International Education Forum, 2025, Volume 3, Issue 4
http://ojs.bbwpublisher.com/index.php/IEF
Online ISSN: 2981-8605

Analysis of Talent Cultivation Strategies for Mechanical Majors in Applied Universities under the Background of Intelligent Manufacturing

Yan Zhou*, Lina Hu, Chuange Li, Huiping Fan

School of Mechanical and Electrical Engineering, Qingdao City University, Qingdao 266106, Shandong, China

**Author to whom correspondence should be addressed.*

Abstract: With the continuous development and popularization of intelligent manufacturing technology, the requirements for talent in the machinery industry are also constantly increasing. Against the background of intelligent manufacturing, mechanical professionals not only need to have solid professional knowledge, but also need to have innovative thinking, practical ability, and teamwork ability to adapt to the rapidly changing market environment and technological innovation. Application-oriented universities, as an important base for the cultivation of mechanical professionals, the adjustment and optimization of their training strategies are of great significance to meet the needs of the industry and promote industrial upgrading. Therefore, application-oriented universities should actively reform the talent training strategies to improve the comprehensive quality and competitiveness of mechanical professionals and provide strong talent support for the development of the intelligent manufacturing field. In this regard, this paper first expounds the new requirements for the cultivation of mechanical professionals in application-oriented universities under the background of intelligent manufacturing, and then puts forward effective reform strategies to provide certain reference and guidance for relevant educational researchers.

Keywords: Intelligent manufacturing; Application-oriented universities; Mechanical major; Talent cultivation

Online publication: April 28, 2025

1. New requirements for cultivating mechanical professionals in applied universities under the background of intelligent manufacturing

1.1. Focus on cultivating high-tech compound talents

With the steady advancement of industrial upgrading and the transformation of the manufacturing industry, mechanical enterprises are constantly developing in the direction of intelligence and automation. Basic operators and junior technical workers will gradually be replaced by intelligent production systems. Therefore, enterprises urgently need talents with high skills and compound capabilities [1]. In this regard, applied

universities should closely focus on industrial demands, adjust the training goals of mechanical professionals to meet the requirements of the intelligent manufacturing era. While strengthening the professional skills training of students, it is necessary to attach importance to the shaping of their sustainable development ability and focus on improving their overall professional quality, including but not limited to professional skills, innovative thinking, continuous learning, critical thinking, hands-on operation, and teamwork, among other capabilities.

1.2. Focus on cultivating innovative and entrepreneurial talents

With the wide application of modern intelligent technologies in various fields, the patterns and goals of the global machinery industry have undergone earth-shaking changes. Countries have been intensifying their efforts, investing in the race of scientific and technological innovation and technological research and development, and vigorously promoting the development of intelligent manufacturing. In this process, innovation is regarded as the most core productive force, and the transformation and upgrading of the intelligent manufacturing industry also rely on this. Only through continuous innovation can its vitality be maintained. In this regard, application-oriented universities should take cultivating innovative talents as the core goal, simultaneously promote the innovation of the talent cultivation model, balance theoretical and practical teaching, strengthen the cultivation of students' innovative consciousness and entrepreneurial ability, and thereby promote them to grow into innovative and entrepreneurial talents that meet the needs of the intelligent era [2].

1.3. Focus on cultivating craftsmanship-oriented talents

In the current context of the rapid development of intelligent manufacturing, the cultivation of craftsmanship-oriented talents is particularly important. Craftsmanship-oriented talents, with their exquisite craftsmanship skills, rigorous working attitude, and ultimate pursuit of details, have become the key force promoting the high-quality development of the manufacturing industry. In the process of cultivating mechanical professionals, application-oriented universities should focus on cultivating students' craftsmanship spirit. Through various approaches such as curriculum setting, practical teaching, and school-enterprise cooperation, guide students to establish the professional concept of striving for excellence and continuously improve their own technical level and professional quality. For example, application-oriented universities can offer elective courses related to the craftsmanship spirit and invite master craftsmen in the industry to the campus to hold lectures or workshops, allowing students to closely experience the charm of the craftsmanship spirit [3].

2. Training strategies for mechanical professionals in applied universities under the background of intelligent manufacturing

2.1. Clarify the goal of talent cultivation and focus on cultivating compound talents

At present, the skills of mechanical professionals cultivated by colleges and universities are relatively single, and the knowledge structure is not wide enough, making it difficult for them to meet the requirements put forward by the machinery industry under the background of intelligent manufacturing. Teachers should optimize and clarify the talent training goals based on the talent demands in the background of intelligent manufacturing, and promote the transformation of talent training from "specialization" to "compound." Therefore, in the specific talent cultivation, teachers need to analyze the talent ability demands of mechanical positions and markets under the background of intelligent manufacturing, as well as the employment standards and job requirements of most mechanical manufacturing units, and adjust the teaching goals of mechanical

majors to cultivate students' development awareness [4]. In this regard, teachers can set the following teaching goals: Strengthen the integration of interdisciplinary knowledge. Students are not only required to master a solid foundation of mechanical engineering, but also incorporate knowledge in related fields such as information technology, automation technology, and electronic technology to form a diversified knowledge system; Strengthen the cultivation of innovation ability, encourage students to participate in scientific research projects, innovation competitions and other activities, stimulate their innovative thinking and practical ability, and provide compound talents with innovation potential for the intelligent manufacturing field; Pay attention to the expansion of international vision. Given the globalization trend of intelligent manufacturing technology, encourage students to understand international industry trends, learn international advanced technologies and concepts, and enhance international competitiveness. Focus on the improvement of students' professional ethics and humanistic quality to ensure that students have good professional ethics and social responsibility while mastering professional skills. In this way, under the guidance of teaching goals, the cultivation of mechanical professionals will be more targeted and effective, and compound talents adapted to the needs of intelligent manufacturing will be cultivated, thereby contributing to promoting the upgrading of China's intelligent manufacturing industry [5].

2.2. Reform and optimize the curriculum system to enhance the effect of talent cultivation

In the cultivation of mechanical professionals, reforming the curriculum system in application-oriented universities is an important step in shaping students' core abilities. By carefully adjusting the course content, constructing interdisciplinary modules, introducing "innovation and entrepreneurship" courses, and building a curriculum system that adapts to the development of the times, a curriculum structure that fits the background of the intelligent manufacturing era can be created, laying a solid foundation for students' core literacy and comprehensive abilities [6]. First of all, application-oriented universities should streamline and improve the course content of mechanical major, carefully review the existing courses, eliminate outdated, redundant or out-of-date courses that are disconnected from the development of the times, and introduce cutting-edge technology courses such as intelligent manufacturing and Internet of Things to ensure that students master the latest knowledge and skills [7]. Secondly, application-oriented universities should recognize that the mechanical major does not exist in isolation and actively build interdisciplinary course modules to promote the deep integration of the mechanical major with electronics, information, computer, and other disciplines. In the interdisciplinary course module, students can master knowledge and skills outside their major while learning the knowledge and skills of the mechanical major. In addition, innovative and entrepreneurial courses should be added to teach students innovative thinking and entrepreneurial skills and stimulate their innovative potential and entrepreneurial passion. Finally, to build a curriculum system that keeps up with the trend of the times, application-oriented universities should update and review the curriculum system regularly to ensure that the course content is in sync with the development trend of the times, and maintain close cooperation with mechanical enterprises and industries, grasp the latest technological trends and industry demands, and adjust the courses and teaching content in a timely manner, thereby improving the quality of mechanical professional talent training [8].

2.3. Take the initiative to improve teaching methods and mobilize the enthusiasm of students

In the teaching of mechanical majors, teachers adopt teaching models such as small-class, discussion-

based, and research-oriented ones to make the teaching of mechanical majors more effective and interesting, unclog students' thinking patterns, and interact with teachers and other students. Meanwhile, diversified teaching activities should also be carried out. Besides explaining professional knowledge in the classroom, case analysis, group discussion, experimental simulation, interactive games, etc., are introduced to create an interesting teaching atmosphere for mechanical majors, enabling students to actively explore professional knowledge and practice professional skills, and effectively improve their learning efficiency [9]. For instance, in practical teaching, teachers can ask students to form groups and, by using the professional knowledge they have mastered and consulting relevant materials, study the changes in the machinery industry in the era of intelligent manufacturing. They should also encourage students to actively carry out group discussions based on scientific independent innovation, create corresponding PPTs, elaborate in detail the development prospects of the machinery industry in the era of intelligent manufacturing, and clarify the job skills that should be mastered, thereby guiding students to actively participate in scientific research and innovation. At the same time, teachers can also set discussion topics and ask students to randomly draw lots to determine the affirmative and negative sides. This process effectively enhances students' ability to apply knowledge and strengthens their spirit of unity and collaboration. Besides, teachers can utilize digital platforms to implement information-based teaching of mechanical specialties. Through the combination of online and offline methods, the limitations of time and space in traditional teaching are broken, enabling students to learn professional knowledge anytime and anywhere and interact with teachers [10]. Teachers can upload teaching videos, courseware, experimental guidance, and other teaching resources for students to study and review independently, and select cutting-edge knowledge and technologies in the industry to prompt students to keep up with the development trends of the times and help further improve the teaching quality.

2.4. Attach importance to the implementation of practical teaching and strengthen students' comprehensive qualities

Against the background of the development of the intelligent manufacturing era, the machinery industry has a very high practical operation requirement for applied technologies. Therefore, application-oriented universities should keep pace with the times and make adjustments to the cultivation of mechanical professionals around intelligent manufacturing, with particular attention to strengthening practical teaching to ensure a close connection with actual engineering projects. The details are as follows. Firstly, strengthen the practical links of professional courses, increase the proportion of practical class hours, design practical teaching links together with industry senior experts, introduce "real problems" such as real engineering problems and project cases into practical teaching, optimize the teaching process, and achieve the combination of course theory and experimental practice, as well as the combination of course learning and engineering practice, so as to enhance students' comprehensive ability to solve practical problems [11]. Secondly, for in-depth school-enterprise cooperation, both the school and the enterprise should be committed to establishing various platforms such as practice bases and industrial colleges, realize the sharing of equipment and instruments, make practical teaching closer to the real manufacturing environment, and also enable students to be exposed to the most advanced technologies in the industry. In this way, students can not only acquire theoretical knowledge but also better understand and master the skills and knowledge in practical work through practical learning. Finally, in today's era of rapid digital development, application-oriented universities make full use of advanced digital technologies to build modern teaching venues such as smart classrooms and virtual simulation laboratories. In these venues,

various results in theoretical knowledge verification, design concepts, and implementation processes can be achieved through simulation technology or the combination of simulation and physical experiments [12]. In this way, in addition to enhancing students' interest in learning, it can also help them better understand and master complex concepts, thereby achieving the goal of improving teaching quality and learning effects [13].

2.5. Deepen school-enterprise cooperation and create a collaborative education model

From the perspective of intelligent manufacturing, enterprises are actively undergoing digital and intelligent transformation. This change has led to a sharp increase in the demand for professional and technical talent in enterprises. However, it is difficult for enterprises to quickly attract a large number of talents by their own efforts alone, and the help of colleges and universities is urgently needed. Therefore, application-oriented colleges and universities should firmly grasp this development opportunity, actively strive for the support of the government and society, and jointly build an intelligent manufacturing industry-education integration community with mechanical enterprises, to deepen the integration of industry and education and accurately deliver talents to enterprises. The details are as follows. Firstly, focus on exerting the "siphon effect" to attract more enterprises to participate in the process of cultivating mechanical professionals, thereby obtaining highly skilled talents that are in line with their own development needs [14]. Secondly, application-oriented universities should shorten the "distance" with enterprises and jointly integrate the resources of both sides. For example, enterprises provide internship and employment positions to schools, while schools can carry out industry-university-research cooperation, jointly solve technical problems, and invite enterprises to participate in the assessment of talent cultivation quality, to continuously optimize the talent cultivation plan for mechanical majors. In addition, actively establish industrial alliances, give full play to the leading role of the government and the main role of enterprises, and strengthen the guidance and direction of the integration of industry and education from the policy level. Through the continuous optimization of the integration model of industry and education, application-oriented universities establish a complete collaborative education system for the integration of industry and education, ensuring the close combination of professional settings and industrial demands, teaching content and vocational standards, practical processes and production processes, and graduation certificates and vocational skill certificates, closely connecting the government, application-oriented universities, enterprises and industries, and realizing the vision of collaborative education [15].

3. Conclusion

In conclusion, in the current rapid development of intelligent manufacturing, new requirements have been put forward for the cultivation of mechanical professionals in application-oriented universities. To ensure that the talent cultivation model is adapted to the development needs of intelligent manufacturing and to cultivate mechanical students into high-quality and competent compound talents, application-oriented universities should clarify the new requirements under the background of intelligent manufacturing and start from strategies such as clarifying the talent cultivation goals and focusing on cultivating compound talents; reforming and optimizing the curriculum system to enhance the effect of talent cultivation; actively improving teaching methods to mobilize students' enthusiasm; attaching importance to the implementation of practical teaching to strengthen students' comprehensive qualities; deepening school-enterprise cooperation to create a collaborative education model. Only in this way can the quality of mechanical professional talent cultivation be highly consistent

with social needs, and high-quality mechanical professionals who have both solid theoretical knowledge and excellent practical ability, and innovative thinking can be cultivated. These talents will play an important role in the field of intelligent manufacturing, promoting industrial upgrading and technological innovation, and contributing wisdom and strength to social and economic development.

Funding

The university-level first-class course "CNC Machine Tools and Programming" of Qingdao City University, Project Number: KC2022-0113L; Project of Shandong Provincial Department of Education, Project Name: Construction and Practice of an Innovative Platform for Cultivating High-quality Applied Talents in Local Universities under the Background of Intelligent Manufacturing, Project Number: M2022362

Disclosure statement

The authors declare no conflict of interest.

References

[1] Zhang MJ, 2021, Research on the Integration of Mechanical Majors and Curriculum Systems in Higher Vocational Colleges under the Evolution of Intelligent Manufacturing. Journal of Jining Normal University, 43(2): 1–8.

[2] Zuo PL, Deng XZ, Wang JP, 2019, Research on the Cultivation of Mechanical Professionals in Higher Vocational Colleges under the Background of the Intelligent Manufacturing Era. Contemporary Education Practice and Teaching Research, 2019(11): 27–28.

[3] Zhang WF, Li YM, Dong XG, et al., 2020, Information Transformation of the Curriculum System of Mechanical Engineering Major under the Background of Intelligent Manufacturing. Wireless Internet Technology, 17(21): 157–159.

[4] Qu JL, Xi XQ, Zheng LL, 2021, Research on the Cultivation of Information Literacy of Mechanical Majors in Colleges and Universities Oriented to Intelligent Manufacturing. Southern Agricultural Machinery, 52(6): 99–100.

[5] Sun XY, Yuan L, Wang JJ, 2022, Research on the Comprehensive Quality Cultivation and Skill Improvement of Undergraduate Students of Mechanical Majors under the Background of Intelligent Manufacturing. Journal of Chizhou University, 36(3): 109–111.

[6] Xia TJ, 2020, Research on the Teaching Reform of "CNC Machine Tools" Course for Mechanical Manufacturing Majors in Secondary Vocational Schools under the Background of Intelligent Manufacturing, thesis, Hunan Normal University.

[7] Shi J, Zhang YJ, Yang LL, et al., 2022, Reform of the Talent Cultivation Mode for Intelligent Manufacturing in Mechanical Majors of Agricultural Colleges and Universities: Based on the Practice and Exploration of the Major of Mechanical Design, Manufacturing and Automation in Yunnan Agricultural University. Journal of Yunnan Agricultural University (Social Science), 16(1): 150–155.

[8] Zhang XQ, 2020, Research on the Talent Cultivation of Mold Design and Manufacturing Major in Higher Vocational Colleges under the Background of Intelligent Manufacturing. Journal of Jilin Engineering Normal University, 36(10): 8–12.

[9] Pu Y, 2019, Construction of the Curriculum System for Compound Talents in Higher Vocational Education under

the Background of “Made in China 2025”: Taking the Major of Mechanical Manufacturing and Automation as an Example. Journal of Ningbo Polytechnic, 23(4): 1–4.

[10] Xu YL, Zhang Q, 2022, Demands, Dilemmas and Choices of the Reform of the Talent Cultivation Model for New Engineering Disciplines in the Intelligent Manufacturing Era. Heilongjiang Researches on Higher Education, 40(9): 47–52.

[11] Lin XQ, 2023, Research on the Cultivation Model of Innovative Talents in Application-oriented Undergraduate Universities under the Background of Intelligent Manufacturing, thesis, Liaoning University.

[12] Zhang P, 2023, Exploration of Ways to Enhance the Cultivation of Electromechanical Applied Talents through Deep School-Enterprise Integration under the Background of Intelligent Manufacturing. Equipment Manufacturing and Education, 37(3): 37–39.

[13] Tao W, Yang KM, 2024, Exploration of the Cultivation Model of Applied Talents in Mechanical Specialty under the Background of Intelligent Manufacturing. Journal of Wuyi University, 43(9): 101–104.

[14] Wang GP, Liu JX, Cheng S, et al., 2023, Research and Practice on the Construction of the “Introduction to Intelligent Manufacturing” Course under the Background of New Engineering Disciplines. Machine Design and Manufacturing Engineering, 52(7): 130–134.

[15] Liu YH, 2024, Research on the Cultivation Model of Applied and Innovative Talents in Machinery under the Background of Intelligent Manufacturing. Modern Agricultural Machinery, 2024(4): 114–115.