

Exploring the Conceptual Connotation and Characteristics of the Practical Competence of Professional Master's Degree Candidates - Based on In-depth Interviews with 17 Supervisors

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Abstract: *Practical competence is central to the training of professional master's degree candidates. Based on semi-structured interviews with 17 supervisors from six universities across three regions in China and grounded in the local experience of professional master's education, this study proposes and elaborates the conceptual connotation of practical competence and identifies four defining characteristics: reality-oriented, professional, comprehensive, and developmental. The study further points out the local characteristics of practical competence in China's professional master's education, namely adhering to value rationality, integrating innovation capacity with practical competence, and advancing from problem solving to knowledge innovation. Based on the interview findings, suggestions for enhancing practical competence are proposed from four dimensions: promoting the undergraduate-postgraduate integration, improving the training system, deepening industry-education integration, and refining classified evaluation. The study enriches the theory and practice of professional master's education in the local context.*

Keywords: *professional master's degree, practical competence, supervisor, in-depth interview*

1. Introduction

Master's professional degree education constitutes an important component of China's graduate education system and plays a significant role in serving the national innovation-driven development strategy and supporting the country in securing a leading position in the new round of technological revolution and industrial transformation (hereinafter referred to as professional degree education). The Outline of the Plan for Building China into an Education Power (2024-2035) explicitly calls for "expanding the scale of graduate training, steadily increasing the proportion of doctoral candidates, and vigorously developing professional degree education." Practicality is one of the essential characteristics of professional degree education, and practical competence is the central focus of professional degree training. The Ministry of Education's directive on further promoting the classification-based development of academic and professional degree graduate education emphasizes that professional degree programs should cultivate "practice-oriented innovative talent equipped with a solid and systematic professional foundation, strong practical competence, and high-level vocational literacy." The understanding of practical competence directly influences resource allocation, operational mechanisms, and quality evaluation in professional degree education, making it an important issue in both educational theory and practice. However, for a long time, research on the practical competence of professional degree candidates has largely drawn on traditional theoretical frameworks derived from international scholarship, with limited theoretical construction grounded in the local experience of China's professional degree education. This has resulted in ambiguous evaluation orientations, unfocused and unreasonable allocation of educational resources, and insufficient alignment with enterprise demands and candidates' developmental needs. Supervisors, as the primary responsible persons for professional degree training and the key executors of policy implementation, process management, and resource provision, offer a new and valuable perspective on understanding practical competence. Therefore, this study conducted semi-structured interviews with 17 professional degree supervisors, seeking to systematically explore the conceptual connotation and characteristics of practical competence grounded in China's local experience from the supervisors' perspective, with the aim of providing reference for enhancing the

practical competence of professional degree candidates.

2. Research method

2.1 Selection of research participants

With the recommendation of graduate education administrators from six universities in Shanghai, Chongqing, and Shaanxi, and after obtaining their prior consent, 17 supervisors of professional master's degree candidates were selected as interviewees. Among them, seven were from "Double First-Class" universities, accounting for 41.2%, and ten were from non "Double-First-Class" universities, accounting for 58.8%. Seven held senior professional titles, eight held associate senior titles, and two held intermediate titles, accounting for 41.7%, 47.1%, and 11.8% respectively. Thirteen supervisors had experience in industry-education integrated training, accounting for 76.5%, while four did not, accounting for 23.5%. All the supervisors in this study had at least one cohort of graduates and possessed independent and fairly profound understanding of the practical competence of professional master's degree candidates. Some of these supervisors also served as doctoral supervisors or supervisors of academic master's degree candidates.

2.2 Collection of interview data

Interview questions were designed around four levels. First, participants were asked to elaborate in detail on their understanding of the practical competence of professional master's degree candidates (e.g., essence, connotation, characteristics). Second, they were asked to elaborate on their understanding of the structure of practical competence (including values, methodology, knowledge structures, and capability systems). Third, taking a representative professional master's degree candidate as an example, they were asked to describe the student's situation before enrollment, the training process, and achievements before graduation. Fourth, based on their own supervisory experience, they were asked to identify the influencing factors in cultivating practical competence. Finally, they were asked to evaluate the overall practical competence of current professional master's degree candidates, choosing from "very satisfied," "fairly satisfied," "basically satisfied," "dissatisfied," and "very dissatisfied," with corresponding scores of 100, 80, 60, 40, and 20 respectively. The interviews were conducted in written form. When sending out the interview outline, the research group explained the purpose and approach of the study. No restrictions were placed on the return time or word count, so that interviewees could have sufficient time and space for in-depth and systematic reflection and could express their views more comprehensively and accurately.

2.3 Organization and analysis of interview data

Grounded theory is an inductive qualitative research method first proposed by Glaser and Strauss in the 1960s in *The Discovery of Grounded Theory: Strategies for Qualitative Research* and introduced into China by scholars such as Chen Xiangming in the early 1990s.[1] This method generates new theories by collecting, summarizing, and condensing intuitive, original, small-sample empirical data. It breaks through the purely theoretical nature of traditional speculative research and the purely scientific nature of empirical research. By offering "insight" during the inductive process, it provides more universally applicable research rules for qualitative studies and has thus been widely adopted in fields such as education, management, journalism and communication, and economics, with education being the most prevalent.[2] This paper adopts grounded theory to gain new understanding of the practical competence of professional master's degree candidates. The returned interview files were compiled into a total of 20,800 Chinese characters of interview records. The 17 supervisors were numbered from D01 to D17, and the interview records were analyzed accordingly.

The analysis began with open coding. Although practical competence has been defined in terms of concept, characteristics, connotation, and structure in both theories and policy documents, supervisors, based on different disciplinary backgrounds and practice contexts as well as their own understanding and experience, clearly have expressions that differ from the "standardized" ones and contain vivid, rich personal experience. On the basis of understanding the written expressions of the interviewees as accurately as possible, this study categorized similar expressions and conducted open coding using uniform descriptions. In each open code, one occurrence was recorded as one node, and the number of node references represented the frequency of that open code. For example, in D17's statement, "participated in one enterprise-commissioned project" was described as "problems originate from the

practical needs of enterprise production and operation” and coded as A3. Similar expressions appeared 13 times in the statements of 10 supervisors. In D04’s statement, “as long as one truly loves the country” was described as “practical competence should encompass the spirit of scientific dedication,” coded as A6, which appeared once in one supervisor’s statement. The open coding results are shown in Table 1.

Table 1. Statistical information of open coding for elements of practical competence of professional master’s degree candidates

Open coding	Node reference count	Number of material sources	Percentage of total interviewees
A1 Problems originate from national and economic practical needs	1	1	5.9%
A2 Problems originate from industry and market practical needs	2	2	11.8%
A3 Problems originate from enterprise production and operation practical needs	13	10	58.8%
A4 Problems originate from the development needs of university disciplines and programs	4	4	23.5%
A5 Problems originate from students’ career development needs	4	4	23.5%
A6 Practical competence should encompass the spirit of scientific dedication	1	1	5.9%
A7 Practical competence should encompass sound values	1	1	5.9%
A8 Practical competence should encompass a sense of professional identity	1	1	5.9%
A9 Practical competence should encompass scientific thinking ability	2	2	11.8%
A10 Practical competence should encompass practical thinking ability	4	2	11.8%
A11 Practical competence should encompass innovative thinking ability	2	2	11.8%
A12 Practical competence should be supported by corresponding professional knowledge	2	2	11.8%
A13 Practical competence should be supported by corresponding theoretical knowledge	7	6	35.3%
A14 Practical competence should encompass research ability	3	3	17.6%
A15 Practical competence should encompass innovation ability	2	2	11.8%
A16 Practical competence should enable the proficient application of discipline-specific techniques, methods, and theories to solve professional problems	15	7	41.2%
A17 Practical competence should enable the use of scientific and professional theories and methods to discover, analyze, and solve problems	28	8	47.1%
A18 Practical competence should enable the proposal of scientific, feasible, and reasonable solutions	2	2	11.8%
A19 Practical competence should	3	2	11.8%

encompass interdisciplinary knowledge and methods			
A20 Practical competence should enable the independent solution of professional problems	8	4	23.5%
A21 Practical competence should demonstrate one's professional strengths and capabilities	2	2	11.8%
A22 Practical competence should encompass teamwork ability	3	2	11.8%
A23 Practical competence should encompass comprehensive abilities such as communication and coordination required for problem solving	3	3	17.6%
A24 Practical competence should encompass the ability to form and continuously accumulate experience	5	3	17.6%
A25 Practical competence should encompass the ability to systematically summarize, refine, elevate, and disseminate personal experience	4	2	11.8%
A26 The results of practical competence should be verifiable and achieve practical effects	11	8	47.1%

Based on the open coding, axial coding was then carried out. During the axial coding process, the study deeply explored and sorted out the connections among the open codes by considering the specific contexts of the interviewees' universities and professional master's training, as well as the theories, practices, policy discourse, and logic of professional master's education. Open codes with the same attributes were categorized, named, and coded. For example, A1, A2, and A3 in Table 1 were uniformly expressed as "problems originate from practical needs of industry," coded as B1 "problems originate from practical needs of industry"; A4 and A5 were uniformly expressed as "problems originate from practical needs of university development," coded as B2 "problems originate from practical needs of university development."

Finally, to further focus on the connections among concepts, subjective clustering was performed to group the categories formed from axial coding, and connections were further established around core categories to form selective coding. The detailed results are shown in Table 2.

Table 2. Three-level coding of practical competence of professional master's degree candidates

Selective coding	Axial coding	Open coding
C1 Reality-oriented characteristic	B1 Problems originate from practical needs of industry	A1 Problems originate from national and economic practical needs A2 Problems originate from industry and market practical needs A3 Problems originate from enterprise production and operation practical needs
	B2 Problems originate from practical needs of university development	A4 Problems originate from the development needs of university disciplines and programs A5 Problems originate from students' career development needs
C2 Professional characteristic	B3 Practical competence should encompass mainstream values	A6 Practical competence should encompass the spirit of scientific dedication A7 Practical competence should encompass sound values A8 Practical competence should encompass a sense of professional identity
	B4 Practical competence	A9 Practical competence should encompass

	should encompass certain thinking abilities	scientific thinking ability
	B5 Practical competence should be supported by corresponding knowledge foundations	A10 Practical competence should encompass practical thinking ability A11 Practical competence should encompass innovative thinking ability A12 Practical competence should be supported by corresponding professional knowledge
	B6 Practical competence should encompass a certain degree of innovation ability	A13 Practical competence should be supported by corresponding theoretical knowledge A14 Practical competence should encompass research ability
	B7 Practical competence should encompass the ability to apply knowledge and skills	A15 Practical competence should encompass innovation ability A16 Practical competence should enable the proficient application of discipline-specific techniques, methods, and theories to solve professional problems A17 Practical competence should enable the use of scientific and professional theories and methods to discover, analyze, and solve problems A18 Practical competence should enable the proposal of scientific, feasible, and reasonable solutions
C3 Comprehensive characteristic	B8 Practical competence should encompass the ability to complete projects independently	A19 Practical competence should encompass interdisciplinary knowledge and methods
	B9 Practical competence should encompass teamwork ability	A20 Practical competence should enable the independent solution of professional problems A21 Practical competence should demonstrate one's professional strengths and capabilities A22 Practical competence should encompass teamwork ability
C4 Developmental characteristic	B10 Practical competence should encompass the ability for theoretical abstraction	A23 Practical competence should encompass comprehensive abilities such as communication and coordination required for problem solving A24 Practical competence should encompass the ability to form and continuously accumulate experience A25 Practical competence should encompass the ability to systematically summarize, refine, elevate, and disseminate personal experience A26 The results of practical competence should be verifiable and achieve practical effects

3. The composition and interpretation of the conceptual connotation and characteristics of the practical competence of professional master's degree candidates

3.1 The conceptual connotation of the practical competence of professional master's degree candidates

Based on grounded theory, and after the processes of open coding, axial coding, and selective coding

of the semi-structured interview records of the 17 supervisors, this study proposes that the practical competence of professional master's degree candidates can be defined as: "a comprehensive ability to creatively solve engineering problems and to form new methods and theoretical systems through the application of professional knowledge and techniques." This competence is manifested not only in the discovery, analysis, and solution of problems but also extends to the summarization, refinement, and dissemination of experience after problem solving, thereby achieving the expansion from specific problems to general problems and the creation of new knowledge.

Unlike fundamental, principle-based scientific problems conducted in laboratories, the objects addressed by practical competence are engineering problems that often emerge from a relatively stable form shaped by the interweaving influence of multiple practical factors, requiring accurate connections to be found between the phenomena presented by the problem and the mechanisms behind them. As Supervisor D07 proposed, practical competence is "the bridge that transforms theoretical knowledge into practical operational ability." Therefore, practical competence first requires the ability to discover and analyze problems, and subsequently the ability to comprehensively apply professional knowledge, techniques, and equipment to design corresponding workflows and implementation plans, as well as the ability to independently complete related tasks. Engineering problems originate from industrial development, which includes traditional industries, the upgrading and transformation of traditional industries, and emerging industries such as intelligent and digital sectors. Engineering problems thus encompass different levels, requiring that practical competence include not only professional foundational knowledge, theoretical knowledge, and professional skills to meet the needs of different levels of engineering problems, but also communication, coordination, and other teamwork awareness and abilities.

This study finds that practical competence is externally manifested in the effective solution of engineering problems and internally encompasses sound values, the spirit of scientific dedication, and identification with and passion for the profession, which together form the value basis for overcoming difficulties and persevering in solving engineering problems. It also requires thinking abilities such as scientific thinking, practical thinking, and innovative thinking, which constitute the higher-order capabilities that enable professional master's degree candidates to discover, analyze, and creatively solve problems and serve as the foundation for their further development. Finally, and more importantly, it requires the completion of experience summarization, refinement, and elevation. Unlike exploratory attempts in the laboratory, the hallmark of practical competence must be the effective solution of problems; otherwise, the true possession of practical competence should not be assumed. The resolution of a single incidental problem does not signify the end of the work. In the process of problem solving, practical competence should also be continuously enhanced and consolidated through the accumulation of experience, promoting the sublimation from a single problem to a class of problems, from the particularity to the universality of problems, and consequently promoting the further improvement of the ability to discover, analyze, and solve problems as well as the development of theory.

3.2 Characteristics of the practical competence of professional master's degree candidates

A characteristic is the fundamental attribute that distinguishes one concept from another. After elaborating on the conceptual connotation of the practical competence of professional master's degree candidates, this study also explores its characteristics. As can be seen from Table 2, the practical competence of professional master's degree candidates possesses the characteristics of being reality-oriented, professional, comprehensive, and developmental.

3.2.1 Reality-oriented characteristic

Any competence is based on the problems to be solved, and thus the source of problems itself constitutes one of the characteristics of the practical competence of professional master's degree candidates. These problems first originate from responding to practical needs at different levels, such as national and economic needs, industry and market needs, and enterprise production and operation needs. This corresponds to the original intention of establishing professional master's degree programs and another essential attribute, namely their vocational nature. As Supervisor D01 described when introducing the source of a professional master's degree candidate's research topic, "the topic originated from a university-enterprise joint project with a key state-owned enterprise and had strong application background and research significance." At the same time, problems can also originate from the practical needs of university development, including alignment with students' career development needs. For instance, Supervisor D05 mentioned a representative professional master's degree candidate, noting that "the student had long been interested in working in mechatronics control and eventually joined the

Technology Development Department of DJI.” The training resources and topic provided by the supervisor corresponded exactly to this “practical need” of the student, stimulating the student’s intrinsic motivation and achieving high-quality employment.

3.2.2 Professional characteristic

Although the complexity of engineering problems imposes higher demands for interdisciplinary knowledge, the “last meter” in solving complex problems still relies on orientation toward a specific professional field, requiring the professional knowledge, professional techniques, and the ability to apply professional tools and software that the field demands. This is the core characteristic of the practical competence of professional master’s degree candidates, encompassing not only the adherence to mainstream values and engineering ethics, but also corresponding thinking abilities, professional knowledge, scientific research and innovation capabilities, and the ability to apply knowledge and tools to solve problems, reflecting the educational goal of fostering both integrity and ability. As Supervisor D11 put forward, professional master’s degree candidates should “possess the foundational knowledge and professional competence of their discipline, master scientific research methods, love their profession, and hold upright values.”

3.2.3 Comprehensive characteristic

As mentioned earlier, the increasing complexity of engineering problems dictates that their solution often relies on close collaboration among team members. Therefore, the comprehensive characteristic of the practical competence of professional master’s degree candidates referred to here means that candidates not only possess the independent ability to undertake their assigned tasks, interdisciplinary knowledge and methods, but also the teamwork awareness, team spirit, and the knowledge and skills of project management, which also meet the career development needs of professional master’s degree candidates. As Supervisor D07 pointed out: “Practical competence can not only help postgraduates better complete their work but also enhance their leadership and management capabilities in the workplace, thus creating greater value for the enterprise or organization.”

3.2.4 Developmental characteristic

With the rapid development of the fourth industrial revolution, new technologies, new industries, new business forms, and new models are emerging rapidly, and corresponding new engineering problems are constantly arising. On the one hand, practical competence is not achieved overnight or acquired merely through standardized education within a limited academic period; it is a process of continuous accumulation, reflection, systematization, and theoretical elevation when facing different problems and engaging in practice-this is development along the temporal axis. On the other hand, facing the increasingly complexity of engineering problems, practical competence should also be developed by continuously learning, expanding, and acquiring interdisciplinary and cutting-edge knowledge to ensure adaptability to the evolving needs of engineering problems-this is development along the structural axis.

4. Suggestions for strategies to enhance the practical competence of professional master’s degree candidates

The level of practical competence of professional master’s degree candidates is an important observation point for evaluating the quality of graduate education. The 2024 National Graduate Satisfaction Survey conducted by the Academic Degrees and Graduate Education Magazine and the Graduate Education Research Center of Beijing Institute of Technology showed that the satisfaction rate of professional master’s degree candidates with their supervisors was 89.2%, which, according to the scoring rule adopted in this paper, corresponds to 88.14 points.[3] Surveys of some professional master’s degree candidates conducted by He Rui et al. and Gui Shuhua et al., using their respectively developed evaluation systems for the practical competence of professional master’s degree candidates, showed that the average values of all indicators exceeded 4 (on a 5-point scale), indicating that the overall practical competence of professional master’s degree candidates was at a favorable level.[4][5] This study also asked the interviewed supervisors to evaluate the practical competence of professional master’s degree candidates. The results showed that four were “dissatisfied,” accounting for 23.5%; seven indicated “basically satisfied,” accounting for 41.2%; five indicated “fairly satisfied,” accounting for 29.4%; and one indicated “very satisfied,” accounting for 5.9%. According to the scoring rule, this corresponds to a score of 63, representing basic satisfaction (i.e., a passing level). This reflects a divergence in evaluation standards and current situation judgments between supervisors and professional master’s degree candidates, which warrants further attention and analysis.

Currently, professional master's education in China is still in the process of scale expansion, structural adjustment, and quality enhancement. Comprehensively improving the practical competence of professional master's degree candidates and thereby enhancing the quality of graduate education is an important task in building a strong education nation. Through in-depth interviews with 17 supervisors and grounded in the local experience of professional master's degree training, this study explores the conceptual connotation and characteristics of the practical competence of professional master's degree candidates and evaluates the current state of this competence. Based on the supervisors' account of the entire training process, from enrollment to employment, of representative professional master's degree candidates, this paper proposes the following suggestions for enhancing practical competence.

4.1 Promote the integration of undergraduate and master's education to improve the quality of incoming students for professional master's programs

The quality of incoming students is the foundation of training quality. This study shows that traits such as an outgoing personality, the ability to communicate well with supervisors, good learning habits, abilities, and attitudes, a solid professional knowledge foundation cultivated during undergraduate studies, hands-on experience through disciplinary competitions and enterprise internships, clear career planning, self-development positioning, and strong willingness to work in enterprises are among the "developmental potential" elements that supervisors pay more attention to and value. By breaking down barriers between undergraduate and master's degree stages, deepening the cultivation of undergraduate practical competence through disciplinary and professional competitions, innovative practice projects, and undergraduate graduation projects, and strengthening the developmental potential of professional master's degree candidates, a supply of high-quality incoming students can be provided for professional master's degree education. As Supervisor D12 mentioned, a representative professional master's degree candidate "chose small current protection as early as the undergraduate graduation project, and by the end of the first year of the master's program, had completed a large amount of simulation and analysis, achieving innovation and verification." This model of integrating undergraduate and master's education can effectively extend the training cycle of professional master's degree candidates.

4.2 Improve the training system to enhance the practical competence of professional master's degree candidates

The cultivation and enhancement of the practical competence of professional master's degree candidates rely on a training system centered on "practical competence." This study shows that a curriculum system that provides a complete professional foundational knowledge system and technical capabilities for the development of candidates' research projects and future employment, a general education curriculum system that enhances candidates' communication skills, critical reflection ability, independent thinking ability, and teamwork awareness, support for candidates to attend academic conferences tracking the frontiers of their disciplines and industries, research topics that combine enterprise production projects with practical application value, and participation in enterprise production practice are all conducive to enhancing the practical competence of professional master's degree candidates. Objectively speaking, the current training system for professional master's degree candidates is comprehensive; what needs improvement is the orientation and effectiveness of the training system, and through structural reform of the training supply side, a shift should be realized from "giving students whatever the training institution and supervisors have" to "providing whatever is needed for enhancing students' practical competence." At the same time, efforts should be made to deepen ethics and social responsibility education, and to accelerate the construction of an educational system that promotes professional dedication, perseverance, and the spirit of rigorous scientific inquiry. For example, during the training process, Supervisor D3 supported the professional master's degree candidate under their supervision to "participate in and lead the research and system development project for a certain measurement method, attend online conferences of the youth tribology society, select courses guided by core disciplinary competence development and personal interest, and choose a research topic that combines personal interest with project practice." Ultimately, the candidate obtained an invention patent authorization during the study period.

4.3 Deepen industry-education integration to expand the supply of high-quality resources for cultivating the practical competence of professional master's degree candidates

Industry-education integration is an important bridge connecting the education chain, talent chain, innovation chain, and industrial chain, and linking the supply side and the demand side, providing an

important platform for cultivating practical competence in professional master's programs.[6] This study shows that participating in enterprise projects and bringing the role of enterprise supervisors into full play in the training process are highly important for cultivating the practical competence of professional master's degree candidates. In particular, enterprises' exploration and practice in areas such as systematic quality improvement, digital-intelligence driven approaches, embedded training, and cross-field integration play an irreplaceable role in enhancing the capacity of professional master's degree candidates' practical competence to serve the development of advanced productive forces. As Supervisor D2 mentioned, a professional master's degree candidate under their supervision "participated multiple times in on-site testing and analysis tasks for gas pipeline vibration and went deep into chemical enterprises for unit vibration testing and analysis to solve problems existing in on-site equipment, thereby cultivating and enhancing professional practical competence," eventually proposing a new method for identifying rolling bearing faults. In recent years, nine central government departments (including the Organization Department of the CPC Central Committee and the Ministry of Education) have launched special pilot programs to reform the training of engineering master's and doctoral candidates, promoting the joint recruitment and training of engineering master's and doctoral candidates by universities and enterprises. By means of full-chain industry-education integration encompassing curricula, research topics, faculty, and evaluation, efforts have been intensified to cultivate outstanding engineers with technological innovation capacity and the ability to solve complex engineering problems, providing new platform support for the cultivation of the practical competence of professional master's degree candidates.

4.4 Refine classified evaluation to highlight the orientation toward cultivating the practical competence of professional master's degree candidates

Evaluation is the baton guiding supervisors' training and professional master's degree candidates' learning engagement. This study shows that whether they are explicit indicators, such as participating in the National Graduate Innovation and Practice Competition series during the study period, applying for patents, publishing high-level professional papers, proposing new methods and implementation plans in response to enterprise needs and ultimately solving enterprise problems while achieving favorable economic benefits, and securing employment in relevant enterprises with a high degree of major-occupation match upon graduation, or implicit indicators, such as the value-added development of scientific research and innovation ability, communication ability, teamwork ability, and independent working ability of professional master's degree candidates, all can serve as evaluation indicators for the enhancement of their practical competence. Therefore, developing an evaluation index system for the practical competence of professional master's degree candidates that covers both process and outcome, explicit and implicit aspects, is a task that urgently needs to be completed. In 2025, the first cohort of graduates from the special pilot project for engineering master's and doctoral education reform achieved degree application not based on dissertations but on practical outcomes such as patents, product designs, and case analysis reports,[7] advancing the in-depth reform of classified evaluation oriented toward practical competence in professional master's degree programs.

5. Conclusion

5.1 The practical competence of professional degree candidates in China emphasizes value rationality in education

The constituent elements of practical competence mainly include autonomous learning ability, thinking and analytical ability, communication and collaboration ability, practical operation and innovation ability, as well as creativity, yet a unified understanding and theoretical concept have not yet been formed. Deng Hui proposed that practical competence generally refers to the comprehensive hands-on and intellectual ability demonstrated by students in practical work such as study, research, production, management, and cultural activities, integrating theoretical knowledge with practical activities. Structurally, practical competence includes general practical competence, professional practical competence, and comprehensive practical competence.[8] Zhao Jianhua argued that practical competence generally refers to the "skills and abilities" displayed in practical activities, characterized by planning in cultivation, initiative of the subject, gradualism in development, and diversity in forms. Structurally, practical competence internally includes practical interest, understanding, planning, execution, and expression, while externally includes abilities such as designing experimental protocols, conducting experiments, and analyzing and interpreting results.[9] These perspectives reflect a tendency toward

instrumental rationality in education. The findings of this study indicate that, at the practical level, the practical competence of professional degree candidates in China encompasses four dimensions: values centered on a spirit of dedication and commitment, a methodology grounded in practice-based epistemology, a knowledge structure built around interdisciplinary and cutting-edge disciplines, and a capability system oriented toward applying theories scientifically to solve real-world problems. In particular, the emphasis on values reflects a deep-rooted commitment to grounding research in national realities and to the educational mission of cultivating well-rounded talent, which constitutes the distinctive foundation of the practical competence of professional degree candidates in China.

5.2 The practical competence of professional degree candidates in China integrates “innovation capacity” and “practical competence”

Innovation capacity and practical competence are two theoretical concepts with distinct scopes, and the differences in their cultivation pathways have long been a topic of educational debate. Chen Hanneng et al. proposed that innovation capacity represents a higher-order form of practical competence, whereas Xu Yaqing argued that practical competence itself is a constituent element of innovation capacity.[10][11] Meanwhile, “practical competence”-understood as the ability to interpret and judge how to apply scientific knowledge to solve problems in complex real-world environments within the value framework of professional identity, thereby driving innovation and change[12]-inevitably evolves in structure and connotation in response to changing real-world problems. Attention must also be paid to the influence of occupational changes on the competence demands for professional degree candidates, so as to support their cross-occupational and cross-cultural development in the post-university era. This study finds that within the framework of practical competence for professional degree candidates in China, “innovation capacity” and “practical competence” have moved from binary opposition to boundary integration, not only to meet the demands of evolving real-world problems, but also to serve the lifelong development needs of professional degree candidates.

5.3 The practical competence of professional degree candidates in China has undergone a sublimation from “problem solving” to “knowledge innovation”

For a long time, practical competence has been positioned primarily as problem solving. For example, He Rui et al. constructed an evaluation index system for the professional practical competence of engineering master’s degree candidates, covering three first-level indicators-professional competence and innovation capability, engineering practice and problem-solving ability, and teamwork and information expression ability-and seven second-level indicators including innovative thinking and innovation ability, the ability to solve engineering problems, and leadership and management ability.[4] Gui Shuhua et al. constructed another evaluation index system for practical competence, consisting of four first-level indicators: practical thinking ability, scientific research practical ability, specialized practical ability, and vocational practical ability.[5] However, this study reveals that, from the supervisors’ perspective, the practical competence of professional degree candidates should not stop at problem solving; it should also involve the systematization and theoretical refinement of the methods and experience accumulated during the problem-solving process, thereby generating new knowledge and completing the upgrade from “skilled practitioner” to “knowledge innovator.” This reflects the higher-order developmental direction of the practical competence of professional degree candidates in China.

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References

[1] Chen, X.M. *The grounded theory approach and methods. Educational Research and Experiment. 1999; (4): 58-63.*

- [2] Xie, X.Y., Lin, Y.Q. *Abductive analysis: methodological extension of grounded theory*. *Higher Education Research*. 2023; (12): 68-78.
- [3] Zhou, W.H., Huang, H., Liu, J.Q., et al. *2024 national graduate student satisfaction survey*. *Academic Degrees and Graduate Education*. 2024; (8): 1-9.
- [4] He, R., Wang, L. *Construction of an evaluation index system for the professional practical competence of engineering master's degree candidates*. *Journal of Hebei University of Science and Technology (Social Science Edition)*. 2025; (5): 79-89.
- [5] Gui, S.H., Hao, S.P., Zhao, W.X. *Research on a quantitative model for comprehensive evaluation of the practical competence of engineering professional degree candidates*. *Journal of Nanjing Institute of Engineering (Social Science Edition)*. 2025; (2): 1-7.
- [6] Chen, K. *Research on industry-education integration for the high-quality development of the manufacturing industry in Jiangsu*. *Jiangsu Higher Education*. 2021; (3): 55-58.
- [7] *The "three-year transformation" of outstanding engineer training-written on the occasion of the symposium on outstanding engineer training reform*. Available from: http://www.moe.gov.cn/jyb_xwfb/s5147/202512/t20251204_1422297.html [Accessed 10th February 2026].
- [8] Deng, H., Li, B.H. *Structural analysis and enhancement of university students' practical competence*. *Seeker*. 2008; (2): 162-163.
- [9] Zhao, J.H. *Analysis of the concept, structure, and influencing factors of university students' practical competence*. *China University Teaching*. 2009; (7): 67-69.
- [10] Chen, H.N., Qin, X.M., Lin, Y., et al. *A study on the "dual-drive, four-party participation" collaborative education model between universities and local governments - based on the exploration of "Guangdong Ocean University - Zhanjiang Group" in collaboratively cultivating graduate students' practical innovation ability*. *Academic Degrees and Graduate Education*. 2015; (11): 18-22.
- [11] Xu, Y.Q. *A collaborative analysis and empirical study of graduate students' innovation ability cultivation*. Ph.D. Thesis, Hebei University of Technology, Tianjin, 2009.
- [12] Padfield, R., Papargyropoulou, E., Baharun, S., et al. *"Ningen Ryoku": the Japanese way in inculcating human skills into engineering education*. *Procedia-Social and Behavioral Sciences*. 2012; (56): 369-376.