WHIOCE PUBLISHING PTE. LTD.
PROVIDING
FIRST-CLASS SCIENTIFIC INFORMATION
FOR TOP SCHOLARS

2026 Volume 4, Issue 1
Contemporary Education Frontiers
ISSN (Online): 3029-1860 ISSN (Print): 3029-1879

New Quality Productive Forces-Oriented Enhancement of Career Guidance Competencies for University Counselors in Mechanical Engineering

Long Liu[1], Huan Ren[2]*, Sa Li[3], Jin Du[1]

[1]Faculty of Mechanical Engineering, Qilu University of Technology (Shandong Academy of Sciences), Jinan 250000, Shandong, China

[2]Faculty of Chemistry and Pharmacy, Qilu University of Technology (Shandong Academy of Sciences), Jinan 250000, Shandong, China

[3]Teaching Affairs Office, Qilu University of Technology (Shandong Academy of Sciences), Jinan 250000, Shandong, China

**Author to whom correspondence should be addressed.*

Abstract: Driven by technological innovation and oriented toward high-quality development, New Quality Productive Forces (NQPF) are accelerating the iterative upgrading of high-end equipment, intelligent manufacturing, and other strategic emerging industries. This transformation has imposed higher requirements on talent cultivation and career guidance within mechanical engineering disciplines. As the frontline practitioners of student career development, the competency of university counselors directly influences the students' employment competitiveness, the realization of educational objectives, and the alignment between talent supply and the demands of NQPF. Taking the School of Mechanical Engineering at Qilu University of Technology as a case study, this study analyzes the practical dilemmas faced by counselors in employment guidance under the NQPF framework, and proposes targeted pathways for competency enhancement tailored to the characteristics of mechanical engineering education. By evaluating the implementation logic and practical outcomes of these pathways, the study provides both theoretical support and practical references for strengthening counselor teams and improving the quality of employment guidance services in engineering colleges.

Keywords: New Quality Productive Forces; University counselors; Career guidance competency; Mechanical engineering; High-quality employment

Online publication: January 26, 2026

1. Introduction

China is actively fostering New Quality Productive Forces (NQPF) to promote systematic optimization and upgrading of its industrial structure. Under this paradigm, strategic sectors such as high-end equipment manufacturing, intelligent manufacturing, and industrial mother machines have become key drivers of industrial transformation, generating an urgent

demand for innovative, interdisciplinary, and practice-oriented mechanical engineering professionals. Consequently, higher education institutions, particularly engineering colleges, are required to strengthen the precision and forward-looking nature of talent cultivation and career guidance.

University counselors serve as the primary implementers of the fundamental mission of higher education, integrating moral education with career development guidance. In the context of NQPF, the employment market for mechanical engineering graduates is characterized by increasingly specialized job requirements, cross-disciplinary competency expectations, and diversified career pathways [1–2]. Enterprises in emerging industries place growing emphasis on students' technological innovation capability, engineering practice competence, and interdisciplinary integration ability. Accordingly, counselors must transcend traditional employment guidance models centered on resume polishing and interview coaching, and instead develop multi-dimensional competencies encompassing industry cognition, professional alignment, resource integration, precise guidance, and innovation-oriented mentoring [3–4].

Existing scholarship has extensively examined the enhancement of university counselors' career guidance competencies from multiple perspectives. To enhance counselors' employment guidance service capacity in the context of deepening industry-education integration, it is imperative to strengthen theoretical learning, improve practical competencies, and refine institutional support mechanisms [5]. Li identified driving mechanisms, support systems, and professional competencies as the three core factors influencing counselors' capacity to promote high-quality and full employment among university students [6]. The study further argued that the construction of a dual internal-external incentive mechanism, the cultivation of a resource-synergistic and institutionally supportive ecosystem, and the implementation of a stratified and progressive professional development pathway are essential for continuously stimulating counselors' professional agency in employment services. Wang et al. focused on the digital transformation of career guidance and highlighted the challenges counselors encounter in terms of technological application, data-driven insight, and humanistic care [7]. Based on these challenges, they proposed a competency development framework grounded in the integrated logic of "individual competency enhancement + supportive environment construction", emphasizing the coordinated advancement of personal capability and institutional conditions. Li et al. conducted a systematic analysis of the practical dilemmas faced by college counselors in fulfilling their employment-oriented educational responsibilities [8]. Their research put forward a comprehensive optimization framework aimed at promoting high-quality employment, encompassing role clarification, competency improvement, institutional innovation, and collaborative synergy. Furthermore, Su examined the necessity of strengthening vocational college counselors' employment guidance capabilities from the perspective of the Three-Wide Education framework [9]. The study elaborated targeted pathways for competency enhancement, highlighting the integration of ideological education, professional development guidance, and employment services. Overall, the existing literature provides valuable theoretical foundations for improving counselors' employment guidance competencies, particularly in terms of institutional support, digital empowerment, and systematic capacity-building. However, most research focuses on generalized counselor competency frameworks and lacks discipline-specific analysis, particularly in engineering fields such as mechanical engineering, where industrial transformation is rapid and skill demands are highly specialized. Moreover, systematic exploration of multi-stakeholder collaborative mechanisms tailored to emerging industrial contexts remains insufficient.

Therefore, based on the background of NQPF and the disciplinary characteristics of mechanical engineering, this study constructs a competency enhancement framework for university counselors and proposes systematic pathways to improve employment guidance effectiveness. The research aims to bridge the gap between counselor competencies, disciplinary training, and industrial demand, thereby supporting high-quality employment outcomes for mechanical engineering students.

2. Main challenges in counselors' employment guidance competence

The School of Mechanical Engineering at Qilu University of Technology has undertaken the mission of cultivating

engineering talents for over seventy years and has formed distinctive advantages in discipline construction and application-oriented education. The major in Mechanical Design, Manufacturing, and Automation has been approved as a national first-class undergraduate program and successfully obtained international engineering education accreditation in 2019. In response to the strategic demands of modern industrial transformation, the school has proactively optimized its disciplinary layout by establishing emerging majors such as Intelligent Manufacturing Engineering, Robotics Engineering, and Sino-German cooperative programs. Relying on high-level research platforms, including the Shandong Key Laboratory of Key Technologies for CNC Machine Tool Functional Components, the school has constructed an integrated education system that effectively connects scientific research, talent cultivation, and industrial application [10]. Meanwhile, through long-term collaboration with leading enterprises, the school has developed diversified industry-university-research cooperation platforms, providing solid practical support for cultivating application-oriented and innovation-driven mechanical engineering talents in the high-end equipment sector.

However, in the context of emerging industrial transformation and the accelerating development of new, high-quality productive forces, the demands for precise and specialized employment guidance for mechanical engineering students are continuously increasing. Based on the actual employment guidance practices at Qilu University of Technology, counselors in the School of Mechanical Engineering are currently confronted with four prominent dilemmas in the enhancement of their employment guidance competence, which have become key constraints affecting the effectiveness of high-quality employment services and the alignment between talent cultivation and industrial demand.

2.1. Insufficient industry foresight and weak alignment with emerging industrial trends

With the rapid evolution of intelligent manufacturing, industrial mother machines, and new energy equipment industries under the NQPF framework, employment guidance for mechanical engineering students requires strong industry foresight. However, some counselors lack disciplinary backgrounds in mechanical engineering and possess limited understanding of emerging industrial trends, competency standards, and career pathways associated with new majors such as Intelligent Manufacturing Engineering and Robotics Engineering.

In practice, traditional perceptions of employment in the conventional mechanical industry still dominate some counselors' guidance approaches, resulting in inadequate interpretation of talent demands in high-end equipment manufacturing and related strategic sectors. In addition, insufficient familiarity with science–education–industry integration projects and school-enterprise cooperation platforms restricts the effective utilization of institutional resources, leading to a mismatch between guidance content and the evolving requirements of NQPF-oriented industries.

2.2. Fragmented guidance competence and limited support for interdisciplinary talent development

The cultivation of mechanical engineering talents under the NQPF context emphasizes the integration of professional skills, innovation capability, and interdisciplinary thinking. Correspondingly, employment guidance should extend beyond basic job-search services to encompass career planning, innovation mentoring, and interdisciplinary development support.

Nevertheless, current guidance practices remain largely confined to resume writing, interview training, and policy interpretation, lacking targeted support for scientific innovation and interdisciplinary competence development. Counselors often find it difficult to provide specialized guidance on technical skill enhancement, such as industrial robot operation, CAE simulation, and intelligent manufacturing applications. Furthermore, insufficient integration of international program characteristics, research platforms, and competition resources limits the formulation of personalized and forward-looking career plans for students. The deficiency in psychological counseling and entrepreneurship guidance also weakens counselors' ability to address students' employment anxiety and entrepreneurial aspirations in emerging industries.

2.3. Weak multi-stakeholder collaboration and inadequate resource integration

Employment guidance under the NQPF framework requires coordinated participation from multiple stakeholders, including counselors, professional faculty, enterprises, and alumni. However, existing collaboration mechanisms remain

underdeveloped. On the one hand, interaction between counselors and professional faculty is insufficient, resulting in weak integration between disciplinary teaching, scientific research, and employment guidance. On the other hand, the exploration and utilization of school–enterprise cooperation resources and alumni networks are limited. Although the college has established partnerships with leading enterprises and accumulated rich alumni resources, guidance practices still rely heavily on information dissemination and recruitment organization, with limited deep engagement of enterprise experts and alumni mentors. This constrains the practical and experiential dimensions of employment guidance and fails to meet the precision-oriented requirements of NQPF-driven employment services.

2.4. Incomplete professional development system and lack of systematic capacity-building mechanisms

The enhancement of counselors' employment guidance competence depends on a systematic training and professional development framework. However, existing training programs exhibit weak relevance, outdated content, and single formats. Current training mainly focuses on employment policies and basic job-seeking skills, with insufficient modules related to emerging industries such as intelligent manufacturing and industrial equipment. Moreover, training methods are predominantly lecture-based, lacking enterprise internships, field investigations, and case-based learning, which limits counselors' practical understanding of industrial talent demands. The absence of differentiated and hierarchical training, along with insufficient assessment and incentive mechanisms, further reduces counselors' motivation and effectiveness in competence improvement.

3. Pathways for enhancing employment guidance competence

To effectively address the aforementioned challenges, the School of Mechanical Engineering at Qilu University of Technology has, in recent years, carried out a series of practice-oriented reforms centered on four core competency dimensions: industry cognition, precise guidance, innovation-oriented mentoring, and resource integration. Through continuous institutional exploration and iterative optimization, a relatively systematic competency enhancement framework for counselors has been gradually established and implemented in actual employment guidance practices.

3.1. Strengthening industry cognition through industry-education integration

3.1.1. Establishing a normalized industry learning mechanism

In practice, the college has embedded industry cognition training into the routine professional development of counselors by constructing a normalized industry learning mechanism. Relying on its disciplinary strengths in mechanical engineering and intelligent manufacturing, the college regularly organizes counselors to participate in academic conferences, industry forums, and thematic seminars related to high-end equipment manufacturing, intelligent manufacturing, and CNC technology. Meanwhile, based on existing school-enterprise cooperation foundations, the college arranges periodic enterprise visits, technical exchanges, and field investigations in cooperative enterprises within the equipment manufacturing and intelligent manufacturing sectors. Through on-site observation of production lines, R&D centers, and engineering application scenarios, counselors are able to gain a first-hand understanding of job competency standards, recruitment requirements, and career development pathways in emerging industries, thereby significantly enhancing the forward-looking and professional orientation of employment guidance.

3.1.2. Promoting collaborative learning with professional faculty

To bridge the gap caused by non-engineering academic backgrounds among some counselors, the School of Mechanical Engineering has established a regular collaborative learning mechanism between counselors and professional faculty. Specifically, the college organizes semester-based employment guidance seminars in which faculty members introduce discipline development trends, curriculum systems, and industrial competency requirements against the background of new-quality productive forces. In addition, counselors are encouraged to participate in discipline competitions, laboratory

open activities, and scientific research project briefings hosted by faculty, especially those relying on platforms such as the Shandong Key Laboratory of Key Technologies for CNC Machine Tool Functional Components. Through continuous engagement in discipline-related academic and practical activities, counselors' understanding of core technical skills, industrial applications, and emerging professional directions has been substantially strengthened, thus improving the scientificity and professionalism of employment guidance.

3.1.3. Activating alumni knowledge networks

The college has also actively leveraged its long-standing alumni resources in the mechanical industry to enhance counselors' industry vision. By establishing an alumni liaison mechanism, outstanding alumni working in intelligent manufacturing, robotics, and advanced equipment enterprises are regularly invited to conduct thematic sharing sessions and career development lectures for both counselors and students. Furthermore, the college has promoted the construction of a normalized "alumni-counselor-student" communication platform, integrating alumni career development cases into employment guidance training. This practice not only enriches counselors' understanding of industry development trends and competency expectations but also provides empirical references for delivering more targeted and practical career counseling.

3.2. Improving professional guidance competence through precision-oriented services

3.2.1. Implementing personalized and precise career guidance

In response to the diversified employment pathways of mechanical engineering students, the college has implemented a refined and classified guidance model centered on individualized student development profiles. Counselors systematically collect data on students' academic performance, competition participation, internship experience, and career intentions, and establish dynamic employment guidance archives. Based on these profiles, differentiated guidance strategies are adopted. For employment-oriented students, counselors provide targeted job matching, skill enhancement suggestions, and internship guidance aligned with intelligent manufacturing and high-end equipment industries. For students pursuing postgraduate studies, guidance is closely connected with discipline development directions and research platforms of the college. For students with entrepreneurial intentions, counselors actively connect them with university innovation and entrepreneurship incubation platforms and relevant industry resources, forming a diversified and precise employment guidance system.

3.2.2. Strengthening innovation-oriented mentoring

Guided by the talent cultivation objective of fostering application-oriented and innovative engineers, the college has integrated innovation education into the whole process of employment guidance. Counselors collaborate with professional faculty to encourage students to participate in discipline competitions, scientific research training programs, and innovation practice projects related to mechanical design, robotics, and intelligent manufacturing. At the same time, counselors actively guide students to develop interdisciplinary competencies by paying attention to the integration of mechanical engineering with artificial intelligence, digital manufacturing, and industrial internet technologies. By embedding innovation guidance into characteristic activities such as academic competitions, research training, and industry practice, students' technological innovation awareness and long-term career planning ability have been significantly enhanced.

3.2.3. Enhancing job-search skill training through digital empowerment

To better adapt to the recruitment characteristics of emerging manufacturing enterprises, the college has continuously optimized job-search skill training content. Counselors provide specialized training on technical resume writing, project experience presentation, and structured interview preparation tailored to engineering positions. In recent practice, digital tools such as online mock interview platforms, intelligent resume evaluation systems, and employment information management platforms have been introduced to support high-frequency and flexible guidance. Through the integration of online and offline training modes, the temporal and spatial limitations of traditional employment guidance have been effectively overcome,

significantly improving the precision and efficiency of career services for mechanical engineering students.

3.3. Integrating multi-party resources to construct a synergistic guidance system

3.3.1. Strengthening counselor-faculty collaborative mechanisms

The School of Mechanical Engineering has promoted the deep integration of employment guidance with professional education by establishing a coordinated working mechanism between counselors and faculty members. Employment guidance is embedded into key links such as professional teaching, practical training, and discipline competitions, forming a collaborative education model. Counselors and faculty jointly conduct industry demand surveys and graduate tracking analyses, which provide data support for optimizing employment guidance strategies. In addition, faculty members' industry cooperation resources and research achievements are actively transformed into employment resources, effectively improving the quality of job matching in strategic emerging industries.

3.3.2. Deepening school-enterprise cooperation platforms

Relying on long-term partnerships with equipment manufacturing and intelligent manufacturing enterprises, the college has built a stable school–enterprise collaborative employment guidance mechanism. Enterprise HR managers, technical experts, and industry mentors are regularly invited to deliver career lectures, technical workshops, and recruitment briefings. Moreover, the college has strengthened the construction of internship bases and practical training platforms, encouraging students to participate in enterprise internships and engineering practice projects. These initiatives not only enhance students' practical competence and employability but also enable counselors to gain a deeper understanding of enterprise talent needs through continuous interaction with industry partners.

3.3.3. Expanding alumni participation in career guidance

In practical implementation, the college has gradually improved its alumni engagement mechanism by inviting outstanding alumni to serve as career mentors, participate in employment guidance courses, and assist in recruitment activities. Alumni forums, experience-sharing sessions, and peer mentoring programs have been institutionalized as regular activities. Through sustained alumni follow-up and information feedback, counselors are able to track industry development trends and employment market changes in a timely manner, thereby continuously updating guidance content and improving its relevance and effectiveness.

3.4. Optimizing the training system and institutional guarantee mechanisms

3.4.1. Updating training content with industry and discipline orientation

Based on the disciplinary characteristics of mechanical engineering and the development trend of new-quality productive forces, the college has optimized counselor training content by adding specialized modules on intelligent manufacturing, industrial equipment, and emerging technological fields. Training also incorporates science-education-industry integration practices, school-enterprise cooperation cases, and discipline competition guidance, effectively enhancing counselors' ability to utilize institutional resources in employment services.

3.4.2. Innovating training models through "online-offline" and "theory-practice" integration

Breaking away from the traditional lecture-based training model, the college has adopted a diversified training approach combining online learning, enterprise practice, field investigation, and case study seminars. Counselors are regularly organized to participate in enterprise attachment training and benchmarking visits to peer institutions with strong engineering disciplines, which significantly strengthens their practical cognition of industrial development and talent demand.

3.4.3. Implementing hierarchical and classified training mechanisms

Considering differences in academic background, years of experience, and competency structure among counselors, the

college has implemented hierarchical and classified training. For counselors without engineering backgrounds, the focus is placed on industry knowledge and discipline orientation training; for young counselors, emphasis is given to practical guidance skills and psychological counseling; for experienced counselors, advanced training in resource integration, innovation mentoring, and research on employment guidance is provided. Competency development files are also established to dynamically track training effectiveness.

3.4.4. Establishing assessment, incentive, and support systems

To ensure the long-term effectiveness of competency enhancement, the college has gradually improved its assessment and incentive mechanisms for employment guidance. A multi-dimensional evaluation system has been established, incorporating indicators such as employment guidance effectiveness, industry cognition level, resource integration ability, and student satisfaction. Evaluation outcomes are linked with annual performance appraisal, professional title promotion, and excellence awards.

Simultaneously, the college has strengthened institutional support by providing dedicated funding for employment guidance activities, encouraging counselors to conduct research on career education, and promoting the transformation of practical experience into teaching and research achievements. These measures have formed a sustainable institutional guarantee for the continuous improvement of counselors' employment guidance competence in the background of new-quality productive forces.

4. Implementation effects

The enhanced employment guidance system has led to a measurable improvement in counselors' professional capacity. After implementation, surveys indicate that over 85% of counselors report improved ability to analyze industry trends and match student competencies with emerging mechanical engineering roles. This has resulted in more accurate and forward-looking career advice, with approximately 78% of students acknowledging that guidance has helped clarify their career goals and improve confidence in planning and decision-making. The proportion of students who feel "well-prepared" for specialized mechanical engineering positions has increased by nearly 20% in 2025 compared to that in 2021.

In addition, career outcomes for students have shown significant positive effects. Follow-up data suggest that over 75% of graduates have secured employment or pursued further studies in positions closely related to their major, including intelligent manufacturing, robotics, and high-end equipment sectors. Graduate satisfaction with the relevance of career guidance has increased, with around 80% of students rating the guidance as "highly relevant" to their professional aspirations. Notably, the number of students entering interdisciplinary or innovation-oriented roles has risen by an estimated 15%–18%, reflecting enhanced support for non-traditional career pathways and the improved employability of graduates.

Furthermore, the institutional environment for career development has become more coordinated and sustainable. Multi-party collaboration among counselors, faculty, and industry partners has increased counselors' access to relevant resources, resulting in a 30% improvement in the speed and accuracy of job placement support. The ongoing professional development framework has led to approximately 90% of counselors engaging in at least one advanced training or industry immersion annually, fostering a culture of continuous improvement. These changes collectively contribute to a more resilient and responsive employment guidance system, ensuring long-term alignment between graduate capabilities and the evolving needs of the mechanical engineering industry.

5. Conclusions

The rapid evolution of New Quality Productive Forces necessitates a paradigm shift in mechanical engineering career guidance, moving from generalized administrative support to a specialized, interdisciplinary, and resource-integrated

model. By constructing a multidimensional competency framework, the School of Mechanical Engineering at Qilu University of Technology has successfully bridged the gap between academic training and the sophisticated demands of the high-end equipment and intelligent manufacturing sectors. The implementation of normalized industry learning, collaborative faculty-counselor mechanisms, and digital empowerment has not only significantly improved counselors' professional agency but also resulted in measurable gains in student employment quality and alignment with strategic industrial trends. Ultimately, this systematic approach provides a scalable blueprint for engineering colleges to cultivate a resilient, responsive, and innovation-driven employment guidance ecosystem that effectively supports the national transition toward a high-quality, modern industrial structure.

Funding

This research was carried out with financial support from the Shandong Higher Education Association Special Project (Project No.: SDGJ2025LGB23).

Disclosure statement

The authors declare no conflict of interest.

References

[1] Li XD, 2025, Implementation Path of Deep Integration of Industry and Education in Higher Vocational Education from the Perspective of New Quality Productive Forces. *Journal of Higher Vocational Education*, 2(5): 48–53.

[2] Guo HY, Liu B, 2025, The Strategic Value of Vocational Education in the Era of New Quality Productive Forces. *Journal of Higher Vocational Education*, 8(6): 40–50.

[3] Hu XM, 2025, Enhancement Strategies for Career Guidance Capabilities of Vocational College Counselors. *Advances in Vocational and Technical Education*, 2025(7): 24–31.

[4] Wang NJ, 2025, A Study on the Impact of College Counselors on College Students' Career Planning Based on Role Orientation and Path Optimization. *Journal of Contemporary Educational Research*, 9(11): 144–149.

[5] Wang HM, 2026, Research on the Improvement of Counselors' Employment Guidance Service Ability under the Background of the Integration of Industry and Education. *Journal of Jilin Institute of Education*, 42(2): 133–137.

[6] Li L, 2026, How Do Counselors Promote High-Quality and Full Employment of College Students? An Inquiry Based on Grounded Theory. *Journal of Higher Education Counselors*, 18(1): 62–68 + 99.

[7] Wang YL, Kong D, 2026, Career Guidance Competency of College Counselors in the Era of Digital Intelligence: Three-Dimensional Structure and Improvement Paths. *Journal of Higher Education Counselors*, 18(1): 69–74 + 82 + 99.

[8] Li LP, Bian DC, 2025, Exploration of Employment-Focused Education Paths for College Counselors under the Orientation of High-Quality and Full Employment. *China University Students Career Guide*, 2025(12): 90–96.

[9] Su YL, 2025, Research on the Improvement of Vocational College Counselors' Career Guidance Ability from the Perspective of "Three-Wide Education." *Journal of Huainan Vocational and Technical College*, 25(6): 54–56.

[10] Lv YX, Su YC, Zhao W, et al., 2023, Research on Mechanical Engineering Teaching System Based on Integration of Science, Education, Industry and Perspective of New Engineering. *Advances in Educational Technology and Psychology*, 2023(7): 87–91.