teaching development.
- (2) Strengthening teaching and research. With the virtual teaching and research platform, teachers are encouraged to explore and strengthen their abilities in conducting research and professional development, implementing curriculum, developing teaching content, applying teaching methods, and conducting teaching evaluation. Teachers should also enhance their awareness of conducting research and promote research results.
- (3) Jointly building high-quality resources. Based on comprehensive research and exchanges, the members of the virtual teaching and research platform collaborate to develop teaching resources such as talent training programs, syllabi, mind maps, teaching videos, electronic courseware, exercises, test questions, teaching cases, experimental projects, practical training projects, and data sets, to contribute to a high-quality shared teaching resource library.
- (4) Providing teacher training. Necessary is to organize and plan teacher training with a regular plan. Led by the demonstration and national teaching teams, experienced teachers, and first-class courses, it helps to promote mature and effective talent training models and curriculum implementation plans and promote the teaching development of front-line teachers.

(http://www.moe.gov.cn/s78/A08/tongzhi/202107/t20210720_545684.html).

4.4 Teaching Competency Development at Societal Level

Social institutions mainly include foundations, societies, associations, private institutions, and other subjects. To develop teaching competencies in higher education, social institutions can consider implementing corresponding actions from the following dimensions (see Table 4.3).

4.4.1 *Non-profit Organization's Initiatives in Improving Teaching Competencies*

Non-profit organizations play an intermediary role in improving teaching competencies. The unified teacher professionalization standards are implemented into teaching competency training practice through various efforts such as ability standard formulation, program design, implementation, and evaluation. The teaching quality assurance system incorporates existing training of universities and other institutions

Development of Teaching Competency Standards. The U.K. Higher Education Research Association officially promulgated the U.K. Professional Standards Framework for Teaching and Supporting Learning in Higher education (UKPSF) in 2011, the first set of teacher teaching competency standards globally. The standards framework outlines three key stages, which are areas of activity (A), core knowledge (K), and professional values (V). It can be used as the goal and outcomes of teaching competency development as well as the content of college teaching evaluation (Advance HE 2019).

Teaching Competency Certification. Quality Matter (QM), an online education quality assurance agency, aims to advance and enhance the quality of online education and student learning globally (<https://www.qualitymatters.org/>). QM members are

Table 4.3 Dimensions of social efforts in developing teaching competencies

1. Develop teaching competency standards
2. Issue teaching competency certification
3. Propose actions to develop teaching competencies
4. Provide various resources to develop teaching competencies
(1) Financial resources
(2) Human resources
5. Implement teaching competency development projects
(1) Training programs
(2) Exchanging conferences
(3) Competition programs
6. Develop digital teaching resources and platforms to develop teaching competencies
(1) Develop digital teaching resources to develop teaching competencies
(2) Build a digital platform for teaching competency development and communication

mainly from universities in the U.S. such as Arizona State University and from other regions such as Fudan University in China. Teachers can participate in a series of workshops organized by QM to enhance online course teaching capabilities and receive Teaching Online Certificates issued by QM upon completion.



Case Study 4-4-1-1

The British Higher Education Academy (HEA) promotes the development of teaching competencies in higher education

The Dearing report issued by the United Kingdom in 1997 proposed establishing a professional teacher association called the Institute for Learning and Teaching in Higher education to develop teaching standards and provide training for college teachers

(<http://www.educationengland.org.uk/documents/dearing1997/dearing1997.html>).

It would require all new teachers to finish training to become association members during their internships. The institute formed in 2000 due to the government's efforts. It was the U.K.'s first national institution dedicated to improving college teacher teaching capacity based on the government's advocacy. In 2003, the Higher education Teaching and Learning Association combined two other institutions to form the Higher education Academy (HEA). After establishing the HEA, the government allocated funds through three funding committees in England, Scotland, and Wales. The government also implemented long-distance supervision of HEA through three methods: personnel dispatch, financial inspection, and management and governance. The government terminated funding in 2017 but allowed HEA to charge fees when providing services to third parties. Therefore, HEA actively developed a business service model and obtained funds for the operation through a comprehensive, diversified, and sophisticated service project for colleges and universities. HEA expanded its business in the U.K. and internationally such as in Asia and Oceania to conduct teacher teaching ability training projects.

HEA is the executor of government policies at the middle level and the provider and quality guarantee of various teaching training programs for teachers in colleges and universities. First, HEA implements national procedures. In 2006, HEA formulated the *U.K. Professional Standards Framework (PSF)* upon the government's requirements. The framework clearly defines the structure of teaching knowledge and competencies of college teachers according to the different stages of teaching ability development and their professional roles in teaching. It also categorizes the specific and detailed standards of teaching ability that each type of teacher should achieve. This standard framework provides a unified and transparent basis for developing

college teacher teaching competencies and effectively promotes the professionalization of college teaching development. The framework is of great significance to improving the quality of teaching practice. Secondly, based on the professional teaching standards, HEA provides rich and high-quality teaching ability training for college teachers and offers personalized and customized services for colleges and universities. Finally, HEA must certify or recognize member universities or other professional organizations that have established teacher teaching ability training mechanisms. This ensures that colleges and universities' teaching ability development projects meet professional teaching standards.

With HEA as an intermediary, the development of British college teacher teaching competencies exhibits traits of independence, cooperation, and restrictions. The government completely supports the autonomy of colleges and professional organizations, and the three work together and share mutual constraints and synergies.

Other Cases to Develop Teaching Competencies. To help African countries improve the quality of teachers and enhance teaching competencies, the Chinese government cooperated with UNESCO in 2012 to fund the establishment of a trust fund called the UNESCO-Chinese Funds-in-Trust Project (CFIT). It is dedicated to developing education in Africa, aiming to enhance teacher education and bridge the education quality gap in Africa (<https://en.unesco.org/events/unesco-china-funds-trust-project-harnessing-technology-quality-teacher-training-africa-phase>).

The Professional and Organizational Development Network in Higher education (POD) network established in the United States in 1974 has members including teachers, teacher development specialists, graduate students, and university administrators (North and Scholl 1979). The organization serves its members by providing resources, publishing articles, organizing conferences, consulting, organizing awards, and more.

The Hamdan bin Rashid Al Maktoum Award for Distinguished Academic Performance in the United Arab Emirates was used to support the effort of teacher training and curriculums to support teaching competency development (<https://globaltalentmentoring.org/about-us/hamdan-foundation/>).

Projects of Teaching Competency Development.



Case Study 4-4-1-2

Association of American Colleges and Universities (AAC&U) Pre-service Teacher Teaching Competency Development Program

Teacher researchers in the United States think that a college teacher's career starts before they begin their teaching position. In 1993, the Association of American Colleges and Universities (AAC&U) and the Council of Graduate Schools (CGS) launched the Preparing Future Faculty Program (PFF) aimed to prepare doctoral students who would become future teachers in higher education. The program provides them pre-service education to help build competency (Zhang & Wu, 2016). The program's strategies for training teachers include:

- (1) Postgraduates take elective courses related to teaching and obtain corresponding credits. For example, Cornell University offers two higher education courses for graduate students: Teaching in Higher education and Teaching as Research in Higher education. The Teaching in Higher education course covers effective teaching and professional development related to the teaching profession in colleges and universities, the context and culture of higher education, teacher roles and responsibilities, teaching styles, teaching methods, and teaching techniques. The Teaching as Research in Higher education course urges students to participate in the teaching and research of their disciplines and improve postgraduates' teaching ability by asking them to design and complete original research projects. In addition, Iowa State University has developed a series of 1-credit seminars and 3-credit elective courses and invited university teachers to share teaching experiences and guide students in teaching practice.
- (2) Teaching certificate programs or teaching certification plans. These programs aim to provide teaching training to graduate students interested in teaching. Upon completion of training, students receive a teaching certificate from the school. For example, Brown University provides a one-year teaching certificate program for graduate and postdoctoral students, covering various content such as curriculum and syllabus design, curriculum and teaching plan implementation, basic primary and evaluation strategies, and effective classroom communication and communication skillset. Harvard University's teaching certification program requires participants to take at least three courses offered by the Bock Teaching Center to perform their teaching practice, critically reflect on

their teaching, and write a teaching portfolio. Its content is based on the following key areas: pedagogy, curriculum and assignment design, professional communication, multicultural classrooms, assessment, and pedagogical reflection.

- (3) Graduate Teaching Assistant Program. The American postgraduate teaching assistant system originated at Harvard University at the end of the nineteenth century. The original intention was to reduce the heavy teaching tasks of teachers. The program has now evolved into one of the essential methods for developing graduate students' teaching abilities. It plays a critical role in assisting graduate students in moving from not knowing how to teach to understanding teaching. Graduate teaching assistants are responsible for helping teachers complete teaching tasks in and out of the classroom including course teaching, occasional speech preparation, organizing discussions, lab guidance, and additional teaching tasks such as grading exercises, quizzes, and exams. Graduate teaching assistants receive specialized teaching training every term. This forward-moving model of college teacher teaching competency development connects the pre-service training of college teachers with the doctoral training system and effectively supports the improvement of college teacher teaching competencies. The project's positive outcome has led to a wave of incorporating graduate students into the teaching development of teachers in American colleges and universities (Wulff & Austin, 2004).



Case Study 4-4-1-3

China's teaching competition project for teachers

China's Higher education Teaching Innovation Competition is a teaching competition hosted by China's Association of Higher Education and supervised by the Higher Education Department of the Ministry of Education. On September 30, 2020, China's Association of Higher education issued the *Notice of First National College Teacher Teaching Innovation Competition* to encourage the development of college teachers. The competition focuses on teaching innovation to cultivate morality and develop new engineering, agriculture, medicine, and liberal arts professionals. It sets off a learning revolution and guides college teachers to devote themselves to teaching and educating people, enhancing teaching quality and responsibilities, encouraging reform in colleges and universities, and comprehensively promoting the quality revolution of higher education.



Case Study 4-4-1-4

China's teaching competition project for pre-service teachers

iTeach Students' Digital Education Innovation Exhibition is hosted by China's Education Information Industry Innovation Platform and the Guangdong Normal University of Technology. The exhibition takes advantage of industry-education synergy in educating people. It encourages more outstanding college students to pay attention to educational development, improve their innovation awareness, cultivate teamwork, and enhance their interest and potential in learning and applying information technology. It enhances college students' overall quality through creative practices. The competition is open to full-time students in colleges and universities for any subject and grade (including junior college, undergraduate, master's, and doctoral students). To reflect innovation-oriented education application and facilitate activity management, the submissions are divided into four categories: digital media technology, courseware, tool system, and educational service application (artificial intelligence education)

Activities of Promoting Teaching Interactions. The interaction among teachers promotes the development of teaching competencies. For example, the China Teacher Education and Teaching Informatization Exchange Activity (referred to as "Teacher Exchange Activity") sponsored by the National Center for Educational Technology (NCET) has gradually grown to be an important activity that has a wide range of influence. It covers all levels of education, targets teachers and professional technicians, and has developed interaction opportunities to promote ICT integration in the classroom and the development of educational resources since 1998. Its goal is to (a) increase teachers' educational technology and network application skills, teachers' information literacy, and software production skills, (b) promote the integration of information technology and subject teaching, and (c) motivate the wide application of information technology in teaching and learning.

4.4.2 *Profit Organization's Initiatives in Improving Teaching Competencies*

Private sectors can participate in developing teaching competencies in higher education by developing resources, tools, and platforms and hosting related training programs.



Case Study 4-4-2-1

Teaching Competency Enhancement Program by a Chinese Private Institution (<http://teacher-edu.cn/>)

Higher Education the Culture (Beijing) Education Technology Research Institute (referred to as “Higher Education National Training”) is a professional training institution approved by the national administrative department and composed of well-known education experts, educational technology experts, and scientific research management experts from Chinese universities. In addition to its core business on the training of Chinese college teachers, it focuses on higher education research and services, and research and promotion of scientific research technology. It has maintained long-term cooperative relations with many domestic colleges and universities, vocational colleges, and other social institutions. Committed to the development of China’s education, its scope of services includes education and teaching in colleges and universities, education consulting, teacher training, teaching methods, and educational technology training, education reform project training, education management training, college students’ employment, entrepreneurship education, education informatization and software development, data management, and so on.

4.5 Teaching Competency Development at Institutional Level

Higher education institutions are the primary units that implement the actions of teaching competency development. Higher education institutions can consider and implement the corresponding actions from the following dimensions (see Table 4.4).

4.5.1 Framework for Developing Teaching Competencies in Colleges

To develop the teaching competencies in higher education, the institutions should provide support from the following aspects: organizational structures, policies, and resources.

Organization Structure. Faculty Development Center or Teaching and Learning Center (referred to as the teaching center in the following texts) is a crucial unit for developing teaching competencies in higher education institutions. According to

Table 4.4 Institutional efforts to develop teaching competencies

1. Setting the institutional goals of developing the teaching competencies
2. Establishing an organizational structure for developing teaching competencies
3. Developing standards for teaching competencies
4. Introducing policies on developing teaching competencies
5. Initiating programs to developing teaching competencies
(1) Training program
(2) Practice and exchange program
(3) Competitions
6. Building digital platforms and resources for developing teaching competencies
(1) Developing digital instructional resources to develop teaching competencies
(2) Building a digital platform for teaching competency development and communication
7. Evaluating the effect of all actions

conservative estimates, at least 21% of high education institutions in the United States had teaching centers in 2011, and this number was nearly three-quarters in research universities (Kuhlenschmidt, 2011). Teaching centers to meet the ever-changing needs of teacher development were established. The centers aim to have a collective impact on teacher development by integrating all institutions' resources. Activities such as faculty training, industry-academic exchanges, teaching and researching, instruction consultation, evaluation management, and career development consultation were included. The teaching center supports instructors' self-improvement by meeting the individual needs. Sorcinelli et al. (2006) pointed out that the key priorities of teaching centers were (a) addressing the needs of assessments in higher education institutions, (b) understanding the needs of diverse student populations, and (c) supporting the use of new technologies in instructions.

In most cases, the teaching center is not an evaluation unit, so it does not administer or be responsible for the teaching evaluation of an institution (Cook & Kaplan, 2011). When improving teaching in an institution, a teaching center serves all instructional audiences (we use "instructors" in the following sections to refer to this group) including new or in-service faculties and lecturers, postdoctoral fellows, graduate instructors or teaching assistants, and undergraduate teaching assistants. Teaching centers collaborate with instructors to improve instruction. Teaching centers staff usually include faculty committees, research scientists, educational technologists, instructional designers, research and assessment specialists, data analysts, and education specialists.



Case 4-5-1-1

The Teaching + Learning Commons at University of California, San Diego (UCSD), United States: organization and staff (<https://commons.ucsd.edu/>)

UCSD's Teaching + Learning Commons is affiliated with Executive Vice Chancellor-Academic Affairs Office. As the core unit to support teaching innovation on the campus, the Commons has a diverse team of educational specialists, many of whom have doctoral and master's degrees to support teaching improvement. The Commons consists of six hubs, and three of them are engaging in activities to improve teaching.

The Education Research + Assessment Hub provides support related to course-level assessment, program-level assessment, teaching effectiveness, and research projects. The team of this hub includes a director, data specialists, assessment specialists, and others. The team adopts evidence-based and equity-focused approaches to conduct research design and data analysis.

The Digital Learning Hub supports online courses and online programs. The director of this hub leads a team of instructional designers and works closely with the information technology department. Through working one-on-one with instructors who plan to or are teaching online, this team supports the instructors in improving their online course design, developing instructional materials, and providing technical support about online teaching platforms.

The Engaged Teaching Hub mainly provides teaching consultation and classroom observation for instructors. The hub has a team of education specialists and postdoctoral fellows. They organize workshops and courses regularly to introduce new teaching methods and popular teaching tools to the instructors. This hub aims to improve teaching by engaging instructors in evidence-based, learner-centered, and equitable teaching practices. This team sometimes also takes the report from the Education Research and Assessment Hub and provides different personalized solutions for the instructor to improve their teaching effectiveness.

The teaching center often carries out five activities to support faculty's advancement in teaching: teacher training program, consultation, teaching innovation research, teaching evaluation, and high-quality teaching resource provision.

Hosting training programs, including pre-service teachers training and in-service teachers training for specific topics. The Pennsylvania State University in the United States, for example, provides pre-service teacher training mainly through a series of courses (Feng, 2016). The most popular courses are pre-class instructional design and in-class teaching methods and skills including teaching and learning goal setup, syllabi development, questioning skills, classroom discussion organization, student evaluations, and more. The University of Oregon in the United States organizes workshops on different teaching and learning topics and provides training

on teaching fundamentals (Duo & Zhong, 2017). The workshop is organized on different topics each semester, and an example theme is “how to build students’ sense of belonging in the classroom.” Training on teaching fundamentals includes basic skills for teaching, such as how to describe teaching concepts, lead discussions, and write online teaching profiles. Peking University in China provides a training program for new teachers (Wang & Yu, 2019). Designed based on the TPACK framework, the training program has four modules: (1) Peking University teaching and teacher professional development, (2) teaching concepts and teaching methods, (3) teaching with technology, and (4) teaching observation and practice.

Providing consulting services such as individualized feedback, diagnosis, and guidance for teaching. There are regular consultations and in-depth consultations. Generally, based on classroom observations, consultations provide individualized guidance on problems existing in teaching. Yale University’s personalized teaching consultation uses discussion (Lu, 2017). The teachers obtain relevant recommendations by discussing with the consultant course objectives, semester plans, and any issues about teaching practice. The consultation team can also involve related members such as librarians, managers, and IT personnel from related departments to ensure that each teacher obtains appropriate teaching resources to support effective teaching. Mid-term Student Feedback (MSF), commonly used in China, is also a very effective way of supervision and consultation (Pang et al., 2018). The MSF is usually conducted during the beginning or mid-term of a course. The process includes teachers’ voluntary application, initial consultation, classroom observation, student feedback collection, report generation, consultation with teachers, and timely improvement by teachers in subsequent classroom teaching activities.

Sharing seminars and experience. Penn State University’s Schreyer Institute for Teaching Excellence has a teaching excellence advancement program for in-service teachers. The program sets specific themes and conducts various activities such as salons, successful teaching experience exchanges, lectures, and small seminars. Those activities promote new technologies and methods in teaching, discuss new issues, and explore new knowledge related to instruction. Experienced and expert teachers that focus on one theme usually chair seminars, and discussions on a pre-prepared presentations are conducted (Feng, 2016). The seminar at the University of Oregon is a long-term event carried out every week (Duo & Zhong, 2017). The university provides a fixed conference room for the seminar at a specified time every week. Yale University has a monthly “Lunch & Learn” for teaching sessions that focus on a specific monthly theme to promote teachers’ communications and discussions on teaching practices (Lu, 2017). Yale University also has a “Cooperative Yale” series of seminars and an advanced teaching and learning seminar (Lu, 2017).

Supporting instruction with technology. Many universities have Educational Technology Centers. For example, the Teaching and Learning with Technology (TLT) at Penn State University provides technical training for teachers and students on the campus through seminars, lectures, and panel talks (Feng, 2016). TLT is also responsible for technical training for new teachers and providing learning opportunities for all campus populations in teaching, learning, and professional development. In addition, departments can request TLT to conduct special training or organize

seminars for their faculty members to deepen their understanding of the strategies of using information technology in the classroom. Yale University has established the Rosenkranz Teaching Development Award, mainly used for teachers' innovation and experimentation in digital teaching that focuses on supporting the development of online courses (Lu, 2017).

Providing resources and services to improve instruction. The teaching center at the university also provides teachers with teaching research resources and communication platforms to serve the professional development of teachers better. The teaching center often has a website to provide various online resources for teaching including library resources related to teaching, recommended educational periodicals, teaching excellence videos, courses and teaching websites, online open courses, unique course resources, and educational software resources.

Yale University's guide to teaching, "*Becoming Teachers*" (Yale University, n.d.), been revised several times since its publication in 2001. The book was written by Bill Rando, Director of Yale Teaching Center. This book provides a comprehensive guide to developing teaching skills from novice to experienced teachers. The "Teacher's Teaching Guide" defines the core principle of teaching competencies as "student-centered" and has detailed guidance for new teachers' "teaching debut," "five stages scheme" for lesson planning, lecture process, and leading discussion (Lu, 2017).

The "Typical Problems" library of teacher teaching at Yale University highlights the "problem solving" approach in teacher training and services. For example, to help teachers think openly and encourage designing courses based on student developmental goals, the Yale Poorvu Center for Teaching and Learning has prepared a three-step solution for teachers. The Center first sets the overall goal of the course by decomposing the goals and developing semester lesson plans. The Center then provides teachers with tips on managing the inclusive classroom. Finally, by developing "lectures," the Center offers teachers with teaching strategy assistance and corresponding resource support (Lu, 2017).

When teachers conduct mid-term course evaluations, the Center for Research on Learning and Teaching (CRLT) at the University of Michigan collects students' feedback and suggestions on the course from various aspects (Kang, 2019). Then, based on the feedback from students, CRLT puts forward actionable improvement strategies, so that the evaluation can effectively promote the professional development of teachers. CRLT has also launched a new online teaching diagnosis service in recent years. Teachers only need to upload classroom teaching videos to acquire professional feedback and guidance.

Conducting teaching quality assessment and providing feedback for instruction. Using teacher teaching portfolios and collecting various data, Peking University builds a comprehensive evaluation system for teacher teaching development, thus providing data support for the design, implementation, and evaluation of teacher teaching development. The data collected in the portfolio include the teaching statement, teaching reflection, teaching output and results, and external evaluation (Yu & Feng, 2020).

The teaching improvement certificate project of Imperial College London has set up flexible courses of teaching development for teachers (Deng, 2019). The project

issues three types of certificates: the University Teaching and Learning Postgraduate Certificate (PG Cert ULT), University Teaching and Learning Postgraduate Diploma (PG Dip ULT), and University Teaching and Learning Master of Education Degree (MEd ULT). The three types of certificates correspond to the three stages of this teaching and learning research project. Teachers can obtain corresponding certificates according to their needs and the completion of courses. The issuance of certificates stimulates teachers' interest, improves their sense of achievement, and helps teachers overcome the problem of "job burnout."

Teaching presentations and peer review. Yale University's Bulldog Day for teachers is a large-scale event across the campus. Teachers can enter other teachers' classrooms to listen and experience classroom teaching innovations. Organized by the Poorvu Center for Teaching and Learning at Yale University, this event is held every semester for a week (Lu, 2017). Imperial College London has set up an Education Day (Imperial College London, n.d.). Each year, the Education Day will have a different theme, and well-known experts and teachers at the university are invited as speakers to share and discuss the latest teaching theories and issues of common concern (Deng, 2019). This event encourages all teachers at Imperial College London to participate in educational seminars, thus fostering a learning environment for all members. Through a wide range of experience exchanges, teachers benefit from this event by reflecting on and summarizing their teaching.

Organizing and guiding teaching reform research. Institutions can encourage all teachers to conduct pedagogical research by providing a variety of ways to support teachers in exploring new teaching methods, participating in various teaching forums, and exchanging ideas with domestic and foreign counterparts. In addition, by contacting external funding agencies, institutions can help teachers apply for research funding regarding curriculum instruction and undergraduate teaching practice. The seminars at the University of Oregon feature an interdisciplinary perspective and small-scale teaching experiments (<https://ctl.uoregon.edu/innovation>). Small-scale teaching experiments are typical in many U.S. universities due to their focus on quantitative research. Data obtained through these small-scale teaching experiments can test research hypotheses and provide evidence supporting the improvement of instructional design. Yale University establishes an annual teaching advancement foundation. This fund supports the exploration of the integration of teaching activities and undergraduate curriculum design, and covers teaching methods, techniques, and materials improvement. This fund supports expenditures on classroom supplies and equipment updates, teaching project development, student field trips, educational seminars, and guest speaker honoraria.

Policies. Institutions should have related policies and systems to develop teaching competencies. For example, institutions can establish a teacher professional development system and provide teachers with services such as workshops and consultations. Policies at the higher education institutions are generally the concretization of policies to improve teaching competence at the national or regional level. Guided by national or regional policies, individual institutions develop their policies to improve teaching competence by considering the specific circumstances of each institution.

Human Resources. Human resources mainly include three categories. First are organizational management personnel. Their primary responsibilities are carrying out the teaching competency development policy and implementing related projects. The second type of human resources is the leadership for teaching competencies. They can be expert teachers or teachers with outstanding performance in teachers' online learning community. The third category of human resources is teachers participating in those teaching competency development programs. Those teachers are learners, practitioners, and demonstrators at the same time. For example, they can be teachers involved in various teacher training programs or teachers in cooperative or online learning communities.

Learning Resources. Learning resources refer to the materials needed during teaching competency development. The learning resources have rich content such as teaching concepts, instruction methods, information technology, and excellent teaching activities. The learning resources can have a diverse format such as lectures, reports, online courses or videos, and more.

Training and Supporting Programs. Faculty development supporting systems and related programs are based on the faculty development stages and different emphasis on teaching improvement. Examples of these programs include instructor onboarding training, core instructor development program, and educational technology training programs.

The teaching center in the United States usually initiates or coordinates faculty awards and grants for instruction. All these activities aim to create a teaching environment and build learning communities for instructors interested in advancing instructional methods and achieving teaching excellence. For example, the University of California San Diego (UCSD) in the United States has a foundation supporting teaching innovation called CDIIP (Course Development and Instructional Improvement Program, available at: <https://academicaffairs.ucsd.edu/evc/cdiip.html>). This funding helps and encourages instructors to try new instructional methods (e.g., flipped classroom), develop new digital instructional materials (e.g., public textbooks, online lab), or try any teaching innovations to help students succeed in the classroom. Instructors could apply for this fund and collaborate with the Teaching + Learning Commons and other related units at the campus to complete this teaching improvement project. In addition, UCSD has established The Center for Advancing Multidisciplinary Scholarship for Excellence in Education (CAMSEE). CAMSEE includes researchers, librarians, educational technologies, and others from diverse disciplines. The goal of this center is to encourage research on teaching, and thus, to improve program (especially STEM programs) development in the information age and to improve students learning interests and achievement. An example project covered by CAMSEE asks, "Does the frequency of interactions with faculty and teaching assistants (TAs) affect grades?".

4.5.2 Institution-Based and Practice-Focused Approach

Teacher training is one of the methods to develop teaching competencies in higher education. It is one of the best ways to help faculty overcome the challenges. By focusing on sustainable teaching competency development and the continuous change of individuals, teacher training helps faculty advance their competencies in self-learning, innovation, teaching practice, and educational research. Teacher training helps faculty advance their competencies in self-learning, innovation, teaching practice, and educational research by focusing on faculty’s sustainable teaching competency development and the continuous change of individuals. As an institutional strategy, teacher training often has a standardized learning process. Common teacher training activities include expert lectures and workshops. The expert lecture is an efficient and direct way for many teachers to understand the learning goals simultaneously. Workshops often delivered through group collaboration have recently become the most adopted faculties development activities worldwide (Phuong et al., 2018).

The flow chart for an institution-based and practical-focused approach is described in Fig. 4.2. The process mainly includes the following steps: creating training objectives, determining training content, developing training plans, implementing training, and training evaluation.

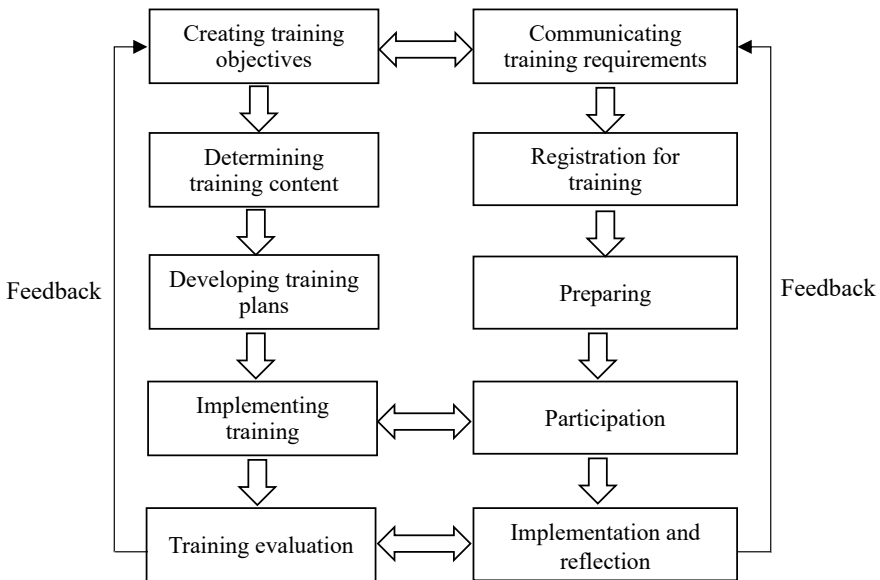


Fig. 4.2 Institution-based and practical-focused approach

Creating Training Objectives. The Teaching Center collects data related to training needs. It follows the training policies, establishes themes, and determines training objectives. According to the stages and dimensions of teaching competency development, goals are determined for different levels or dimensions. For example, for newly recruited teachers, the training aims at understanding education laws, regulations, and policies, mastering the fundamental theories of pedagogy and psychology, and becoming familiar with the professional requirements of teachers. The “educational technology training,” on the other hand, aims to enhance the initiative and consciousness of teachers in applying modern educational technology in the classroom through learning the fundamental theory of educational technology, practicing basic skills in real settings, and discussing cases of successful teaching examples. Institutions need to consider the different development needs of teachers when setting training objectives. According to Tough (1979), the first stage of learning for an adult learner is deciding where to begin. As adult learners, teachers should be involved in setting action goals, evaluating self-learning interests, and finding relevant information to identify opportunities.

Determining Training Content. Based on the training objectives, the Teaching Center chooses the content for training that includes selecting the most appropriate knowledge and skills to deliver and designing the training content system. Each type of training program usually corresponds to a series of content. For example, the new teacher onboarding training program includes education policies and regulations, teachers’ professional ethics, education concepts, education and teaching methods, online teaching technology, and online course design and development.

Teachers’ professional ethics mainly refer to relevant policies and regulations. Educational concepts and teaching methods involve basic theories related to teaching. Expert talks usually deliver this content. The experts determine training content according to the theme and design the training by subject areas. Online teaching technology includes the online learning platform’s function, structure, usage, and operation. The main training content of online course design and development includes knowledge regarding instructional design and curriculum development. The course instructional design consists of three parts: preliminary analysis, overall course design, and learning unit design. The curriculum development also consists of three parts including fundamental content construction, curriculum structure development, and construction of learning units.

Developing Training Plans. At this stage, the Teaching Center needs to determine the training form and mode, establish a training plan, and choose the evaluation methods and tools. The forms of training are relatively diverse. According to how much technology is involved, teacher training can be implemented in three different forms: face-to-face, online, and blended.

Face-to-face training is in person, during which teachers participate in short-term training sessions in a fixed location. This training is mainly used for delivering completed learning content in a concentrated time to a large group audience through expert talks, seminars, workshops, and more. Online training offers teachers learning resources and communication channels through the internet.

Online training is usually delivered through online courses, video conferences, discussions, and other forms in variable learning locations and with a long learning cycle. Due to the flexible learning time of online training, teachers can start and pause learning at any time and can learn repeatedly. In this way, online training conforms to different teachers' learning habits and learning progress. In addition, online training is easy to manage in an institution, and the investment is generally less than that of face-to-face training.

Blended training not only ensures sufficient personalized learning for teachers, but also ensures the efficiency of interaction with experts. The blended training mode is the new normal of current teacher training because it not only ensures flexible learning time for teachers, but also facilitates the institution on management and evaluation (Wei & Li, 2017).

The concept of learning involves introducing fundamental teaching theories, practical examples, and encouraging and guiding teachers to actively participate in related activities. Based on the content, teacher training is divided into concept learning, technical operation, online course design and development, and workshop collaborative learning. Expert reports deliver the training.

The main goal of the technical operation training is to help teachers understand the function and structure of the online teaching and learning platform, and to solve the problems associated with teachers' technical operation threshold. Thus, after completing the technical operation training, teachers know the functions of the online teaching platform and complete the operation tasks according to the functional requirements.

The online course design and development goal is the main online learning step of the teacher's teaching ability improvement project. At this stage, the main content of this training content is the knowledge of instructional design and curriculum development.

The workshop collaborative learning section includes lectures on the key and difficult concepts of course design and development, frequent Q&A (Question & Answer) sessions, production and application of instruction resources, and case sharing of course design and implementation. The case sharing session would invite teachers with certain teaching experience to share real cases on course design and implementation through talks or reports. Peer coaching has an important impact on what teachers have learned in daily teaching (Becker, 1996).

Zhu (2017) proposed ten common teacher training models: demonstration-imitation, situational experience, on-site diagnosis, case teaching, task-driven, problem exploration, theme combination, and self-regulated learning. The detailed introduction of these ten modes is shown in Table 4.5.

Implementing Training. The development of teaching competencies is a process achieved through the continuous cycle of learning and practice. When implementing training, the first step is to identify training participants. For mandatory sessions, teachers are notified to participate. For optional sessions, teachers need to sign up and prepare for participation in the training. Secondly, after training is organized and implemented as planned, teachers participate and complete the learning activities in the training and apply what they have learned in teaching practice.

Table 4.5 Ten types of instructional models used in teacher training

Instructional model	Process	Scope of application
Demonstration—imitation	Demonstration → participatory practice → independent practice → transfer	Applicable for trainings involving action behaviors
Situational experience	Creating situational problems → showing the problem situation → experiencing the situation → summarizing then transferring	Applicable for trainings involving teaching materials, pedagogy analysis, and classroom organization management
On-site diagnosis	Preparation before class → field observation → after class analysis → report development → reflection and discussion	Applicable for individual instruction, providing opportunities for teachers to reflect on the information in natural and authentic situations
Case teaching	Case formation: preliminary preparation → determining the theme → scenario description; Case application: case introduction → case discussion → interpretation and research	Applicable to various types of trainings for, helping teachers learn theories, enrich practical experiences, evaluate, and reflect, and then improve teaching resilience
Participation—sharing	Emotional communication, brain storming, group communication, whole-class discussion, summary, and evaluation	Applicable for small-scale training occurring in a certain period
Collaboration	Independent thinking → group discussion → intergroup requirement → collective evaluation	This model is demanding for trainer's host organization on their coordination and organization ability; applicable for explorative questions with open content
Task-driven	Clarify the goals and tasks to make them concrete, actionable, evaluable, challenging, and motivating	Requiring certain equipment and professional guidance

(continued)

Table 4.5 (continued)

Instructional model	Process	Scope of application
Problem exploration	Ask questions → formulate hypotheses → develop plans → test hypotheses → summarize and improve	Applicable for long and small-scale participatory training that requires trainers to be familiar with rules of cognitive activities and designing with care
Theme combination	The starting point of learning is autonomy, the learning process is self-control, and the learning result is self-assessed	The trainers are required to be proficient in thematic development and research activities organization. The trainees should have a fully qualified academic degree and corresponding level of subject knowledge and subject ability. A mechanism for job recruiting and promoting is required in the external environment
Self-regulated learning	Self-set goals, self-selected learning content and materials, self-picked effective learning strategies, self-assessment, and self-explored information collection channels	Institutions should provide the necessary time and conditions for self-regulated learning; requiring the trainers to have higher abilities

Teachers' learning occurs in the entire process of teaching competency development no matter in training or practice. The structure of teaching competency development model is built around two stages: learning and application. Each stage consists of five components: learning unit, teaching models, support methods, learning outcomes, and learning evaluation. Among them, the learning unit is the main component. Teaching models, support methods, learning outcomes, and learning evaluation are designed based on the characteristics of each learning unit. The following section describes the five components during the learning and application stage.

Learning Stage

Learning Unit. The learning unit starts with “concept learning.” In the learning unit, workshops are primarily used to develop teaching competencies and establish professional relationships (e.g., one-on-one instruction, group guidance). Training courses and expert lectures are also commonly used as ways to develop teaching competencies (Phuong et al., 2018). Therefore, the in-person training process uses workshops. During the implementation of the workshops, group guidance promotes teaching effectiveness. The learning unit in the learning stage has six parts: in-person concept learning, in-person technical operation learning, online course learning, online learning assessment, in-person workshop collaborative learning, and in-person presentation and review.

Teaching Models. Different teaching models are adopted according to the characteristics of each step. The *concept learning* step is delivered by face-to-face expert reports in the traditional lecture mode.

The *technical operation* step mainly solves teachers' technical problems when using unfamiliar online teaching platforms. This step involves procedural knowledge that teachers can learn through multiple trainings. Therefore, in this step, the most useful training format is letting teachers focus on practices and solve common operation issues face-to-face. This step uses the approaches of *demonstration-imitation* and *case study*. First, teachers are provided with case studies of different types of online course development, followed by the ideas and characteristics for developing each type of course. In addition, the operational functions of the online teaching platform are provided for teachers to learn and imitate.

The *online course learning* and *online learning assessment* are two steps for teachers to learn relevant pedagogical knowledge. The self-learning method is adopted for teachers to learn online by themselves. At the same time, the task-driven teaching mode is used to design sub-task after completing each learning unit. Teachers need to complete the sub-tasks of each learning unit to complete the training. Finally, online homework grading will assess teachers' online learning results.

The *workshop collaborative learning* step continues the *online Course Learning* step. It mainly solves the problems and doubts that arise in the process of teachers' online learning and task completion. This step adopts the form of collaborative learning in workshop groups, generally led by assigned experts to complete related tasks. In this step, all questions asked by teachers during the course learning process are answered through a centralized Q&A session. In addition, excellent assignment projects in the course are presented to all teachers so they can imitate the example.

The *presentation and review* is the last step of the training and learning stage. The main purpose of this step is to help teachers sort out the learning results of the previous five steps and conduct an on-site diagnosis of the results of the current stage. This step adopts the approach of a combination of participation-sharing and on-site diagnosis. Experts solve individual problems of each teacher in a targeted manner while bringing out common problems. In this way, all teachers are encouraged to participate in the discussion and share solutions to summarize, reflect, and improve.

Support Methods. According to the designed learning unit and teaching model, the support methods in learning stage is divided into two types: offline support and online support. The offline support mainly includes pre-training introductory material sharing, training requirements gathering, instructional materials distributing, on-site expert guidance and comments, and Q&A session by course design experts. Online support focuses on online course learning and evaluation, including online learning results review and online Q&A. In addition, regarding technical questions, teachers are continually supported through remote services such as telephone, email, and online Q&A.

Learning Outcomes. The learning outcome in learning stage mainly includes three parts: (1) the improvement of teachers' understanding of teaching, (2) the mastery of knowledge and skills of online teaching and learning platforms, and (3) the mastery of knowledge and skills regarding teaching and curriculums.

Learning Evaluation. Given the above learning outcome, the evaluation of teaching competency development in learning stage includes teachers' satisfaction with the learning process and the completion of teachers' instructional design plans.

Application Stage

Learning Unit. The application stage is mainly for teacher self-learning during teaching practice. Teaching reflection at this stage is important to develop teaching competencies (Zhang et al., 2009). Teaching reflection is a process of multiple spiral developments repeated many times. In this stage, the teacher's learning process takes one semester as the practice cycle. During each semester, teachers first deepen their understanding of the knowledge and skills learned in the previous stage through course design and curriculum development of the target courses, and then implement the teaching. The teachers learn by themselves during the process of "discovering-exploration-solving" problems in teaching practice. Finally, teachers reflect on and share instructional design, curriculum development, and teaching implementation experience during the summary and evaluation stage before they enter the next cycle of "learning by doing." In the process of teaching practice, institutions support teachers' teaching practice by setting up teaching reform projects. Generally, teaching reform projects can last years. Therefore, all teacher teaching cases and projects are reviewed annually. Teachers reflect on their teaching practice during the reviewing process, which can help them improve their teaching ability further.

Teaching Models. The self-regulated learning model runs through the whole application stage. The teaching process mainly focuses on guiding teachers' learning based on different teaching models or creating an environment to help teachers learn. In the application stage, the cycle is carried out every semester. In each cycle, teachers experience three units of "design and development," "implementation," and "reflection and communication." Institutional teachers often do not know how to plan due to a lack of experience in the process of implementing instructional design and curriculum development for the first time. Therefore, in the first round of the "design and development" step, case teaching is indispensable as the actual case study of the same or similar courses is significant for teachers. In addition, teachers have collaboration and exchange opportunities through provided teaching assistants and organized seminars with teachers teaching similar courses. Also, essential is to provide opportunities for reflection, sharing experiences, and brainstorming using the "participation-sharing" model.

Support Methods. The support methods in the teaching implementation occur online and offline. The offline support methods offered by the institution include a teaching innovation environment, implementation support, incentives, and organizational structure. Specifically, those supports include leadership support, management measures, working conditions, facility construction, resource services, communication and counseling, technical support, follow-up evaluation, incentive measures, and organizational structure. Agencies organizing training in the training and learning stage offer online support methods. Major methods mainly include providing continuous and real-time Q&A services through social media and inviting experts to guide, support, and discuss with teachers on teaching reflection.

Learning Outcomes. The learning outcome of an application stage needs to reflect the degree and quality of teachers' usage of the newly learned knowledge and skills, which are slightly more complicated than the learning results of the training and learning stage.

Learning Evaluation. The learning evaluation is mainly carried out through a satisfaction survey and learning outcomes (Wang, 2016). The evaluation focuses on the effect of learning results in application stage, especially the application effect of new knowledge and skills in teaching.

Evaluation. Institutions need to supervise the training implementation process, find out the problems during the training, and give timely feedback. After training, the institutions would evaluate the training effect and identify new training needs.

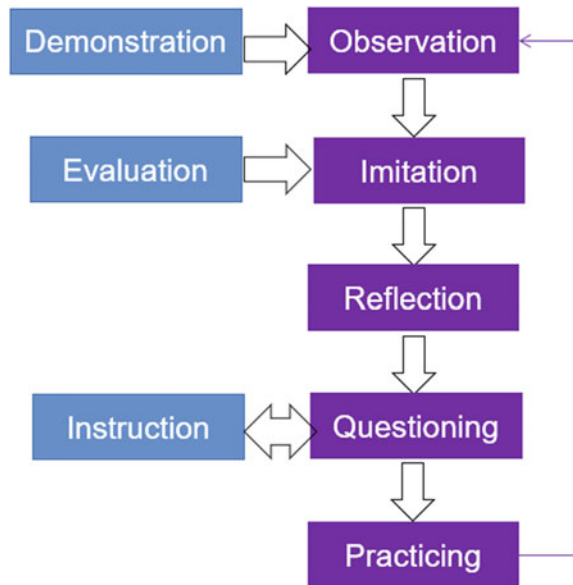
4.5.3 Team-Based Approach

Expert teachers play the leading role when adopting the team-based approach to develop teaching competencies. A team is composed of all teachers in a particular program. Experienced and expert teachers guide novice teachers in different aspects such as teaching concepts, methods, skills, and career development, and help them improve their teaching competence. The teamwork mechanism created by expert teachers can help novice teachers become actively involved in the development and innovation of instructional teams. There are two sub-models of the teaching competency development model based on the academic team: the apprenticeship-based method and the teaching and research office-based method.

Improving Teaching Competencies Using Apprenticeship. Apprenticeship helps teaching and learning in a rich context. Apprenticeships emphasize that knowledge must be used to solve real-world problems, focusing on both expert processes and context learning (Sawyer, 2005). Traditional apprenticeships, however, must have a hands-on learning experience, evidenced by the craftsmanship produced. Collins et al. (1989) proposed the concept of cognitive apprenticeship. Cognitive apprenticeship emphasizes cognitive learning processes such as visualizing conceptual processing. In this approach, the teacher or other knowledgeable person interprets the reasoning process behind the teacher's actions, thereby teaching students through cognitive apprenticeship. Teachers then provide guidance and scaffolds to reduce teacher intervention that enables students to act without teacher support (Spector et al., 2007). In the apprenticeship-based teaching improvement model, expert teachers with rich teaching experience and strong teaching ability usually take the role of masters, while novice teachers are in the role of apprentices (Sawyer, 2005).

The most prominent features of the apprenticeship in improving teaching competence are observation, imitation, and repeated practice. Teachers find problems in practice, acquiring knowledge through reflection and questioning, and acquiring practical skills through re-observation and imitation. Expert teachers should not only demonstrate well, but also provide scaffolding for novice teachers including

Fig. 4.3 Flowchart of improving teaching competence using apprenticeship



the evaluation and guidance of novice teacher teaching practice. The main steps of the apprenticeship-based method in improving teaching ability are *observation*, *imitation*, *reflection*, *questioning*, and *practice*. The process is shown in Fig. 4.3.

Observation. Observation is the first step of the apprenticeship-based model. Through observation, the apprentice intuitively understands the behavior learned. During the observation step, teachers observe expert teachers' teaching process in the teaching site or watching a video of the teaching process. The content of observation can be the process of designing the lesson plan or demonstrating teaching practice. These two types of content are the process-oriented examples and product-oriented examples (Gog et al., 2004).

Product-oriented work examples describe the process of solving a problem by providing the learner with an initial state, a goal state, and a set of problem-solving steps (Gog et al., 2004). A product example only provides a solution to a problem. The learner learns from some problems with solutions before dealing with the requirements of the problem, and goes through three stages of self-explanation, schema construction, and automated practice in the learning process (Renkl, 2014). Through worked examples, the learner investigates the state of the problem, the goal state, and the expert's solution to the problem (Hoogveld et al., 2005). Then, learners gain knowledge of the problem state, operations, and knowledge elicited by the applied operations, which is then integrated into cognitive schemas that apply to subsequent problem solving. Through observation, novice teachers can obtain the main elements of good instructional design or practice and their relationships. In the observation process, teachers have a more comprehensive understanding of the

expert teachers' teaching structure, teaching process organization, teaching skills, language organization and expression, and teaching attitude.

Process-oriented worked examples explain how to solve a given problem and why these operations are used (Van Gog et al., 2004). It explains not only the “what” to the learner, but also the “why.” By observing the detailed process of designing and organizing teaching by expert teachers, novice teachers can further understand why the expert teachers design and organize teaching in this way, and the pedagogical theoretical foundation behind it. These fundamentals are essential factors in enabling transfer, and in theory, process-oriented worked examples can lead to more efficient transfer. Process information may initially impose an effective cognitive load on the learner and lead to greater efficiency. However, during training it may become redundant and impose an ineffective load, thus affecting efficiency (Van Gog et al., 2004, 2008). Observation is not a singular occurrence, and teachers usually observe multiple expert teachers or repeatedly observe the teaching process of one expert teacher. After each observation, teachers should sort out, summarize, and refine the observation content. Based on observation, novice teachers extract the observed core elements and the basic structure between the elements, incorporate them into their own cognitive schema, and form their own understanding through cognitive processing.

Imitation. The original meaning of learning is to imitate, and imitation is a necessary step for teachers to develop teaching competencies. Imitation is a modeling process, and the learner learns by modeling and using the model (Jonassen, 2006). Just looking at a model and imitating it is called indirect learning (Bandura, 1986). Yet, by building a model and manipulating it, learners can learn more (Jonassen, 2006). Modeling is one of the cognitive processes with the strongest conceptual engagement that requires learners to express causal reasoning explicitly while providing cognitive support. Modeling involves testing hypotheses, conjectures, reasoning, and other important cognitive skills. Modeling includes representing the real world, simulating the problem-solving process of experts, and visualizing strategies and details (Collins, 1989). During the modeling process, learners identify appropriate elements to present theory or reality, or both. The learning process resides in specific choices made by the modeling.

Project-based learning modeling includes domain knowledge modeling, problem modeling, and thinking modeling. Domain knowledge modeling is the modeling of domain knowledge and its structure. Problem modeling is constructing a mental space for a problem; that is, a mental model consisting of carefully selected problem elements and their interrelationships (Jonassen, 2006). Thinking modeling is when learners reflect on their own learning process. They then model the thinking used to solve a problem, make a decision, or complete a task (Jonassen, 2006). Mindtools help learners transcend their thinking limitations including memory, mindset, or problem-solving limitations (Pea, 1985).

Novice teachers form their own domain knowledge and knowledge on teaching methods through cognitive processing of the information obtained by observation. They express it through externalized instruction design plan or teaching practice.

This process is called imitation. In the initial stage of imitation, it reflects the characteristics of “drawing a tiger according to the cat,” which means that the novice teachers mostly imitate the explicit behavior of the expert teachers. Through imitative behavior, novice teachers’ understanding of domain knowledge and knowledge of teaching methods are transformed into explicit teaching skills. The teaching behaviors of expert teachers imitated by novice teachers are usually typical and prominent. In general, a one-time imitation does not achieve the desired goal, and imitation is an iterative process intertwined with observation, reflection, and practice.

Reflection. Frequent feedback is critical for learners to gain insight into learning and understanding. Learners need to monitor their learning and actively assess their strategies and current level of understanding. Reflection forms knowledge construction, and the “acceptance” formed without reflection does not mean construction, but a mechanical accumulation or rote memorization of knowledge. The factor that triggers knowledge construction is the cognitive imbalance. The elimination of the cognitive imbalance manifests itself as a psychological operation of assimilation and adaptation at the micro-level, and as a reflection at the macro-level. Reflection is a way of thinking within a metacognitive process. In reflective activities, learners review and analyze their performance and compare their performance with others such as peers or experts (Collins, 1989). Speculation and testing in the process of reflection significantly promote the integration of domain-relevant knowledge (Bandura, 1986). The process also prompts learners to examine the process of cognitive activities and improve learning strategies.

Reflection in the process of teaching competency development mainly refers to teachers’ reflection on their own imitation behaviors. Imitation behavior is the externalization of teachers’ teaching competencies. Novice teachers reflect on their teaching behaviors to re-understand their understanding of teaching and find conflicts. Teachers revise their understanding based on feedback from peers. Their knowledge is internalized in interpersonal interactions and self-reflection.

Questioning. Questioning is the driving force for developing teaching competencies. First, questioning is the manifestation of the cognitive imbalance at the macro level. Asking questions is a learning process. The learner discovers cognitive conflicts when reflecting on the existing cognitive schema, and then generating learning needs. Second, questioning maintains the learner’s attention, keeping the learners focused on the problem and other important issues (Barron et al., 1998). Cognitive imbalances caused by cognitive conflict drive learners into cognitive assimilation or adaptation activities. For example, retrieving information based on the relationship between existing knowledge and new information to help new knowledge “grow” based on the original experience forms a new cognitive schema.

Problem solving reflects the active process and results of learners’ thinking activities. On one hand, in applying knowledge to solve problems, learners may find a gap between the knowledge they simply accept, and the knowledge used and put into effect. This sense of gap further promotes and stimulates the learners to reconstruct and reflect on the knowledge concepts they have learned. This way, learners can strengthen their in-depth understanding and comprehension of knowledge, transform sluggish inert knowledge into internalized active knowledge, further understand

new knowledge, and promote thinking development and improvement. To a certain extent, problems become the basis and approach for selecting knowledge, testing thinking, and developing abilities.

On the other hand, questioning promotes the synergistic development of learners' knowledge and thinking ability. Problem-solving represents the completion of a complex intellectual activity consisting of various cognitive skills and actions. Novice teachers have doubts in reflection, find deficiencies when comparing their teaching behaviors with those of expert teachers, and form new learning needs.

Practicing. Practicing (Xi) in ancient Chinese means a bird practicing flying repeatedly. Teaching is a highly practical activity, and practice is a necessary way to improve teaching ability. Practice is the explication of modeling results. Novice teachers refine their internal knowledge of what to teach and how they teach based on reflection, while practices externalize their internal modeling about teaching. In addition, through practice, expert teachers can observe the teaching behavior of novice teachers and discover their understanding of relevant knowledge and mastery of teaching skills. Therefore, practice makes teaching skills more proficient, while exposing the problems in teachers' teaching. Practice intertwines with observation and imitation. Learning and practicing achieve unity in practice.

Coaching. Coaching is the guidance and help given by expert teachers based on evaluating the teaching skills of novice teachers. Coaching scaffolds for the improvement of teacher teaching ability. Coaching can appear in diverse ways such as prompting, feedback, hinting, demonstration, and guidance. Problem guidance is a commonly used scaffold strategy.

Teaching Competency Development in Teaching and Research Section. The teaching and research section is usually a unit within a department or college. Development of teaching competencies in the teaching and research section adopts the apprenticeship approach and the community of practice model. This development model emphasizes the role of masters/experts and peers in the learning community. Another prominent feature of this model is that the unit has a strict organizational system, evaluation process, and supervision mechanism.

The main process of the teaching competency development model in teaching and research section includes practice, peer review, revision, and re-practice, as shown in Fig. 4.4.

Collective Lesson Preparations. The teaching and research office develops teaching plans by, and individual members formulate personalized teaching plans according to their own course learning goals. At this stage, each teacher should prepare lesson plans collectively and have a settled weekly plan for collective lesson preparations meetings such as meeting frequency, duration, and the content and agenda for each meeting. A teaching and research office usually organizes at least one instructional activity from time to time (e.g., every week). The activity depends on each unit's specific regulations and situation, and informal communication between unit members is not limited to this activity.

Peer Review and Reflection. The teaching and research office members review other members' lesson plans and teaching practices to learn from each other, criticize the shortcomings, and suggest improvement. In this process, experienced teachers

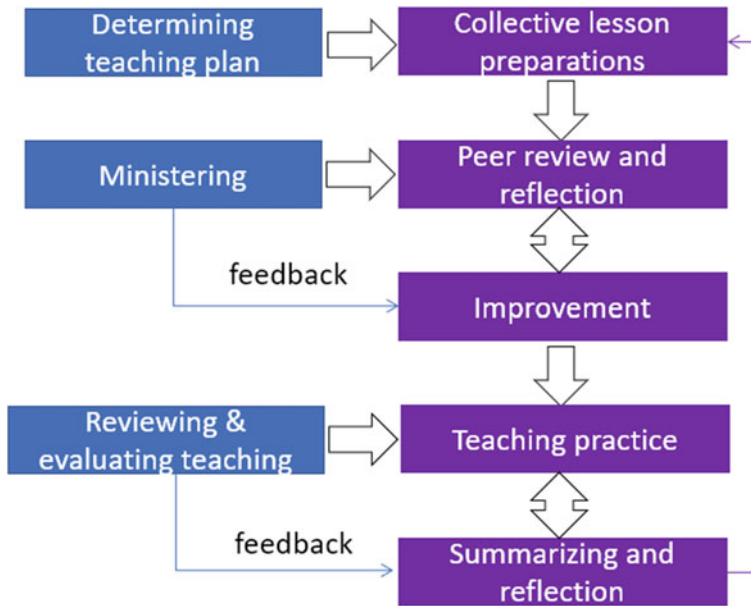


Fig. 4.4 Flowchart on improving teaching competence in the teaching and research section

should guide other teachers and provide more scaffolding. Through the mentoring process, novice teachers are encouraged to promote their teaching competence through observations and teaching competitions.

Improvement. Teachers revise and improve lesson plans based on peers' feedback and personal reflection. The revised lesson plan can go through the peer review process again. Teachers implement the revised and improved lesson plans in the classroom. The teaching and research office members conduct teaching peer review, including classroom observation and commendation, and offer recommendations for how to improve future classroom teaching practice. The unit could also organize specific training programs targeting common or prominent problems in teaching.

Monitoring and Evaluation. A person assigned to oversee the whole teaching and researching process ensures the effectiveness of the teaching and research office. This includes monitoring and evaluating progress.

4.5.4 Evidence-Based Approach

Evidence-based method refers to educational practices that emphasize empirical evidence. In the education field, experiments are the most typical empirical study. By conducting experiments, instructors could gather scientific evidence and draw findings on how to effectively improve their instructional design and improve students

Table 4.6 Instruction assessment and improvement of project implementation steps

Step	Actions	Deliverables or research content
Initial consultation	The first meeting was between instructors (or department administrators) and staff in the teaching center	Project memo (project plan)
Stage one, instruction plan	Data collection	Conducting surveys, classroom observations, interviews, focus groups, analyzing learning platform data, etc.
	Generating results	According to the data collection method selected in the previous step, the teaching center uses appropriate analysis methods to generate feedback reports from different student groups
	Providing consultations	The teaching center provides reports and makes recommendations for future instruction improvement. Then, the center works with the instructor to develop the plan for the second stage of the project
Stage two: Instruction improvement	Implementing	Instructors implement new teaching strategies based on student feedback and the center’s recommendations
Stage three: effectiveness assessment	The second round of data collection for the classroom using new teaching strategies	Conducting surveys, classroom observations, interviews, focus groups, analyzing learning platform data, etc.
	Consultations and evaluations	The teaching center compares the data from two rounds of teaching and concludes with the results of the whole project. The center offers suggestions for instructors to further improve their teaching. If necessary, the center can continue work with the instructor for another round of data collection and assessment

learning achievements. When discussing teaching effectiveness, the common final scientific evidence is whether students benefit from the improvement of instructors’ improved teaching. This evidence is embodied in improving students’ course satisfaction, academic performance, and increased interest in learning.

The teaching center works with instructors by offering consultations on improving teaching effectiveness based upon student feedback. The general steps of this kind of project are as follows in Table 4.6.



Case 4-5-4-1

A data-driven approach to develop teaching competencies

This case is from the Teaching + Learning Commons (the Commons) at the University of California, San Diego (UCSD: <https://commons.ucsd.edu/>) Combining equity-focused and evidence-based approaches in all services, the Commons at UCSD encourages all instructors to assess and reflect on whether their teaching practices contribute to equitable outcomes for all students. The Education Research and Assessment Hub (ERAH) under the Commons has access to campus institutional data and learning management system (LMS) data. ERAH gathers evidence of teaching effectiveness by collecting data from both students' learning outcomes and survey feedback. For example, the hub supports instructors in designing experiments using empirical research methods, developing and administering surveys, sampling student artifacts, and supporting data analysis. Machine learning methods such as topical modeling and sentimental analysis are applied to understand the text data generated from student open-ended survey questions. For quantitative data analysis, student data are disaggregated by different student groups (e.g., first generations, under-represented students). This way, minority students' feedback and learning outcomes are not ignored. Instructors also have to pay attention to whether teaching strategies are effective in helping all students become successful. The ERAH applies evidence-based and equity-focused principles throughout the project, including research design and data analysis.

4.6 Teaching Competency Development at Individual Level

The development of teaching competencies at an individual level includes four categories based on the dimensions of thinking and practice and explicit and implicit dimensions. These categories include reflective practitioners, metacognitive approaches, novice to expert, and action research (Pill, 2005). College teachers' most desired training formats include on-site and online training. Akahori et al. (2001) found that online training support systems had considerably increased the knowledge and skills of participating teachers. Falcinelli et al. believed that integrating trainees' online activities, small group activities, and training courses would result in a more successful teachers training format. This section introduces teachers' self-regulated learning and teaching practice model based on open educational resources (OER), teaching practice exchange and reflection based on online community and learning community, teaching–learning model, and teacher development model based on adaptive learning systems.

4.6.1 Teacher Self-regulated Learning and Teaching Practice Model Based on OER

Self-regulated learning refers to how students can determine learning goals, formulate learning plans, and make specific learning preparations before learning activities. They can self-monitor, self-feedback and self-adjust learning progress and learning methods during learning activities. They can self-check, self-summarize, self-evaluate, and self-revise learning outcomes after learning activities (Pang, 2001).

Self-regulated learning is a learning process model in which each stage is connected in a cyclical format that includes cognition, emotion, and social situation. Each area supports teachers' iterative reflection process and helps them see how they constructed their core knowledge. Therefore, the teacher self-regulated learning model supports teachers' autonomous learning and offers professional development more completely and systematically (Burton, 2013). In the past 20–30 years, academia has conducted a lot of research on self-regulated learning and proposed a series of self-regulated learning models. Winne and Hadwin (1998) proposed a four-stage self-regulated learning model: (1) defining tasks, (2) setting goals and planning, (3) developing learning strategies, and (4) adapting metacognition for future learning. Starting from the college student's self-regulated learning to improve performance, Zimmerman (1998) also proposed a four-step cyclical model of self-regulated learning: (1) self-evaluation and monitoring, (2) goal setting and strategic planning, (3) strategy implementation and monitoring, and (4) strategic outcomes monitoring. Winne and Hadwin's model are more inclined toward the preparatory stage of self-regulated learning, while Zimmerman's model emphasizes the integrity of the process.

Later, Zimmerman et al. (2008) proposed a social cognitive model of self-regulated learning, which divides the learning process into a three-stage learning activity cycle. The cycle includes the pre-planning stage, the execution stage, and the self-reflection stage. The social cognitive model enriches the content of behavior, motivation, and cognition involved in each stage process, and regarded as a three-stage cycle formed by a series of events. The first stage is planning that includes two activities: task analysis and self-motivation belief. The task analysis activity sets goals and plans learning strategies according to the goals. Self-motivation beliefs include a series of self-motivation adjustments including self-efficacy, expectation of results, interest or value to the task and goals, and goal orientation. The second stage is execution and includes two adjustment processes: self-control and self-monitoring. Self-control consists of self-teaching, imagination, concentration, and organizing task strategies. The self-monitoring process includes metacognitive monitoring and self-recording. The third stage is self-reflection that involves self-judgment and self-reaction based on self-judgment. The self-judgment process includes self-evaluation and attribution of evaluation results. Self-reaction includes self-satisfaction and active adjustment or resistance to outcomes. Teacher self-regulated learning is a cycle including goal guidance, strategy activities (i.e., defining problems and expectations, setting goals, selection, adjustment, and creation of appropriate strategies),

self-monitoring of results, and adjustment of goals and methods to achieve better desired results (Butler & Schnellert, 2012).

Individual self-regulated learning is achieved with OER, where learning environment and self-regulated learning strategies play an important role. A major challenge of using OER is how to apply OER in the teaching and learning process effectively. The resource-based learning environment provides a theoretical framework for self-regulated learning based on open educational resources. Yet, self-regulated learning strategies are the important self-regulated learning scaffolds. The scaffolds guide learners to set and plan learning tasks, formulate learning objectives, select and use appropriate learning resources, and self-monitoring and reflection on the learning process. Gagne (1965) pointed out in his nine events of instruction that effective learning did not mean just presenting teaching information. It needed more instruction and support such as maintaining learning motivation and completing learning tasks. Deimann et al. (2007) stated that simply providing learners with OER was meaningless because learners needed support and guidance to maintain learning. They believed that teachers needed to use educational design knowledge to promote the effective application of OER. They proposed some overall principles for integrating OER and instructional design including providing contextual information, scaffolds, and tools and learning modules to support the use of OER to achieve instructional objectives. The self-regulated learning process based on OERs includes (a) setting self-regulated learning objectives, (b) formulating learning plans, (c) selecting and organizing learning resources according to learning objectives, (d) performing metacognitive monitoring and process adjustment in the learning process, (e) learning reflection and self-evaluation, and (f) modifying and improving learning objectives and learning plans.

Teachers' Self-regulated Learning and Teaching Practices Steps. For teachers' self-regulated learning and teaching practices based on OER, teachers should construct a resource-based learning environment, which generally includes four elements: context, resources, tools, and scaffolds (Hill & Jannafin, 2001).

According to Hill and Jannafin (2001), context referred to a learning environment that guided learners to a specific learning need or problem. Its main function is to provide learners with matching learning problems or learning environments for specific learning objectives and learning needs. There are three different types of contexts. First, the teacher and the external environment provide the externally directed context, which both correspond to the objectivist epistemology. Second, learner-generated context is based on learners' unique environment and needs that corresponds to constructivist epistemology. Learners self-define their knowledge and skill needs, identify relevant resources, and establish meaningful associations between these resources and their needs. Finally, the negotiated context is a combination of the above two contexts. The externally directed context gives a relatively macro problem, and the learner generated context defines subproblems according to his/her internal needs.

Self-regulated learning must be based on sufficient learning resources. Hill and Hannafin (2001) defined resources as the foundation of a learning environment that consists of media, people, location, and perspectives to support the learning process.

OERs provide self-regulated learners with a large number of open access courseware, open textbooks, open courses, teaching media materials, and personal and community resources. They are open to the society free of charge and provide a sufficient reserve of learning resources for self-regulated learning based on OERs.

According to Hill and Hannafin (2001), tools are used to assist students in learning with resources. Their main function is to help learners locate, access, operate, interpret, and evaluate the usefulness of resources. It helps learners organize and present their understanding in concrete ways. There are generally four types of tools to support a resource-based learning environment: searching tools, processing tools, manipulating tools, and communication tools.

Hill and Hannafin (2001) described scaffolds as all types of support that assist learners in participating in learning tasks. In a resource-based learning environment, the main function of scaffolds is to assist and support learners in the process of participating in and completing learning tasks. There are four types of scaffolds: procedural scaffolds, conceptual scaffolds, strategic scaffolds, and metacognitive scaffolds. Procedural scaffolds emphasize how to help learners use the existing resources. It enables learners to focus on resources during learning activities. Concept scaffolds guide learners to identify problem-related knowledge and establish connections among concepts to make them more explicit. Metacognitive scaffolds are often used in inquiry-based learning environments, prompting reflection, comparison, and revision based on self-evaluation and understanding. Strategy scaffolds primarily support learners in determining the methods of analysis, planning, and response such as identifying and selecting information and evaluating resources (Hannafin & Hill, 2007). These four scaffolds incorporate into the model of self-regulated learning.

Specifically, the self-regulated learning process based on OERs includes an array of activities. These tasks include: (a) setting self-regulated learning goals, (b) formulating study plans, (c) searching and organizing learning resources according to the learning goal, (d) performing metacognitive monitoring and processing adjustment in the learning process, (e) learning reflection and self-evaluation, and (f) revising and improving the learning goal and plans.

Setting Self-regulated Learning Goal. The goal of teachers' self-regulated learning generally comes from the reflection on teaching practice. Teachers generally make basic judgments about their teaching ability and development through observation and reflection. However, they often do not have clear problems and specific development goals. Teachers can refer to the teaching ability framework, indicators, and standards of college teachers described in the previous chapter to evaluate their own teaching abilities. They can further understand their own teaching ability's status through peer and student evaluation and feedback. Teachers can set appropriate and feasible developmental goals based on the stage of development and break them down into specific and continuous learning goals.

Formulating Study Plan. Teachers develop a learning plan based on the self-regulated learning goal. The plan includes learning tasks, learning content, learning paths, and time arrangements. When formulating a learning plan, teachers should decompose the learning tasks properly to make them operable. When formulating the learning path, teachers should set the type and sequence of learning activities

according to the factors such as their own learning styles and self-regulated learning abilities. When selecting learning content, teachers should focus on subject matching, target specificity, and diversity of formats. When arranging the study time, teachers should consider the contradiction between work and study, family, and study, and maintain the continuity of learning.

Searching and Organizing Learning Resources. Teachers use certain search strategies to find learning resources such as resource type, knowledge content, question type, and the like. Once selecting the required learning resources, teachers sort out and compare the retrieved resources. For example, they learn about teaching methodology, observe excellent teaching cases of the same content, analyze the advantages and characteristics of teaching methods used in different cases, and refine their common features. They can understand the knowledge of pedagogy and transfer it to their own instructional design and practice.

Metacognitive Monitoring and Process Adjustment. In order to gain insight into learning and understanding, learners need frequent feedback. Learners need to monitor their own learning, and actively assess their strategies and current level of understanding (Bransford et al., 1999). They can adjust their learning process based on their reflection on learning cognition. Metacognitive monitoring runs through all aspects and processes of self-regulated learning and teaching practices. Learners adjust the learning process according to the monitoring results. Monitoring and strategy use are two of the most critical aspects of self-regulated learning (Winne & Hadwin, 1998; Winne, 2001).

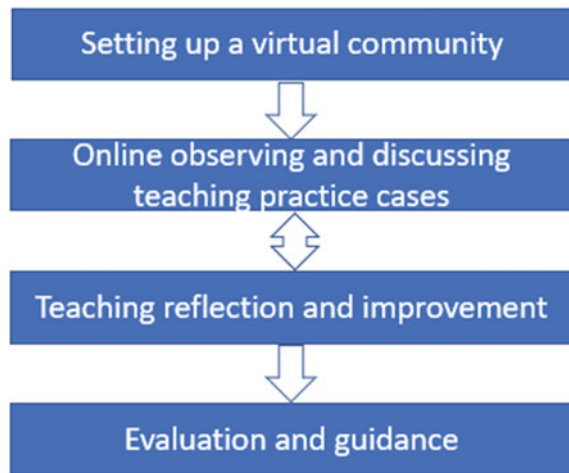
Learning Reflection and Self-evaluation. Teachers' self-regulated learning process integrates with teaching practices. Teachers should often reflect and evaluate the self-regulated learning process and teaching practices. In reflection activities, learners review and analyze their own performance, and compare theirs with others' (peers or experts) performance (Collins, 1989). Speculation and testing in the process of reflection significantly promote the integration of domain knowledge (Bandura, 1986), and motivate learners to examine the process of cognitive activities and improve learning strategies. Specifically, teachers can apply what they have learned to teaching practice and test what they have learned through practice. For example, the learning results can improve the teaching plan. Teachers put the teaching plan into teaching practice. They can video-record the teaching process, watch the video of the teaching process repeatedly, sort out the steps that do not achieve the expectation, analyze the reasons, and propose solutions.

Revising and Improving the Learning Goal and Plans. The goals and plans of self-regulated learning are not static. Teachers should adjust the learning goals and plans appropriately according to the learning progress and problems in the learning process.

4.6.2 Teaching Practice Exchange and Reflection Model Based on Online Community and Learning Community

In the process of self-developing teaching competencies, teachers complete the learning process as adult learners. On one hand, a great feature of adult learners is that they have a wealth of work experience (Knowles et al., 2005), which becomes a resource for learning from each other. Teaching practice experience is the most valuable professional development resource for teachers. Teaching practice integrates with the content learned for teacher development. Through teaching observation, it is easier to form learning resources suitable for teachers' development in the zone of proximal development. At the same time, interaction based on real problems in teaching practice helps teachers form interdependent partnerships, thus resulting in high-quality construction processes and results. Teachers' professional knowledge develops in the process of communicating with their peers. On the other hand, communication among adults helps promote individual reflection on teaching. Two or more peer teachers work together to reflect on current teaching practices, improve and build new skills, teach each other, share experiences, participate in teaching research, and work on practical problems (Robbins, 1991). By observing peers' teaching practices, teachers can easily compare and distinguish their own teaching experience, clarify the problems and deficiencies in teaching, and form new learning needs. Teachers should make full use of teaching experience to carry out teaching observation and evaluation, conduct professional reflection, regularly summarize, and exchange practical experience, and increase the feedback between teachers to improve teaching behavior. Teachers can promote learning development together in collaboration. Collaborative professional learning based on online communities or learning communities is part of teacher's professional development. It is a way of reverting the teacher training process to an activity involving shared action. Its main idea is the recognition that teachers learn from their teaching practice. They learn to explore select, experiment, innovate, and ultimately learn to teach. Thus, collaborative professional learning combines a variety of strategies involving peer interaction such as learning new teaching methodologies, reflecting on classroom events, and developing and reviewing institutional educational programs. Collaborative processes include interaction, dialogue, and reflective analysis to change one's way of being and generate pedagogical knowledge in practice. Suggestions or constructive criticism of the teacher's presentation from mentors, colleagues, or observers, are most effective, especially before and after the teaching observation (Marcelo, 2008). Equally effective is group work between experienced and inexperienced teachers, mixed work groups based on majors, or mixed work groups involving teachers and administrators or teachers and students. Teaching competency development depends on practical reflection, which can make recommendations for the observed teachers through observing others, describing their own experiences, classroom observations, and communication (see Fig. 4.5).

Fig. 4.5 Flow chart of teaching practice communication and reflection model within an online community



Setting up a Virtual Community and Learning Communities. With the help of tools such as blogs, podcasts, Wikis, RSS, and Delicious, in-service teachers and education experts can set up a virtual teaching and research community. Teachers participate in constructing and improving practical knowledge in the virtual community. The virtual communities have different levels or types according to the scope of universities or subject categories covered such as national level, state level, district and county level, engineering education, medicine, and teacher education. Teachers in the virtual community form learning communities based on the subjects they teach.

Online Observing and Discussing Teaching Practice Cases. Best practices can be learned through observing teaching practice videos or reviewing each other's instructional plans. On one hand, best teaching practices provide teaching models for other teachers to imitate. By analyzing and discussing the advantages of various teaching strategies, teaching methods, and imperfections, teachers form their own teaching templates. Discussion is an expressive process that transforms specific situational knowledge into generalized knowledge by expressing tacit knowledge to be explicit. On the other hand, observed teachers find benefits in receiving peer feedback that represent the same point of view and common difficulties (Collins, 1989). Webb (1982, 1989) found that learning enhanced when learners gave explanations and questions to each other. During the interpretation process, learners can clarify concepts, restructure thinking, and reconceptualize material. Peer questioning engages learners in problem-solving, knowledge-building interpretation, and reasoning (King, 1991, 1993). Based on the exchange of teaching practices in online communities and learning communities, teachers discover the differences between their knowledge of teaching practice and their peers' knowledge of teaching practice through online sharing and comparison. They ask questions, discuss, negotiate the differences, and reach a consensus in the collision of opinions. They then form more recognized knowledge in the community and realize the co-construction and development of teaching skills and knowledge.

Teaching Reflection and Improvement. Teaching observation helps promote teaching reflection. The speculation and inspection in the process of reflection significantly promote the integration of domain knowledge (Bandura, 1986). They also prompt teachers to examine the process of cognitive activities and improve teaching strategies. Teachers often need to reflect on teaching practices and underlying assumptions. They also need to identify basic teaching principles, formulate principles-compliant plans for teaching activities and practices, monitor results, and critically reflect on their efforts and activities. Reflection embodies two aspects in the exchange of teaching practice based on the online and learning communities. One is the reflective behavior generated in the process of comparing with peers' teaching. Different perspectives on teaching form a source of cognitive conflict. In comparing their teaching behaviors with others, teachers make comparisons, identify, and decide whether to adjust their own teaching behaviors and test them in teaching practice. The second is to reflect on one's teaching behavior such as noting down or recording one's teaching process, viewing the notes, or watching videos afterwards, or recall the process to analyze, judge, and adjust the teaching process. Through reflection, teachers apply the constructed knowledge to the improvement of teaching plan and teaching practice. In general, the learning environment of an online community can support teachers' self-regulated learning in adapting and reflective teaching. Even without collaborative support, teachers can improve their teaching practice through systematic, planned, and reflective self-regulated learning (Butler et al., 2004).

Evaluation and Guidance. Teachers post the teaching plan or teaching process video to the online learning community. Community members analyze the teaching plan or teaching video to point out deficiencies and make suggestions for improvement. In the process, several teachers discuss the same teaching plan or video. The discussion serves as scaffolds for other teachers' development in this conversation. They pay attention to problematic strategies that can arouse peers' thinking, demonstrate peers' understanding of the problem through brainstorming, and form a common problem solution. In this process, expert teachers with teaching experience should give full play to their leading role and guide the direction of discussion.



Case Study 4-6-2-1

Teaching practice exchange and reflection cases based on online community and learning community

1. ***National Teacher Training Network of the Bolivarian Republic of Venezuela***

Teachers use telematics and information technology to exchange experiences and communicate online (i.e., forums, chat rooms, and videoconferencing), as well as share individual and group work disseminated in educational settings anywhere in the country (<https://unesdoc.unesco.org/ark:/48223/pf0000232822>)

2. ***Virtual Community of Practice Thematic Network***

Argentina's professional development plan for teachers includes the use of emerging technologies such as e-mail, e-groups, and virtual platforms to create a tool that allows for communication and collaboration beyond physical distances. In some provinces, these are employed in induction processes (Ministry of Education, Science and Technology, National Teacher Training Institute 2007)

3. ***Brazil Web Conference***

The working group meets regularly online. This activity increases communication and enables teachers to share their work. The coordinator is a qualified teacher selected to oversee the program. The role of the coordinator is to plan, implement, support, and evaluate the work of teachers involved in professional development groups (<https://unesdoc.unesco.org/ark:/48223/pf0000232822>).

4.6.3 Teaching–Learning Model

Teaching is a collective effort. Student learning is the result of intervention by a group of teachers who collaborate with and intervene with students chronologically or synchronously (UNESCO, 2015). At the same time, teachers realize their own development in the process of teaching. *Xue Ji* or *The Note of Learning* is one of the articles in *Li Ji* written in classical Chinese. *Xue Ji* is the first Chinese theoretical works to systematically discuss the issues of education and teaching written between fourth–third century BC. *Xue Ji* stated,

Although there is delicious food, you do not know its deliciousness without tasting it. Although there are profound and perfect truths, you will not know its benefits if you do not study it. Only after teaching others will you realize that there is something you do not understand well. Only when you know your academic deficiencies can you be strict with

yourself. Only when you know what you do not understand can you study tirelessly. Therefore, teaching and learning promote each other. Teaching others can also increase their own knowledge. *Duiming* says, ‘Teaching is half of learning.’ That is what it means.

That is to say teachers are half-teaching and half-learning in the process of teaching and teaching and learning go hand-in-hand with each other.

In the teaching process, teachers present their own understanding of the domain knowledge they teach through teaching design and implementation, and at the same time present their domain knowledge and teaching ability. This process is more of a process of extracting concepts. Student feedback is a very important source of information to distinguish concepts and increase concepts and knowledge integration in this process.

In-service teachers’ professional learning and development activities should integrate with their existing teaching experience and learning needs. Teachers’ own view of students and their teaching methods to meet students’ needs are more significant for students to obtain a positive learning experience. Meeting the needs of students requires cultivating students’ knowledge, skills, emotional attitudes, and values based on disciplines and courses. At the same time, it requires teachers to meet their developmental needs in a way that suits students’ psychological and emotional characteristics. Paying attention to the interaction between teachers and students can improve subject teaching and promote the development of teachers’ professional ability (Zhang, 2015). Its effectiveness reflects in the cognitive development of students. Communication with students enables students to provide feedback on teaching. Teachers improve teaching by reflecting on teaching based on student feedback (see Fig. 4.6).

Designing Instruction. Teachers design instruction and form instruction plans based on the subject’s teaching objectives and the students’ overall learning needs.

Delivering Instruction. Teachers deliver instruction according to the teaching plan. They fully interact with students during the teaching process, and obtain more real student needs through interaction, including practical feedback on the domain knowledge reflected in the teaching content and teaching methods.

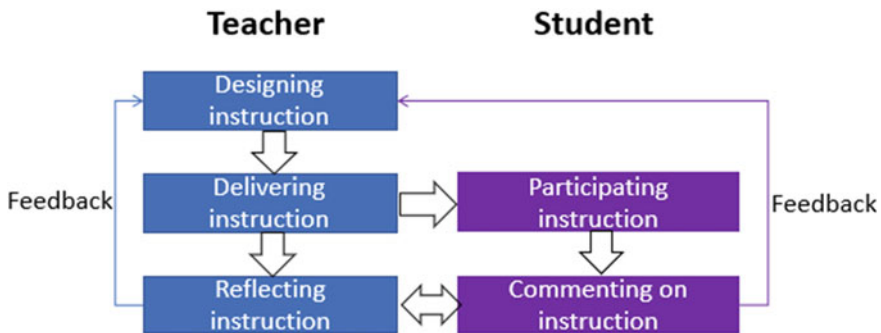


Fig. 4.6 Teaching–learning model flowchart

Reflecting on Instruction. According to the teacher-student activities in teaching and the feedback from students, teachers think about the problems existing in teaching and the confusion generated in teaching. This forms the driving force of learning development as teachers modify and improve the teaching plan and apply it to teaching practice.

4.6.4 Teacher Development Model Based on Adaptive Learning Systems

The development of artificial intelligence and data mining technology provides technical support for teachers to deliver adaptive learning. The adaptive learning system not only provides functional support for teachers' development, but also diagnose teachers' online learning in real time and provide dynamic scaffolds.

Teachers, as learners, have different prior knowledge and learning styles (e.g., field-dependent and field-independent). They also have varying levels of self-regulated learning abilities such as super-self-regulators, competent self-regulators, forethought-endorsing self-regulators, performance/reflection self-regulators, and non or minimal self-regulator (Lucy et al., 2010). In the teachers' online learning process, the adaptive learning system usually has a learning analysis function that monitors and tracks the learning process according to the teacher's learning trajectory. It analyzes the teacher's learning style characteristics, cognitive preferences, and self-adjusted learning level. Interventions such as providing resources in line with their cognitive characteristics and levels, giving learning feedback and suggestions, and recommending learning paths and other learning scaffolds are given. Scaffolds are implicit and explicit (Winne, 2001), conceptual, metacognitive, procedural and strategic (Hannafin et al., 1999; White et al., 2000; Vye et al., 1998), and fixed and adaptive (Azevedo et al., 2004). Ideally, the system would also be able to model effective strategies while monitoring and tracking ineffective strategies' use (or lack thereof). Monitoring would include warnings and feedback to encourage effective strategies and discourage the use of ineffective strategies (Lucy et al., 2010).

The teacher development model based on the adaptive learning system is mainly used for teachers' self-regulated learning. Developing the system requires a lot of work consisting of learner analysis, learning behavior analysis, learning strategy generation rules, and so on. Technology is an important element in the system development process. The quality of the system determines the theory on which technical analysis is based. For the analysis of learning styles, learning styles from different dimensions are analyzed such as field-independent and field-dependent, visual, and auditory, sequential and holistic, and so on. For different learning styles, we should consider what types and forms of learning resources are provided, what learning paths are recommended, and what learning strategies are provided. For the judgment of the teacher's cognitive level, we should judge the learning stage of the cognitive level

in combination with the learning objectives and recommend learning tasks suitable for their cognitive proximal development zone. For the judgment of teachers' self-regulated learning level, we should set judgment standards and indicators, analyze the learning strategies of teachers at different levels, and provide corresponding monitoring and adjustment strategies. The degree of adaptation of the learning system varies due to the maturity of the technology and the richness of teachers' online learning data. The intelligence of the system reflects in the learning analysis and intervention with weak rules. In specific applications, we should consider the degree of intelligence of the system we have, and appropriately supplement the intervention of human tutors.

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Chapter 5

Practices of Teaching Competency Development



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Teachers play the critical role in improving student learning and achievement. What teachers do in the classroom is crucial in this process. Teaching competencies offer teachers practical strategies, practices, and rules to guide teachers in ways to improve instruction that improves student performance and the quality of the work experience. This chapter provided examples of current practices of teaching competency development, including international practices (Sect. 5.1), institutional practices (Sect. 5.2), and individual practices (Sect. 5.3). The seven cases illustrated how the aforementioned theories and models have been applied in different real-life scenarios. It is our hope these cases will inspire you to think teaching competency development in higher education in a new way and guide you to undertake your own practice.

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5.1 International Practices of Teaching Competency Development

5.1.1 *Education for Sustainable Development and Global Citizenship Education in Central Asia*¹

The pandemic has become a major challenge for the higher education system, requiring teachers to adapt to the online learning environment quickly. Advanced training and consultation of university teachers regarding online learning technologies allow teachers to increase teaching efficiency and develop teaching competencies. In this context, UNESCO supported teacher training institutions to train pre-service teachers and in-service teachers' teaching competencies. In particular, the UNESCO Almaty Office conducted two online trainings (August, October 2021) for teachers of teacher training institutions in Central Asia.

Goal: Effective implementation of Education for Sustainable Development and Education in the spirit of global citizenship, as well as to increase the capacity of teachers in the field of application distance learning technologies.

With the advent of the coronavirus pandemic, many countries have faced new challenges in various fields of activity. The world situation required a quick and urgent response to prevent the rapid spread of the infection. Along with the rest of the world, the education system looked for alternatives and effective teaching methods that could be used in the higher education system at the same time. Online distance teaching has become one of such methods. However, its implementation had some difficulties. In addition to the requirements for the technical equipment of teachers and students, namely the availability of a computer, laptop, tablet or smartphone, and a stable Internet connection, one of the main difficulties was the lack of skills in conducting online classes among teachers. Therefore, teachers urgently have had to master distance learning technologies and improve their skills of information and communication technologies. Since 2020, the UNESCO Cluster Office in Almaty has organized online training for teachers in Central Asia on the topic "Implementing education for sustainable development through the use of distance learning technologies." The training was developed to improve the qualifications of higher education personnel.

In addition to tools and services that help teachers quickly adapt to the online learning environment, the training studied topics of the Sustainable Development Goals, teaching methods, competence-based approach, criterion assessment and other topics of interest to teachers. The online training revealed a great interest on the part of teachers in studying the available possibilities of distance learning technologies, including ready-made online services and tools. According to the polls conducted after the training, many training participants used the knowledge gained during the training in their daily practice. In 2021, the UNESCO Almaty Office held

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two online training (in August 2021 and in October 2021) for teachers at pedagogical universities in Central Asia. The main objectives of the trainings were the effective implementation of education for sustainable development and education in the spirit of global citizenship, as well as increasing the potential of teachers in the field of using distance learning technologies.

For the successful implementation of the set goals a program was developed. Participants included three coaches and groups of willing listeners. The target group of training was teachers at pedagogical institutes and pedagogical universities in Central Asia and the South Caucasus. The program was created for 72 h: 36 h of active learning (theory + practical classes, developing and protecting a portfolio), and 36 h of adapting the material and conducting master classes. The program developed content based on the input that surveyed participants provided.

The total number of training participants was 127, including 54 teachers from nine organizations in August and 73 from eight organizations in October. The participants represented three Central Asian countries: the Republic of Kazakhstan, the Republic of Kyrgyzstan, and the Republic of Uzbekistan. After completing the online training, the participants held master classes where they shared the knowledge gained during the training with other listeners. Among the participants were students, teachers, and other stakeholders in these master classes. The number of participants in master classes (appropriation, transfer of knowledge, discussion, reflection) was 252 in August and 352 in October.

Today, competency-based education is a priority to meet both the needs of all students and needs of the labor market, considering national socio-economic priorities. Education for Sustainable Development (ESD) and Global Citizenship Education (GCED) are among the most effective tools for mainstreaming 21st-century competencies, especially through training and skills development for teacher educators in this area.

In this context, UNESCO continues to support teacher training institutions for the training of future teachers and professional development. In particular, the UNESCO Almaty Office conducts online training for teachers of pedagogical educational institutions of Central Asia and the South Caucasus to effectively implement ESD and GCED and become key institutional agents of change in the field of sustainable development. In addition, the planned activities help build on the new ESD Roadmap 2030 adopted at the 40th UNESCO General Conference, as well as on its strategic goal and a priority area for capacity-building for teachers and educators in ESD/GCED. The training is also aimed at enhancing teachers' capacity to use distance learning technologies. During the development of the online training program, the developers focused on the data from the opinion poll of teachers and tried to consider the following methods, technologies, and tools in their training: critical thinking, design thinking, teamwork, competence-based approach, brainstorming, project learning, problem-solving training, storytelling, and criteria-based assessment. During training, Internet services and tools used were ZOOM, Miro board, Google Form, Kahoot, and Wooclap.

The online training program composed of three stages:

1. Premodule—2 academic hours (independent acquaintance with the course program, with the Zoom platform, Google Drive, Miro, 17 SDGs, ESD, entrance testing using Google forms, trial connection).
2. The main module—36 academic hours (streaming lectures, practical sessions, co-teaching, independent work, portfolio defense, reflection).
3. Post module—34 academic hours (updating the portfolio, self-adaptation of course materials, conducting master classes).

According to the idea of the developers, the training was supposed to provide practical skills in the use of materials. Great emphasis placed on practical training of students, both individually and as part of teams, occurred. The main module consisted of streaming lectures held simultaneously for all listeners, and practical sessions in which the participants worked out the acquired knowledge online in real-time. For this, three groups formed for practical exercises. Each group had a separate coach. In turn, within the groups there was a division into subgroups in accordance with the chosen portfolio topic. Each subgroup, which consisted of a maximum of six people, chose a specific SDG to complete practical tasks on the topics of the streaming lecture, and worked out the elements of the portfolio. At the end of the training, each subgroup had to draw up and defend a portfolio constructed on the training materials covered. In accordance with the conditions of the training, those participants who wished to receive a Certificate for 72 h had to conduct a Master Class within a month to share the knowledge gained at the training. Thus, the skills of practical mastery of new material worked out several times in the training. An entrance diagnostic questionnaire had been developed to target the participants' needs more effectively. According to the survey results, almost all participants (96% of those who passed the survey) were familiar with sustainable development goals. The majority (74% of participants) already had experience in conducting sessions on the topics of the Sustainable Development Goals. This also testified to the practical importance of the developed training course.

The answers to the question about the most pressing problems of distance learning showed the following. First, technical issues related to the quality and access to the Internet (58%) caused greatest difficulties, which aggravated educational institutions located in the regions. The second issue was inactive students during classes (42%). Lack of time for teaching distance learning methods (30%) was also noted as one of their significant problems. All these points were considered when developing the training program. During the training, the students mastered the methods, technologies, and tools that allowed effective distance learning, and involved students in the process of discussing and completing assignments. In completing practical tasks, the participants discussed how the proposed methods and tools helped increase students' active participation and involvement in the educational process. This situation demonstrated the importance of trainings and seminars on distance technologies with a practical orientation and the possibility of further implementation in the educational process.

Analyzing the needs and preferences in the choice of topics for online learning was important. The analysis helped trainers to place greater emphasis on discussing relevant and interesting issues in the learning process. The listeners answered the question of the questionnaire: “What topics within the framework of ESD would you like to study in the framework of this training Distance Education?” The most three important topics for listeners were: interactive exercises (noted by 62% of the listeners), case technologies (56%), and SMART goals (44%). We would like to note that Bloom’s Taxonomy, which became the foundation in the methodology for developing assessment criteria in this training program, also aroused significant interest among the listeners with 38% (and ranks fourth in the survey). The listeners’ answers regarding this issue allowed the trainers to facilitate the process of completing practical tasks on the development of assessment criteria using Bloom’s taxonomy. Participants could jointly develop educational goals and assessment criteria in groups, expressing their opinions and sharing their practical experience in this direction. Worth noting that during the streaming lecture held on the Zoom platform, all groups participated in the same conference from 10:00 a.m. to 11:20 a.m. At 11:30 a.m.–12:50 a.m., as well as at 2:00 p.m.–3:20 p.m., session rooms were opened for practical sessions, which were held using the Miro application, where forms for completing practical tasks were developed and formed in advance. During the lecture and practical sessions, attendance was checked. An important condition for certification was participation in 80% of the classes.

Mini groups of participants formed during training to develop proposals on how to achieve the SDGs. The facilitating trainers paid special attention to how each person completed even the smaller actions. Regardless, the actions aimed at improving the situation in society, ecology, and economy. As a result, the training participants developed products that could be implemented and thereby, contribute achieving the SDGs. There were proposals for the development of courses, creating schools for a healthy lifestyle, access to on-line visits to museums, teaching the elderly to use online applications, organizing courses for the public, and more. Colleagues formed mini communities, shared their knowledge with each other, and performed group tasks together.

The defense of the portfolio took place on the last day of training in an online format. The portfolio contained ready-made materials suitable for further master-classes in the field. The participants asked many questions and expressed their opinions and wishes. Worth noting during the defense process, many participants planned joint events and indicated a desire to continue cooperation. Within a month after the training, the participants held master classes in their organizations on the topics of their portfolios.

During on-line training, one of the fundamental problems that obstructed the dynamic process was listeners’ different level of ICT competencies. Participants noted the problem as they were asked to divide into groups according to the degree of Information and Communication Technology (ICT) proficiency at future trainings. As the reality showed before the pandemic, teachers did not actively use ICT in the classrooms. The rapid transition to distance learning revealed such technical problems.

We would like to share a case study to demonstrate difficulties that occurred. In one of the subgroups, there were two older teachers not confident in their ICT skills. They were experienced teachers who knew and taught their subject for a long time and thus, had significant experience and knowledge. Due to their age, before the pandemic, they did not face the need to teach using modern Internet technologies and online tools. During the pandemic organizations created and sent them links to online platforms like Zoom. Teachers logged in using links and conducted classes without actively using possible Internet services and tools. In our training, it was rather difficult for them to carry out practical tasks as they had problems using almost every technology tool. At the beginning they had difficulties with screen sharing, clicking on links, and they did not immediately figure out where the general chat was located. They also had problems working with the on-line whiteboard because it was not clear how to move objects, print text, and place information/images.

Further, when working in services that required initial registration, they also encountered difficulties. The trainers had to devote a lot of time in explaining and demonstrating step-by-step to complete the task (e.g., hover the cursor over an object, press the left/right mouse button, listen to my voice, and move the cursor up, then left). It took a lot of time and slowed down the dynamics of the whole group's work. Unfortunately, this particular situation was no exception. A significant proportion of older teachers also did not have good ICT skills. Limited skills were due to several reasons:

- Previously, teachers were not required to have knowledge of ICT.
However, offline training made it possible to do without the specified knowledge.
- Not all teachers are psychologically ready to use ICT in the educational process.
- Lack of clear guidelines on using existing Internet resources and online opportunities existed.
- Lack of time existed for the working teacher. They have a lot of paperwork and reports.
- Lack of a clear understanding that the available technological capabilities would help create their own electronic content (presentations, video lectures, electronic surveys, on-line quizzes, tests, etc.) that could reduce the time (e.g., for checking tests) and increase engagement students existed.

The creators of the training also conducted surveys among students aged 14–23. The survey results indicated that young people were much more interested in learning when a teacher used interactive games, explained complex topics with simple examples, used case studies, motivated with their own stories, and used humor and famous quotes. Young people noted that boring, non-stop lectures did not contribute to better understanding of the materials and were often annoying.

Considering the above, the developers of the training would like more teachers to work on improving the presentation of the material, use interesting forms of online quizzes when assessing the level of assimilation of the material, conduct online brainstorming sessions, and use design thinking approaches in the learning process.

To solve the above problems of teachers with a low level of ICT competence of teachers, we offered the following solutions (as competence develops from basic to advanced):

- Know the current digital educational resources on the Internet.
- Select and use the necessary tools and resources to work under the assigned training objectives.
- Confidently use the selected distance educational tools and services (e.g., online platforms, online boards, online educational services).
- Process and present information in an effective form for solving educational problems and compose their own educational content.
- Choose the form of transmission of information to students.
- Effectively use tools for organizing student learning activities (e.g., testing programs, electronic workbooks, systems for organizing student learning activities).
- Organize various alternative forms of online student work by combining available resources. Create unified programs on one topic using various online resources, and Design Thinking methods.
- Share knowledge of online educational technologies with other teachers and recommend the most successful and effective tools. Conduct collaborative training with other teachers from different institutes and countries.
- Select content suitable for the most effective distance learning technology that are of interest to students.

In conclusion, we would like to note that feedback received from the participants of the training indicates that this kind of training was an effective way to develop Education for Sustainable Development (ESD) and Global Citizenship Education (GCED). With such platforms, teachers not only learned new distance learning technologies, but also exchanged knowledge, and created communities of like-minded people who would be able to implement new ideas and projects in the interests of ESD and GCED. According to the feedback of the training participants, they created communities to discuss the SDGs. The course material generated from the training was actively used in work. Online tools presented at the trainings were integrated, and participants had publications on the topics of the SDGs and GCED. Teachers needed to improve their soft skills and competencies, and such trainings provided them an opportunity to do it. They practically pumped-up skills and tested various tools including online services and tools. The training program developers hoped that the knowledge transferred during the training regarding SDGs helped teachers conduct their online classes more interestingly and effectively.

5.2 Institutional Practices of Teaching Competency Development

5.2.1 *Three-Stage Developmental Path of Teaching Competencies*²

Problems and Challenges

Shandong University of Technology (SUT) is located in Zibo, Shandong Province. It is a multidisciplinary university focusing on science and engineering. Students in Electrical Engineering and Automation and Electronic Information Engineering programs must take “Analog Electronics” as a foundational course. The course is designed for the second-year students and includes 64 credit hours and four credits. Students must also take Advanced Mathematics, Introduction to Physics, and Electric Circuits as prerequisites that provide them with fundamental electrical knowledge and skills to build and assess basic circuits. Students enjoy collaborating and experimenting with new technologies, and many gain knowledge from literature reviews and independently analyzing and solving problems. However, students may find applying theories to the practical problems challenging because the course focuses on new concepts and formula derivation. Furthermore, students have limited opportunities in the course to perform experiments making it harder to develop skills in solving complex engineering problems.

As a result, traditional teaching-centered classroom instruction with only summative assessments at the end can no longer meet students’ needs. Technology-enhanced instruction provides students with flexible, individualized, and independent learning opportunities. Teachers who take advantage of technology and innovative teaching methods can effectively motivate students and enhance their independent learning skills and outcomes. Some issues instructors encounter in implementing technology-enhanced teaching are as follows:

- (1) Outdated teaching philosophy and lack of technology integration pedagogy.
- (2) Inadequate competencies in designing and developing digital learning resources, particularly video editing software.
- (3) Insufficient proficiency in using “circuit simulation” software.
- (4) Inadequate skills in effectively using Learning Management System (LMS) and its tools in teaching.
- (5) Lacking experience in using technology to motivate students and encourage online interaction.
- (6) Insufficient capabilities for analyzing and utilizing educational data.

² Authored by Weimei Li, Hui Zhou, Yan Zhang, Xueting Liu, and Lei Ding, Shandong University of Technology, China.

Strategies for Promoting Teacher’s Teaching Competencies

As a result, SUT proposed the following three phases for developing teaching competencies. In phase one, teachers first must become aware of the benefits of using technology in teaching. Then, they begin to incorporate technology tools into their teaching and grasp the principles of applying technology in curriculum. In phase two, teachers have intermediate technology integration skills in teaching. They develop instructional content in the course and build relevant digital resources. In the last phase, teachers design, implement, and evaluate technology-enhanced instruction, exhibiting advanced skills in applying technology in teaching.

Promoting Awareness of Applying Technology in Teaching (Phase one)

This phase emphasized the benefits of using technology in teaching. It encourages teachers to study pedagogies of technology integration and assists them finding characteristics and requirements of using technology in teaching. Teachers could recognize new teaching approaches by studying Bloom’s Taxonomy and technology attributes. Teachers attended several conferences, meetings, and training programs to improve their awareness of technology integration in education. Teachers could shift from a “teaching-centered” to a “learning-centered” approach, integrate in-class and out-of-class activities, use formative and summative evaluations, and adopt online synchronous and asynchronous channels using technology.

SUT teachers have a preliminary understanding of the technology-enhanced teaching methods to provide learner-centered, competency-based, and continuously improved education for their students. Methods include flipped classrooms and connecting pre-class, in-class, and after-class activities and assignments. SUT also invited experts and experienced teachers to provide training on how to organize an effective technology-enhanced classroom.

Curriculum and Information Technology Integration (Phase two)

This phase involves setting up a curriculum team, organizing instructional content, building curricular resources, improving teachers’ competencies in designing and developing online instructional resources, and using “virtual circuit simulation experiment” software. The curriculum team for this phase comprises five groups: curriculum planning group, video recording and editing group, question bank group, experiment design group, and Q&A group. The curriculum leader is in charge of summarizing essential instructional content in the course. The video recording and editing group are responsible for recording and editing videos around knowledge points. The question bank group is responsible for creating exam banks and designing homework. Finally, the experiment design group oversees designing experiments using “virtual circuit simulation experiment” software.

Based on Bloom’s Taxonomy, the curriculum team develops learning outcomes, proposes learning content, and creates appropriate assessments. The team also determines the teaching approach, implementation plan, and learning guides. Video lectures, PowerPoint slides, electronic teaching plans, virtual simulation software, experiment films, and other instructional tools are used throughout the course.

Various assessments used in the course included online exams, online assignments, in-class questions, group discussions, circuit design, virtual experiments, and physical experiments.

At SUT, the learner-centered instructional design encourages students to learn independently, provides them with opportunities to practice what they have learned, and assists them in developing their knowledge and solutions to practical challenges. Helpful instructional design resources include students' self-study work sheets. Instructional design templates provide assistance in the course. Faculty can use the instructional design templates to analyze essential teaching context, situational factors, teaching content, instructional goals, instructional resources, and activity plans. Furthermore, building technology-assisted curricular resources for students is needed. Resources such as micro-course videos, question banks, software for "virtual circuit simulation experiment," supplementary instructional resources, and MOOC-specific resources assist in learning the material.

Innovative Technology Integration in Teaching (Phase three)

Innovative technology integration in this phase led to innovative teaching approaches, instructional design, and teaching evaluation. SUT applied flipped classroom, problem-based learning, and collaborative learning approaches in their teaching. SUT also provide opportunities for students to apply theoretical knowledge in their physical and virtual experiments. The team also designs various projects for students to complete on their own. The following are brief introductions of the many innovative approaches:

- Flipped classroom: Purposefully connecting pre-class, in-class, and after-class activities and assignments.
- Problem-based learning: Guiding students to learn to ask questions and using those questions to guide instruction.
- Collaborative learning: Promoting various group projects and rotating group leaders.
- Combining teaching and experiments: Encouraging applying theoretical knowledge in experiments, internships, projects, and exams.
- Virtual experiments: Applying virtual simulation in the entire curriculum.
- Promoting learning on three levels of cognition: Concept discussion-application of foundational theories and principles-collaborative group work.
- Project-based design: Students complete the projects independently with scaffolding support.
- Application of innovative teaching in practice: Cultivating students' innovation by integrating instructional activities with research and science competitions.

SUT encourages students' interest in autonomous, collaborative, and research-based learning by using diverse teaching methodologies on distinct course topics. As a result, students improve their analytical and problem-solving skills at the same time.

Innovative Instructional Design and Course Delivery. SUT also adopted the hybrid teaching mode to guide students with inquiry-based and personalized learning. Online synchronous and asynchronous opportunities are provided to help connect before-class, in-class, and post-class activities. Varied activities in the class include learning guidance, lectures, tests, discussions, project design, simulations, content presentation, and extension activities. These activities enhance students' capacities to learn, consider, express, collaborate, query, and solve problems. Besides, SUT also used many evaluation methods such as student participation, learning satisfaction, exam pass rate, and accomplishment of learning outcomes. The evaluation findings help adjust teaching strategies as needed.

Innovative Teaching Evaluation. Additionally, SUT developed its comprehensive evaluation system to promote formative evaluation and competency development. Evaluation criteria to grade each assessment is used. Formative and summative assessment account for 50% of the final grades. Summative assessment is a closed-book exam at the end of the semester. In contrast, formative assessment comprises of class interaction, online tests, online self-directed learning, physical experiments, flipped classroom, assignments, and virtual simulations. Teachers assign challenging discussion topics and projects to help students enhance their capabilities and innovations to solve complicated engineering problems.

Impacts of Faculty Development

Faculty development strategies at SUT, such as training on technology use, hybrid teaching, and instructional monitoring, have improved the faculty's technology integration and course facilitation skills. The faculty's efforts are recognized with many provincial teaching awards, and students have highly rated this lab. Through the implementation of the young teacher training plan, young faculty have grown rapidly and received several awards in teaching competitions.

Team members effectively integrate technology into their teaching and skillfully use online teaching platforms and instructional tools. According to a recent poll, more than 95% of teachers felt they could skillfully develop micro-lessons, analyze the data collected in-class activities, and offer timely feedback to students. At the same time, they have also developed their instructional design capabilities and earned awards in instructional design and innovative teaching competitions.

On the other side, students also demonstrate more enthusiasm toward class activities and their grades have improved yearly, thus decreasing failure rates. The survey results indicated that more than 92% of students were satisfied with the course. The change also has led to enhancing their learning interests, independent learning, vocal expression, teamwork, and problem-solving capabilities.

Reflections on Team-Based Strategies Summary

The three-phase strategies for developing SUT teachers have led to the continuous development of their teachers' competencies in instructional design, technology usage, course delivery, teaching evaluation, research, and innovation. As the team comprises of engineering faculty, further study should determine if the team-based strategies might work in other disciplines or universities. Furthermore, SUT needs to

improve its online teaching platforms and smart classrooms to encourage the use of technology in teaching. The university should also monitor activities such as visiting physical or virtual classrooms, expert reviews, and student evaluations. Finally, the university should regularly hold instructional design contests, micro-course competitions, young teacher lecture competitions, and other technical competitions to encourage their instructors' continual progress.

5.2.2 Teaching Competency Development in Blended Learning³

Yangzhou University is a comprehensive university in Jiangsu Province. Since 2007, the university has promoted online teaching initiatives and trained its teachers to teach and deliver online and hybrid courses. Their instances of hybrid teaching have been included in UNESCO's "Hybrid Teaching White Paper."

Problems and Challenges

Yangzhou University analyzed its educational data on the online platform from 2007 to 2015 in 2016 to evaluate its curriculum development and implementation. Although they found that online courses have been extensively offered at the university, many online courses did not provide opportunities for students to apply new knowledge inside or outside the classroom. There were also limited teacher feedback and online interaction in their online courses. Furthermore, they found that the university's policy on online teaching focused more on the number of online courses rather than the quality assurance of the online offering. As a result, teachers have passively used the online learning platform, which was not an essential component of their teaching.

At the same time, most of their teachers lacked sufficient training in designing and teaching online courses. The university primarily organized faculty development opportunities, and faculty did not take many initiatives to apply training content and technology to their teaching. As a result, Yangzhou University decided to offer new initiatives to promote their teachers' digital literacy and hybrid teaching competencies and to engage them in effective and sustainable faculty development opportunities.

Teaching Competency Development Strategies at Yangzhou University

An "Online + Onsite" Mode of Digital Literacy Development

With the rapid development and widespread use of technology, many school administrators have realized that faculty is the key to the effective use of ICT in education. Therefore, Yangzhou University has adopted an "online + onsite" training mode to motivate faculty and promote their digital literacy.

³ Authored by Jiali Wang, Yangzhou University, China.

A Systematic Training Program to Promote Hybrid Teaching Competencies

Yangzhou University also developed a systematic training program to promote teaching competencies. The training program considers classroom delivery issues, teachers' pedagogical and technical challenges, and diverse needs in implementing hybrid teaching. The training program's 14 themes cover the instructional design, development, implementation, and evaluation phases (see Table 5.1). The program helps teachers develop skills in hybrid teaching, teaching evaluation, quality assurance, and personalized instruction based on learning analytics.

At the same time, Yangzhou University offered hybrid training for faculty to learn on their own time online and then gather to discuss their experiences. Teachers meet initially to learn about the training goals and tasks, and then complete the program online over 15–20 days. They meet again to share their experiences and discuss cases of hybrid teaching. The program provides teachers with an excellent opportunity to experience hybrid teaching from the student perspective, which may be used later as a model for their hybrid teaching later.

Innovative Training Methods to Motivate Faculty

To encourage teacher participation and ensure the effectiveness of their training, Yangzhou University adopted a system that allows teachers to schedule appointments based on their availabilities. The program used the inquiry-based approach to engage and guide teachers with questions and problems. Ninety-five percent of the teachers have completed the trainings.

The training program also employs various activities such as discussions and seminars to engage teachers. Each training theme focuses on a particular topic and engages teachers with questions at hand. In addition, teachers can gain hands-on experience with new technology throughout the training to apply it to their classrooms. Teachers can also connect with each other using various communication tools such as WeChat and QQ. Furthermore, Yangzhou University has collaborated closely with its industry partners, such as LMS suppliers to offer collaborative and sustainable training for their teachers.

Impact and Summary

The hybrid teaching initiatives at Yangzhou University have greatly motivated teachers to participate in the hybrid teaching training and apply it to their classrooms. Since spring 2015, the university has offered the program 119 times, with 2625 participants and a 100% satisfaction rate. Faculty have found that the training classes and online QQ groups are excellent forums to share their hybrid teaching experiences. Though the pandemic significantly disrupted the educational experience, teachers who had completed the trainings earlier expressed that they had the least impact due to their hybrid training experience. In addition, the flexible and targeted training program has positively influenced the academic community on campus. Yangzhou University and its teachers have won many national and provincial awards in teaching reform competitions and others.

Table 5.1 Training modules for developing hybrid teaching competencies at Yangzhou University

Hybrid teaching competencies	Training themes	Main content	Audience
<ul style="list-style-type: none"> • Motivation for achievement • Teaching reflection • Information literacy 	Application and questions on Learning Management System (LMS)	<ol style="list-style-type: none"> 1. Online asynchronous learning challenges 2. Getting started 3. LMS application tips 4. Q&A 	Teachers who want to learn to how to use LMS to teach online
<ul style="list-style-type: none"> • Curriculum design • Innovative spirit • Information literacy • Continuous improvement 	LMS-based personalized course design	<ol style="list-style-type: none"> 1. Why do we offer hybrid courses? 2. How to design a hybrid course? 3. Developing instructional resources and activities in LMS 	Teachers who want to build a high-quality hybrid course in LMS
<ul style="list-style-type: none"> • Information literacy • Continuous improvement 	Designing and developing online instructional resources	<ol style="list-style-type: none"> 1. What online resources do learners need? 2. How to present Word, PowerPoint, and video/audios to students? 	Teachers who want to make full use of current instructional resources
<ul style="list-style-type: none"> • Innovative spirit • Information literacy • Continuous improvement 	Designing your micro-lessons	<ol style="list-style-type: none"> 1. How to plan micro lessons? 2. How to lecture in front of the camera? 3. How to use a recording classroom for micro-lessons? 	All teachers
<ul style="list-style-type: none"> • Innovative spirit • Information literacy • Continuous improvement 	Developing micro-videos in hybrid courses	<ol style="list-style-type: none"> 1. What is a micro-lesson? 2. How to use Camtasia to design a micro-lesson? 3. How to use micro-videos in LMS? 4. Production of other micro-resources 	Teachers who want to learn how to create micro-resources

(continued)

Table 5.1 (continued)

Hybrid teaching competencies	Training themes	Main content	Audience
<ul style="list-style-type: none"> • Teaching reflection • Maintain interaction • Learning analytics • Hybrid teaching strategies 	Designing effective online interaction in hybrid teaching	<ol style="list-style-type: none"> 1. How to design effective online interaction? 2. Principles and strategies of designing effective online interaction 3. Follow up on online interaction asynchronously 	Teachers who want to promote their students' online interaction
<ul style="list-style-type: none"> • Teaching reflection • Maintain interaction • Learning analytics • Hybrid teaching strategies 	Promoting class participation in LMS	<ol style="list-style-type: none"> 1. The Use of LMS App in teaching 2. Improving class participation with technologies 	Teachers who want to improve their class participation with tools
<ul style="list-style-type: none"> • Evaluation literacy • Maintain interaction • Quality assurance • Teaching reflection • Learning analytics 	Adjusting teaching based on data analytics	<ol style="list-style-type: none"> 1. Data analytics in LMS 2. Data-informed curriculum redesign 	Teachers who want to learn how to use data analytics to improve their teaching
<ul style="list-style-type: none"> • Teaching reflection • Information literacy 	Use of new features of LMS to enhance hybrid teaching	<ol style="list-style-type: none"> 1. Updated LMS functions and features 2. Case studies—how to use LMS to design high-quality hybrid courses 	All teachers
<ul style="list-style-type: none"> • Motivation for achievement • Maintain interaction • Evaluation literacy • Teaching reflection • Quality assurance 	Research-based teaching in LMS	<ol style="list-style-type: none"> 1. Why do we need research-based teaching? 2. Manage research-based teaching with LMS 3. Experience sharing and exchange 	All teachers who want to know how to conduct research-based teaching

(continued)

Table 5.1 (continued)

Hybrid teaching competencies	Training themes	Main content	Audience
<ul style="list-style-type: none"> • Evaluation literacy • Maintain interaction • Quality assurance • Teaching reflection • Learning analytics 	Assessment and evaluation of hybrid courses	<ol style="list-style-type: none"> 1. Strategies for assessing and evaluating hybrid courses 2. How to set and evaluate using LMS? 3. Experience sharing and exchange 	Teachers who want to learn how to assess and Evaluate hybrid teaching
<ul style="list-style-type: none"> • Motivation for achievement • Teaching reflection • Hybrid teaching strategies • Information literacy 	Guest speakers on LMS use in hybrid teaching	<ol style="list-style-type: none"> 1. Best practices of hybrid teaching 2. Impacts of hybrid teaching 	All teachers
<ul style="list-style-type: none"> • Teaching reflection • Hybrid teaching strategies • Information literacy 	Application of mind-mapping tools	<ol style="list-style-type: none"> 1. What is mind-mapping? 2. How to create mind-mapping? 3. The application of mind-mapping in teaching 4. Case studies on mind-mapping 	Teachers who would like to learn how to use mind-mapping in teaching
<ul style="list-style-type: none"> • Hybrid teaching strategies • Maintain interaction • Information literacy 	How to use a smart classroom?	<ol style="list-style-type: none"> 1. How to use a smart classroom for group activities? 2. Case studies on using smart classrooms 	All teachers

In summary, faculty are critical in implementing new educational initiatives and reforms. Collaborative support from departments, librarians, instructional designers, faculty developers, and instructional technologists is essential to support faculty design and deliver compelling learning experiences for students.

5.2.3 Teaching Competency Development in Local Professional Community⁴

Regional Community for Teacher Development

Yantai University is a comprehensive university in Shandong province, which Peking University and Tsinghua University have jointly built. Yantai University has led the efforts of establishing the alliance of universities in Northern Shandong Province to expand its academic impact, facilitate school-enterprise collaboration, and promote regional economic and social development.

Qingdao, Yantai and Weihai are the three major cities on the Jiaodong Peninsula in Northern Shandong Province. The three cities are close in proximity with comparable situations. Therefore, establishing the university alliance in this region can significantly encourage further academic exchange and collaborations.

Current Situations and Challenges

All the allied universities have established their teacher development centers and identified the unique approaches to promoting teacher development. Each university has its programs and lessons gained in developing academic programs and faculty development. The experience makes them eager to collaborate and exchange ideas and recommendations.

To promote teacher development, the alliance of universities in Northern Shandong Province established to encourage and support programs and services such as new faculty programs, teaching consultations, Scholarship of Teaching and Learning (SoTL), and regional resource sharing. Historically, teachers at Yantai University have been placed a greater priority on their research, and many do not spend as much time on teaching competency development. Therefore, the regional community for teacher development can greatly help its community members exchange best practices, new SoTL research studies, teaching pedagogies, and teaching techniques. In this way, each member university effectively and efficiently supports its faculty.

College teachers should continuously enhance their professional knowledge and abilities to meet the growing need for interdisciplinary research. This regional community for teacher development provides an excellent platform for teachers to meet other teachers from various disciplines. The relationship helps them expand the breadth and depth of their knowledge. Teachers are encouraged to reflect on their experiences within the regional community. They can address difficulties through collective wisdom, resulting in enhanced teaching competencies. Teachers have volunteered to engage in community activities, and the community operates through a shared responsibility to assure equal rights.

⁴ Authored by Enjing Guan, University of Health and Rehabilitation Sciences, supported by Yantai University, China.

Building Regional Community of Practice for Faculty Development

The alliance holds high-end forums and general meetings of all members regularly. The alliance committee oversees hosting and organizing meetings, and the committee chair is elected on a rotating basis. The alliance meetings usually involve new faculty development, faculty training programs, curriculum development, teaching competitions for young teachers, and the establishment of faculty development centers. All members participate in the meetings and discuss issues on teacher development.

The alliance also creates an expert database that includes recipients of teaching achievement awards, principal investigators of teaching research projects, excellent teachers and their teams, and others. Those experts have joined task forces to support faculty development by advising faculty development, training teachers, reviewing teaching awards, evaluating teaching and research projects, and so on. In addition, the alliance has also organized and offered several webinars by inviting experts from top universities such as Peking and Tsinghua universities.

At the same time, a teaching practice platform exists to promote widespread communication within the alliance. New teachers engage in activities such as curriculum development, creating micro-courses and MOOCs, and more. Topics such as these considerably improves their ICT skills in teaching. Students also benefit from the network as they can choose from various courses offered by numerous universities within the alliance.

The Impact of Regional Community for Teacher Development

The alliance of universities in Jiaodong Peninsula is the first regional community for teacher development in Shandong Province. The high-quality resources and best practices have contributed to faculty development in the region and serve as models for others in the country. The establishment of the alliance encourages regional universities to co-create and share resources among its members. It also greatly enables them to collaborate with other faculty and students. Finally, the allied cooperation aids its member universities in effectively promoting curriculum development and faculty development.

The regional community for teacher development has also helped regional institutions in their attempts to establish teacher development centers. Based on the experience of other member universities, those teaching centers have clearly specified their roles, offered more faculty development programs and services, and played a more vital role in training their faculty.

Summary

As there are no existing models or norms to follow, this regional community for teacher development has promptly adjusted its operation plans based on formative input and results. Thus, teacher development in regional community encourages efforts to build more comparable communities for faculty development and establish a set of adequate standards and procedures.

The uneven state of faculty development within the alliance is a roadblock to effectively forming a regional community for faculty development. Although the regional

community's fundamental structure has been established, more comprehensive and practical solutions are needed to balance member institutions' efforts to improve faculty teaching competencies. Furthermore, critical is to develop a systemic mechanism for developing regional communities for teacher development. More efforts are needed to find new approaches to developing regional communities and supporting innovative curriculum design.

5.2.4 Teaching Competency Development in Learning Community⁵

Founded in 1958, Inner Mongolia University for Nationalities (IMUN) is a comprehensive university located in Tongliao, in the eastern part of the Inner Mongolia Autonomous Region. With a diverse range of academic programs, including 79 undergraduate programs, IMUN has graduated over 190,000 students. Intending to become one of the top regional universities in China, IMUN has made significant efforts to promote its educational reform and teacher development. There are two challenges in developing teachers' teaching competency in IMUN.

First, deeply rooted teacher-centered teaching philosophy. Teachers in higher education have long been accustomed to the teacher-centered teaching philosophy that places them at the center of the stage with students as the audience. Teachers have placed a greater emphasis on how to teach and finish a teaching assignment than on students' ability to engage, reflect, and apply what they have learned. Traditional teaching methods failed to motivate students, stimulate their curiosity, or develop their learning potential, making it difficult to cultivate their independent learning skills, teamwork, or innovation spirits.

Second, four essential professional competencies are underdeveloped. The first issue is a lack of definition of teaching competency. Influenced by the wrong historical value of emphasizing "research" above "teaching," new teachers have not had sufficient teaching competency nor aware of the importance of cultivating this skill. Teaching is regarded as a simple task and faculty have been teaching the same way for years without much improvement or innovation. As a result, teachers' enthusiasm for teaching has waned, and they have gradually burned out their teaching interest and creativity. Second, an insufficient competency of incorporating ICT in teaching exists. Applying ICT tools in the traditional classroom is an effective approach of innovative teaching in the information age. However, many teachers are not able to innovate their instruction with technology. Third, engaging students with obsolete teaching methods have been used. Teachers are accustomed to the traditional teacher-centered approach and unaware of other innovative teaching approaches. Teaching approaches such as inquiry-based, discussion-based, or problem-based methods can open opportunities for improved student learning. Instead, lectures dominate the classroom with little attention for students' reactions. Fourth, there are inadequate

⁵ Authored by Jun Ren, and Huaiyu Liang, Inner Mongolia University for Nationalities, China.

competencies to adjust teaching promptly. As a result, many college teachers cannot actively adapt their teaching in response to changes in the external environment. For instance, the worldwide COVID pandemic has forced many educators to adopt online instruction quickly without much planning and support. Without reflecting on their current teaching and the ever-changing environment, they cannot timely adjust and update their teaching methods or skills based on the formative feedback.

Developing Teaching Competency in Learning Community

Strategies used to develop teaching competency in learning community include developing standard-based faculty development, promoting instructional research and practice, enhancing technology integration skills, incorporating teaching competitions into faculty development programs, and establishing institutional incentives to promote faculty development.

Developing Standard-Based Faculty Development

IMUN released several institutional policies to support their faculty development such as the Pre-employment Training Plan for New Faculty and Implementation Plan for Faculty Competency Development. Those policies established standards for teacher development, linked pre-employment and on-the-job trainings, offered on-campus and off-campus training options, and delivered training via both in-person and online platforms. Those approaches have greatly changed teachers' teaching philosophies by broadening their horizons and enhancing their teaching competencies.

To enhance their learning-centered teaching pedagogies, new teachers at IMUN must complete a semester-long training program. The program includes various activities such as seminars on foundational theories and pedagogies of teaching in higher education, classroom observations, and teaching skills practice and assessment.

New instructors must submit a three-year teaching development plan after passing the exams approved by their department before sent to the Teacher Development Center. The Center staff works closely with the faculty to provide support. The provost's office randomly selects several new faculties to offer teaching demonstrations and only those who have passed the demonstration can begin teaching. Three hundred and sixty-seven faculty have given teaching demonstrations in the past five years, with an initial pass rate of 81.2%. Since 2015, IMUN has sent 614 faculty to attend trainings in various locations. In addition, more than 40 educational experts have been invited to provide intense training sessions for their faculty. IMUN also purchased many online faculty development training resources to support their faculty development.

Promoting Instructional Research and Practice

To encourage faculty to apply educational research to their teaching practices, IMUN published their Management Plan of Educational Research and Practice, and allocated funds every year to support faculty in conducting instructional research based on their teaching. Faculty have also been encouraged to apply for regional and national educational research funding. IMUN faculty have received 217 regional and

national funding in the last five years for their academic research projects. The IMUN Teaching Development Center has also collaborated with various colleges, departments, and other key offices on campus to invite educational experts and receipts of various teaching awards and funding to share their experiences. Since 2015, IMUN has sponsored 133 teaching workshops with more than 5200 participants. They have also scheduled 23 teaching observations with a total of 2400 participants. Those research projects and instructional practices have greatly improved their teacher teaching competencies.

Enhancing Technology Integration Skills

As part of their teaching reform initiatives, IMUN released their Hybrid Teaching Implementation Plan and offered trainings to enhance their teachers' skills of integrating technology in teaching. Since 2016, a total of 476 teachers have attended 12 training sessions. In addition, more than ten national experts shared cases and examples of the effective use of technology in teaching. Those trainings have encouraged faculty to actively apply technology in their hybrid teaching by using both in-class and online platforms, as well as engaging students through pre-class, in-class, and after-class activities.

Incorporating Teaching Competitions into Faculty Development Programs

To promote their teacher teaching competencies and enhance learning outcomes, IMUN hosts institutional teaching competency contests on various topics, including instructional design, micro-lesson creation, syllabus development, quality teaching materials, and lectures. In the past five years, 1063 faculty have participated in a series of teaching competitions, which have substantially motivated teachers to develop and facilitate engaging and effective technology-enhanced learning experiences. At the same time, many instructors benefit from the rich teaching experience of others, thus allowing them to update their teaching methods continuously.

Establishing Institutional Incentives to Promote Faculty Development

IMUN also issued many policies and established a system to acknowledge teachers' efforts to improve themselves. For example, they set up 43 teaching awards in eight categories to inclusively recognize diverse accomplishments. The awards apply in their tenure review or for other recognition. Since 2015, more than 400 faculty members have won teaching awards for their exceptional teaching efforts and skills. Those incentives have greatly motivated teachers to invest more time into teaching and research that continuously enhances their teaching.

Summary

IMUN's faculty development efforts have helped faculty transform from a "teaching-centered" to "learning-centered" instructional approach. Teachers are able to use technology to connect "pre-class," "in-class," and "after-class" activities, which enhances student learning outcomes and independent learning capabilities. IMUN's faculty development model for hybrid teaching educational reform is used at other

universities. In addition, the university has also received many national prizes in recognition of its teaching reform efforts.

Many faculties have improved their teaching methods and integrate technology tools into their teaching as a result of their efforts in teacher development. Student ratings of outstanding teachers have steadily increased from 89.9 to 98.38% over the last five years. A few exceptional teachers have been identified, and their examples of using technology effectively in teaching are extensively shared with other universities and teachers. More than 54 faculty have received national and regional teaching awards, and several invited to share their experiences at national teaching conferences.

At the same time, IMUN's faculty development efforts also improved learning experiences and outcomes. According to a research study, 93.7% of students felt that hybrid teaching increased learning quality while 92.6% of faculty believed it improved teaching effectiveness. Further, 83% of experimental classes performed better than the control classes. The number of students admitted to the graduate school grew by 98.6 from 431 in 2015 to 856 in 2020. In addition, students have also won many national and regional prizes in various competitions. The employment rate of their graduates has continued to increase from 87.6 to 93.5%.

IMUN teachers' competencies in integrating ICT tools into their teaching have significantly improved thanks to their learning-centered faculty development efforts. During the pandemic, the university's teaching has remained unaffected as the teachers have already been prepared to teach online. Students rated their remote learning experience with a student satisfaction rate of 93.8%. The preparation and training activities of the IMUN faculty demonstrate success.

5.2.5 Teaching + Learning Commons at University of California, San Diego⁶

The University of California, San Diego (UC San Diego) is a public research university in San Diego, California, United States. Located near the coast of the Pacific Ocean, UC San Diego is the southernmost of the ten campuses of the University of California. The university is proud to have a diverse undergraduate student body with various ethnicity and age groups. In 2020–2021, UC San Diego enrolled 31,842 undergraduate students and 7,734 graduate and medical students. The top three ethnicity groups of the university's undergraduate student body are Asian/Asian American (37.1%), Chicano/Latino (20.8%), and White (19.0%). Other ethnicities include 17% of International Citizen, 3.0% of African American, 2.5% of Undeclared/Missing, 0.4% of American Indian, and 0.2% of Native Hawaiian (UC San Diego, 2022). The average age of undergraduates is 21 years old, including 41.1% of 19–20 years old, 35.7% of 21–25 years old, 18.8% of 16–18 years old, and 4.1% of 25+ years old (UC San Diego, 2022). The university embraces the principles of

⁶ Authored by Dr. Yu Yan, University of California, San Diego, USA.

equity, diversity, and inclusion (EDI) in its endeavors that are included in its strategic plan (UC San Diego, 2021).

Teaching + Learning Commons

Teaching + Learning Commons at UC San Diego (the Commons) was founded in 2016. The Commons was developed to advance student success by transforming educational practices so that all members of our student and faculty communities can thrive. Informed by Adams and Love's (2009) faculty development framework, the Commons reinforces deep teaching and learning by fostering positive learning experiences for all students and faculties of all backgrounds and identities, not limited to a different gender, race, age, and ethnicity group, and social-economic status.

The Teaching + Learning Commons is affiliated with Executive Vice Chancellor-Academic Affairs Office at UC San Diego. The Commons consists of six hubs: Academic Achievement, Experiential Learning, Writing, Digital Learning, Education Research + Assessment, and Engaged Teaching. The first three are student-based among the six hubs, and the latter three are faculty-based. The following section introduces the three faculty-based hubs. It explores how these hubs engage with activities to support teaching at the campus.

The **Digital Learning Hub** supports online courses and online programs. The hub has a team of instructional designers and works closely with the faculties and information technology department. Through working one-on-one with faculties who plan to or are teaching online or hybrid courses, this team supports the faculties in improving their online teaching skills (e.g., helping faculties design courses to meet the Diversity, Equity, and Inclusion course design rubric), developing instructional materials, and providing technical support about using online teaching platform.

The **Education Research + Assessment Hub** supports course-level assessment, program-level assessment, teaching effectiveness, and research projects. The team of this hub includes a director, data specialists and assessment specialists, and others. The hub adopts an evidence-based and equity-focused approach when conducting research design and data analysis.

The **Engaged Teaching Hub** mainly provides teaching consultation and classroom observation for faculties. The hub has a team of education specialists and postdoctoral fellows. They organize workshops and courses regularly to introduce new teaching methods and popular teaching tools to the faculties. This hub aims to improve teaching by engaging faculties in using evidence-based, learner-centered, and equitable teaching practices. This team sometimes also takes the Education Research and Assessment Hub report and provides other personalized solutions for the faculty to improve their teaching effectiveness.

Actions to Promote Teaching for Equity, Diversity, and Inclusion

A Data-Driven Approach

Combining equity-focused and evidence-based approaches in all services, the Commons at UCSD encourages all faculties to assess and reflect on whether their teaching practices contribute to student learning outcomes. The Education Research

and Assessment Hub (ERAH) under the Commons has access to campus institutional data and learning management system (LMS) data. ERAH gathers evidence of teaching effectiveness by collecting data from students' learning outcomes and survey feedback. For example, the hub support faculties in designing experiments using empirical research methods, developing, and administering surveys, sampling student artifacts, and supporting data analysis. Machine learning methods such as topical modeling and sentimental analysis help understand the text data generated from student open-ended survey questions. For quantitative data analysis, student data are disaggregated among different student groups (e.g., first-generation, under-represented students). In this way, feedback and learning outcomes of minoritized students are not ignored. Faculties also must pay attention to whether teaching strategies are effective in helping all students to be successful. The ERAH applies evidence-based and equity-focused principles throughout the project, including research design and data analysis.

Programs and Learning Communities

The Teaching + Learning Commons also partners with other units on campus to offer programs and build learning communities for faculties to increase teaching awareness of equity, diversity, and inclusion on campus.

Inclusive Classroom Workshops. The university has established the Center for Advancing Multidisciplinary Scholarship for Excellence in Education (CAMSEE). CAMSEE includes researchers, librarians, educational technologies, and others from diverse disciplines. The goal of this center is to encourage research on teaching and thus, improve program (especially STEM programs) development in the information age by improving students learning interests and achievement. The Commons collaborates with the CAMSEE to offer workshops on creating an inclusive classroom (<https://camsee.ucsd.edu/events/inclusive-classroom.html>). The two half-day workshops support faculties learning strategies for creating an inclusive classroom and guidance on creating course materials that address the diverse needs of students.

Anti-Racist Pedagogy Learning Community. Facilitated by the Commons Engaged Teaching Hub, the anti-racist pedagogy learning community is a quarter-long learning community. Fellows and facilitators meet every other week to discuss and reflect on what and how teaching practice can promote the well-being of all students on campus, particularly those minoritized students.

Summary

Teaching + Learning Commons discussed in this case provides a good example of developing teaching competencies on campus from institutional perspective, specifically preparing instructors for equity, diversity, and inclusion in teaching practice. The strategies discussed above (e.g., equitable teaching training provided in Engaged Teaching Hub) could ensure that all students feel supported so that they freely learn and explore new ideas, feel safe to express their views in a civil manner, and respected as individuals and members of group. Other educational practitioners can use this case as an example to intentionally incorporate these inclusive teaching strategies to

help students view themselves as people who belong to the community of learners in a classroom and the institution.

5.3 Individual Practices of Teaching Competency Development

5.3.1 *Teaching Competency Development for College Physics Lab Sessions*⁷

Shihezi University (SU) is located in Shihezi, Xinjiang Province of China. The university has 94 undergraduate programs in 11 fields including economics, law, education, literature, history, science, engineering, agriculture, medicine, management, and art. With a total of 32 credit hours and 16 lab projects, the General Physics Laboratory Course is a required lab course for 31 undergraduate programs such as science, engineering, agriculture, and medicine at Shihezi University (SU). The course aims to develop students' abilities to perform independent experiments, analyze and research, connect theory with practice, and innovate. By the end of the course, students can:

- (1) Explain measurement errors and correctly process experimental data.
- (2) Measure fundamental physical quantities.
- (3) Explain physical experimental methods and use them in experiments.
- (4) Articulate features of instruments in the laboratory and use them correctly.
- (5) Apply experimental operation techniques in experiments.

The General Physics Laboratory Course is offered to students majoring in science, engineering, agriculture, and medicine. Students enrolled in this course have diverse backgrounds and expectations. Some challenges include:

- (1) Limited pre-lab resources. Teachers must invest a lot of time in preparing for the lab experiments, evaluation criteria, and other online resources.
- (2) Difficulty in designing lab content to meet all students' needs due to their different backgrounds.
- (3) Promoting students' innovative skills.
- (4) Carrying out hybrid teaching during the pandemic.

Faculty ICT Competency Requirement

To effectively design and deliver this course, faculty are expected to have ICT competencies in teaching. These competencies consist of (a) using ICT tools in teaching, (b) enhancing instructional design and teaching skills, (c) developing digital resources for physics experiments, (d) applying research studies in teaching with digital instructional resources, and (e) integrating ICT technologies into physics experiments.

⁷ Authored by Yunhu Liu, Shihezi University, China.

Faculty members who are currently teaching this course may not have all the essential ICT competencies; therefore, they may need to enhance their pedagogical knowledge of utilizing ICT in teaching, improve technical skills in using ICT tools, and develop skills in translating research into physics experiments.

Strategies to Enhance Faculty's Teaching Competencies in the Information Age

The lab teaching team applied the TPACK (Technological Pedagogical Content Knowledge) framework to develop teaching competencies such as pedagogical and technical skills in applying ICT tools in teaching. Specific strategies include:

- (1) The team developed a TPACK-based teaching framework for the General Physics Laboratory Course and specified requirements for teachers.
- (2) The team revised the lab content to promote students' comprehensive development. In addition to content in the textbook, added were a series of experiments on force, heat, light, electricity, and modern physics. The lab's content and hours also adjusted to accommodate students' needs. The redesigned experiments allow students to progress through various levels and themes of experiments with support.
- (3) Based on the analysis of current problems, the team also created online instructional resources such as micro-courses and developed effective online learning environments for students. For example, they have used the virtual simulation system to facilitate pre-class, in-class, and post-class activities. The system enables students to conduct experiments at any time and location. Students can gain theoretical knowledge through virtual demonstration during the live synchronous session. Students can also schedule their online physics experiments through an online registration system. Different tracks of online experiments have been developed for various colleges, and students can select their personalized modules based on their needs. Students can also submit their experiment reports online, and faculty can provide timely feedback to students.
- (4) To promote students' innovative capabilities, lab team members introduce physics competitions for students, and guide them by integrating competition content into their lab experiment activities.

The Impact of the Teaching Reform

The above strategies have enhanced competencies in applying ICT in teaching and improved learning outcomes. Students rated the course more positively and showed great enthusiasm for physics and experiments. Students' grades have also significantly improved, and they won many awards in physics competitions. Table 5.2 describes the occurrences that happened before and after the professional development.

Summary

This case provides a good example of individual instructor's practice of applying TPACK framework to train college instructor's ICT competencies to fulfill the

Table 5.2 Teaching results before and after the teaching reform

Prior to teaching reform		After teaching reform		
Problems and challenges	Previous instructional plan and strategies	Current instructional plan and strategies	Areas of changes	Teaching results
Lack of preparation	Students handwrite or print pre-lab reports	Students prepare for the lab with online resources. Students are assessed based on the lab performance	Online resource and assessment	Better preparation for the experiment and enhanced knowledge
Lack of individualized support	Same lab experiments for all students	Students self-select lab modules from major-specific tracks	Students self-select lab modules	Improved students' enthusiasm in Physics and labs. Enhanced achievement of learning goals
Offering online experiments during the pandemic	Cancel or adjust lab experiments	The use of a virtual simulation experiment system for hybrid teaching	The 3-D virtual simulation experiment system	Anytime anywhere virtual experiments. Improved students' ICT literacy
Promoting students' innovations	Promote complex experimental projects	Applying Physics competition content in-class activities	Extend class activities with Physics competition content	Enhanced students' innovations and more competition awards

teaching requirements during pandemic. Teaching effectiveness has been significantly improved after the training. Students performed better and were more engaged in learning. This case showed that teaching competency development will not only benefit instructor's teaching (e.g., efficient teaching) but more importantly benefit students and promote efficient learning.

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Appendix

Glossary of Terms

Cognitive apprenticeship instruction: Apprenticeship shows its inheritance relationship or similarity with traditional apprenticeship, that is, it emphasizes that learning should take place in the context of its application, and knowledge and skills should be acquired through the combination of expert work and practical operation. Cognition, on the other hand, reflects a strong realistic significance, emphasizing that the learning of general knowledge takes place in the application scene and promoting the application of knowledge in various situations. The main purpose of cognitive apprenticeship is to develop learners' advanced cognitive skills, such as ability of problem solving and ability of reflection.¹

Community of practice: Community of practice refers to such a group of people that all members have a common focus, and work together to solve a group of problems, or invest in enthusiasm for a theme. They develop their knowledge and expertise in the common field by continuous interaction.

Competency standards: Competency standards are a set of knowledge, skills and attitudes that enable individuals to effectively complete specific occupations or job responsibilities in accordance with professional standards.

Cyberspace for learning: refers to the virtual computer world, and more specifically, an electronic medium that is used to facilitate online communication. Cyberspace typically involves a large computer network made up of many worldwide computer subnetworks that employ TCP/IP protocol to aid in communication and data exchange activities. Cyberspace's core feature is an interactive and virtual environment for a broad range of participants.²

¹ Collins, A. O. (1987). Cognitive apprenticeship: Teaching the craft of reading, writing, and mathematics. In L. B. Resnick (Ed.), *Knowing, learning, and instruction: Essays in honor of Robert Glaser* (pp. 453–494). Lawrence Erlbaum Associates, Inc.

² Weller, M. (2007). *Virtual learning environments: Using, choosing and developing your VLE*. London: Routledge.

Digital Badge: Digital badge is a kind of digital tokens representing learning achievements with icons or logos, which is used to certify learners' achievements or abilities in formal and informal learning.

Digital learning resources: refers to materials included in the context of a course that support the learner's achievement of the described learning goals. These materials consist of a wide variety of digitally formatted resources including: graphics, images or photos, audio and video, simulations, animations, prepared or programmed learning modules.

Distributed cognition: Distributed cognition is concerned with how information is propagated through a system in the form of representational states of mediating structures. These structures include internal as well as external knowledge representations, (knowledge, skills, tools, etc.).³

Distributed learning: refers to the instructional model that allows instructor, students, and content to be located in different, non-centralized locations so that instruction and learning occur independent of time and place. The model can be used in combination with traditional classroom-based courses, with traditional distance learning courses, or can be used to create wholly virtual classrooms.

Educational evaluation: is the continuous inspection of all available information concerning the student, teacher, educational program, and the teaching-learning process to ascertain the degree of change in students and form valid judgment about the students and the effectiveness of the program.

Information teaching ability: In essence, information teaching ability is a kind of knowledge and ability structure that teachers use information technology to "transform" subject knowledge into students' effective acquisition in the real teaching situation. Its purpose is to realize technology promoted learning. Teachers should not only have media and information literacy, but also include the ability to integrate and transform "information technology, teaching method and teaching content" according to the specific and real teaching situation. Instructional design ability, implementation ability and evaluation ability are the most critical abilities.

Learning management system (LMS): A learning management system (LMS) is an e-learning software application that handles the delivery, administration, automation, and analytics of learning materials. As such, an LMS is a highly organized set of software that serves the entire online educational ecosystem.

Learning community: A learning community is a learning team composed of learners, facilitators, and other people with a clear sense of team belonging, common aspirations and extensive communication opportunities, with common goals, common sharing, communication, common activities, and mutual promotion.

Online learning: Online learning is a form of distance education where technology mediates the learning process, teaching is delivered completely using the internet, and students and instructors are not required to be available at the same

³ Hutchins, E., & Klausen, T. (1996). Distributed cognition in an airline cockpit. *Cognition and Communication at Work*, 15-34.

time and place. it does not include more traditional distance education instruction methods, such as print-based correspondence education, broadcast television or radio, videoconferencing in its traditional form, videocassettes/DVDs, and stand-alone educational software programs.⁴

Open educational resources (OER): Open educational resources (OER) are learning, teaching and research materials in any format and medium that reside in the public domain or are under copyright that have been released under an open license, that permit no-cost access, re-use, re-purpose, adaptation and redistribution by others.⁵

Resources-based learning model: refers to the learning model in which learners learn by interacting with various types of learning resources. Learning resources are all print and non-print media that are available, involving books and articles, audio and video materials, electronic databases and other computer-based, computer multimedia and computer network resources, etc.

Self-regulated learning: Self-regulated learning is a learning mode that students can determine their own learning objectives, and formulate learning plans and make specific learning preparations before learning activities. In learning activities, they can make self-monitoring, self-feedback and self-regulation on learning progress and learning methods. After learning activities, they can conduct self-examination, self-summary, self-evaluation and self-recovery on learning results.

Teachers' digital competencies: Teachers' digital competencies include ICT skills with innovations in pedagogy, curriculum, and school organization. The target is to improve teachers' teaching, to collaborate with colleagues, and perhaps ultimately to become innovation leaders in their institutions.⁶

Teachers' professional development: Teachers' professional development refers to that when college teachers are engaged in teaching, research, and service, they guide self-reflection and understanding through independent and cooperative activities, and finally improve their professional skills such as teaching, research and service.

Teaching Competencies

Teaching competencies are the skills and knowledge that help a teacher be successful in teaching.⁷

TPACK theory: TPACK theory is further developed based on subject teaching method knowledge (PCK) proposed by Schulman in the United States. It introduces

⁴ Siemens, G., Gašević, D., & Dawson, S. (2015). *Preparing for the digital university: A review of the history and current state of distance, blended, and online learning*. Athabasca University Press.

⁵ UNESCO. (2019, November 25). *Recommendation concerning open educational resources*. http://portal.unesco.org/en/ev.php-URL_ID=49556&URL_DO=DO_TOPIC&URL_SECTION=201.html.

⁶ Basilotta-Gómez-Pablos, V., Matarranz, M., Casado-Aranda, L. A., & Otto, A. (2022). Teachers' digital competencies in higher education: A systematic literature review. *International Journal of Educational Technology in Higher Education*, 19(1), 1–16.

⁷ Teachmint. (n.d.). *Teaching Competencies*. <https://www.teachmint.com/glossary/t/teaching-competencies/#:~:text=Teaching%20competencies%20are%20the%20skills%20and%20knowledge%20that,deal%20with%20every%20student%20>.

technical knowledge into the original subject teaching knowledge framework, and the technical knowledge interacts with subject content knowledge and teaching method knowledge that forms a subject teaching knowledge structure integrating technology.