Education Reform and Development, 2026, Volume 8, Issue 6
https://ojs.bbwpublisher.com/index.php/ERD
Online ISSN: 2652-5372
Print ISSN: 2652-5364

Innovative Application of 3D Printing in the Cultivation of Applied Talents in Universities

Ronghai Zhang, Fanyi Zeng, Yifu Xie, Peiqi Dai, Sibei Chen

Nanning College of Technology, Guilin 541006, Guangxi, China

Abstract: Against the background of digital transformation, 3D printing technology has been widely used in equipment manufacturing, cultural and creative services, daily consumption and other fields, with its application scenarios continuously expanding. The demand for applied talents proficient in 3D printing technology is growing rapidly. China has a huge demand for applied talents, and the application of 3D printing in the training system of applied talents in universities is a practical need for the reform and innovation of higher education, as well as social transformation and development. This paper expounds the application value of 3D printing in the cultivation of applied talents in universities, focusing on four aspects: teaching platform, curriculum construction, practical training conditions and faculty development. It puts forward innovative application strategies of 3D printing in the cultivation of applied talents in universities, so as to promote the improvement of the quality of applied talent training in universities, realize the precise alignment of talent training with industry needs, and cultivate high-quality applied talents for the digital transformation of the industry.

Keywords: 3D printing; Universities; Cultivation of applied talents; Innovative application

Online publication: July 20, 2026

1. Introduction

Against the background of building a strong manufacturing country and a strong digital country, technological innovation has become the driving force for high-quality development. New quality productive forces are gradually integrating into various industrial fields, injecting vitality into industrial transformation and development. 3D printing, also known as additive manufacturing, is an emerging manufacturing technology that produces solid objects by stacking materials layer by layer based on digital models. It is an important force for China to foster new, quality productive forces and a new growth point for future industrial development. At present, 3D printing has been deeply applied in mold manufacturing, ceramic technology, medical devices, architectural modeling and other fields, rapidly integrating into social production and life. Therefore, the demand for talents with professional competence, practical skills and 3D technology is increasing day by day. Universities are important positions to serve the needs of social development and cultivate applied talents. Against the background of emerging engineering education construction, many

universities focus on interdisciplinary integration, integrating big data, artificial intelligence, 3D printing, and other technologies into the curriculum and practice systems, and have achieved certain results [1–5]. However, restricted by educational resources, conditions and concepts, some universities have not yet established special interdisciplinary platforms. The set teaching contents fail to keep pace with the development of the times, and practical teaching resources are scarce, making it difficult to effectively combine talent training with social needs. In the process of talent training, by introducing 3D printing technology, teachers can guide students to analyze the innovative development direction of the integration of 3D printing and their majors from an interdisciplinary perspective and broaden their professional horizons. Meanwhile, teachers and students can use 3D printing technology to print teaching aids and practical tools, and develop and design new products, which is of great significance for cultivating students' interdisciplinary thinking, broadening professional horizons, and enhancing innovation and application abilities.

2. Application value of 3D printing in the cultivation of applied talents in universities

3D printing has a wide range of applications. Introducing it into the training system of applied talents in universities conforms to the goals of emerging engineering education. Its main values lie in cultivating practical ability, stimulating innovative thinking, promoting industry-education integration, and enhancing talent competitiveness.

2.1. Helping improve practical ability and solving the disconnection between theory and practice

3D printing can make up for the high cost of traditional training and the shortage of practical training resources. Practical teaching is crucial for cultivating applied talents. Traditional teaching focuses on theoretical education and provides limited practical resources for students, making it difficult to fully cultivate their knowledge application ability and practical innovation ability. 3D printing supports teachers to build an integrated teaching system of design, processing, verification, and improvement. While learning professional knowledge, students can apply professional knowledge and 3D printing technology in a cross-cutting manner. Through 3D modeling, digital design and physical printing, students can experience the application value of professional knowledge in different disciplines, realize the connection between theoretical knowledge and practical application, and help enhance knowledge understanding and practical application ability.

2.2. Cultivating innovative thinking and training students' independent inquiry ability

3D printing reduces the processing cost of traditional machine tools. It not only provides a platform for teachers to carry out repeated practical training, but also assists students in experimenting and revising creative project results, thereby reducing the cost of practical teaching, innovation and entrepreneurship. Electrical and information majors usually involve complex structures and models. By introducing 3D printing equipment, teachers enable students to learn by doing and do by learning, transforming structural models into physical objects. This process deepens their understanding and application of professional knowledge and hones their innovative ability. Meanwhile, with the help of the 3D printing platform, students can independently model and process creative works according to their own interests, optimize product structures by adjusting processing parameters, and realize learning by doing and creating by learning. This allows them to accumulate

practical experience in engineering projects and enhance their abilities of independent learning, exploration and innovation.

2.3. Connecting industry-education integration and realizing synchronization of talent training and industrial needs

3D printing is an advanced and green additive manufacturing technology, and its application scenarios are highly consistent with the needs of emerging positions. In the cultivation of applied talents, by connecting with the 3D printing application industry and scenarios, universities can introduce relevant theories, technologies and cases according to the characteristics of different majors and disciplines, enrich the professional knowledge system, realize the precise alignment of industrial needs and talent training, and improve the advancement of the curriculum system and the pertinence of talent training. Meanwhile, relying on the industry-education integration platform, teachers can connect with the post needs of various industrial scenarios, jointly develop teaching case resources with enterprises, let students understand the application direction, engineering tasks and production processes of 3D printing, promote them to integrate professional knowledge with cutting-edge technologies, improve interdisciplinary knowledge and practical ability, and enhance the adaptability of talent training to industrial needs.

2.4. Enhancing talent competitiveness and adapting to industrial upgrading needs

Integrating 3D printing into the university talent training system enables students to master cutting-edge knowledge and technologies, cultivate their practical and innovative abilities, and enhance their post-competence and competitiveness. 3D printing is a key support for the digital and green transformation of the manufacturing industry. All industries have a growing demand for applied talents proficient in 3D printing technology in the process of transformation and development. Facing the needs of industrial transformation and upgrading, by introducing 3D printing technology, universities can add 3D printing theoretical and practical courses according to professional characteristics, guide students to carry out creative design, processing operation and process optimization combined with the needs of various emerging fields, cultivate students' digital thinking and interdisciplinary application abilities, and make them better adapt to post changes brought by industrial upgrading [6].

3. Innovative application of 3D printing in the cultivation of applied talents in universities

Applied talents refer to those who apply mature theories and technologies to actual production and life. The innovative application of 3D printing in the cultivation of applied talents in universities mainly focuses on four aspects: teaching platform, curriculum construction, practical teaching and faculty development.

3.1. Constructing a diversified teaching platform to realize resource integration and sharing

The improvement of the teaching platform is the foundation for integrating 3D printing technology into talent training. It is necessary to build a diversified system consisting of "on-campus core platform + interdisciplinary sharing platform + university-enterprise co-construction platform" to realize resource integration and efficient utilization.

Build a core teaching platform on campus. Universities should increase capital investment, establish a special 3D printing teaching laboratory, and equip it with different types and precision levels of equipment, such as Fused Deposition Modeling (FDM) and Stereolithography (SLA), to meet the needs of various majors. Meanwhile, a digital teaching resource library should be established to integrate modeling software, teaching videos, practical training cases and other resources to support students' independent learning.

Establish an interdisciplinary sharing platform. Universities should make use of their unique educational characteristics to encourage interdisciplinary teaching and research activities among schools of information engineering, civil engineering, art and media, etc. Universities should focus on the transformation of traditional industries and the needs of emerging industries, and establish an interdisciplinary 3D printing maker sharing platform open to teachers and students of pilot universities. Teachers can guide students of different majors to form interdisciplinary learning and innovation teams, and let project teams participate in skill competitions, design competitions and project development, so as to cultivate their ability to apply professional knowledge and promote the cultivation of interdisciplinary thinking [7].

Co-construct a university-enterprise cooperation platform. Cooperate with local manufacturing and 3D printing enterprises to establish an industry-university-research cooperation and application platform. Use the advanced printing equipment of enterprises to carry out practical teaching and extracurricular activities. Teachers and students can personally design and manufacture component models combined with industrial scenarios, improve production processes and parameters, and serve the industrial innovation and development [8].

3.2. Optimizing the curriculum system and promoting the in-depth integration of 3D printing and majors

Curriculum system optimization is the core to improving the quality of talent training. It is necessary to build a 3D printing curriculum system featuring "hierarchical design, major integration and project-based learning".

Construct a hierarchical and progressive curriculum system. The basic level includes courses such as "Fundamentals of 3D Printing Technology" and "Fundamentals of 3D Modeling" to popularize technical principles and basic operations. The advanced level integrates professional characteristics and offers modules such as "3D Printing Technology and Equipment" and "Professional Parts Printing Technology". The innovation level includes courses such as "3D Printing Innovative Design" and "Project Research, Development and Practice" to cultivate innovative abilities [9,10].

Promote in-depth integration with professional courses. Integrate 3D printing into core professional courses: integrate mechatronics into mechanical manufacturing courses, electrical major into component design courses, and art major into product design courses. Develop project-based teaching materials, taking real projects as carriers to realize the organic combination of technology and professional knowledge [11,12].

Reform the curriculum assessment method. Establish a comprehensive assessment system combining "theory + practice + innovation". The theoretical assessment examines technical principles, the practical assessment evaluates practical skills, and the innovation assessment assesses work design and project development ability, so as to comprehensively evaluate students' comprehensive quality.

3.3. Improving practical training conditions and enhancing the quality of practical teaching

Practical teaching is crucial for cultivating applied talents. It is necessary to improve the quality of 3D printing practical teaching by improving practical training conditions and innovating practical training modes.

Strengthen the construction of on-campus practical training conditions. Increase the quantity and precision of practical training equipment, equip with 3D printers, 3D scanners, post-processing equipment, etc., and build a complete practical training system [4,13]. Design a hierarchical practical training plan of "basic-comprehensive-innovation". Basic practical training focuses on operation training, comprehensive practical training combines professional post needs, and innovative practical training relies on academic competitions and innovation and entrepreneurship projects [14].

Expand off-campus practical training bases. Cooperate with enterprises to establish off-campus practical training bases, organize students to participate in internships and research-based practical activities, and gain an in-depth understanding of industrial production processes and work standards [5,9]. Invite enterprise engineers to serve as off-campus instructors to improve the professionalism of practical training [3,13].

Innovate the practical training teaching mode. Implement the "project-driven, learning by doing" mode, guiding students to complete the whole process from design to printing with real projects. Introduce the "AI + 3D printing" mode and build an immersive simulation and practical training platform to make up for the shortage of offline equipment [15].

3.4. Strengthening the construction of teaching staff and improving teachers' professional ability

Teachers are the main body applying 3D printing technology to teaching practice. They need to understand the technical principles and development trends of 3D printing and master the application of this technology. Universities should cultivate a professional teaching team with "solid theoretical knowledge and excellent practical skills" through the combination of introduction and training as well as university-enterprise cooperation [16].

Increase efforts to introduce professional teachers. Introduce talents with professional backgrounds in 3D printing and front-line enterprise experience, and employ senior enterprise engineers as part-time teachers to enrich the teaching team [5].

Strengthen the cultivation of teachers' practical ability. Establish a normalized training system, regularly invite experts and engineers in the field of 3D printing to give lectures and seminars in schools. Encourage teachers to carry out teaching and scientific research projects on innovative applications of 3D printing combined with their own professional directions, so as to improve their teaching and scientific research abilities [17–19].

Establish a collaborative teacher training mechanism between universities and enterprises. Use the industry-education integration platform to arrange teachers to take temporary positions in emerging fields and participate in project research and development and engineering practice activities. Through regular collective lesson preparation activities, transform 3D printing application cases into teaching resources, so as to improve teachers' practical ability and teaching level [20].

4. Conclusion

In summary, promoting the innovative application of 3D printing in the cultivation of applied talents in universities is an important way to deepen industry-education integration, accelerate the construction of emerging engineering education, and cultivate students' practical application ability and interdisciplinary thinking. Therefore, universities, teachers and enterprises should seize the opportunity of industrial digital and

intelligent transformation, focus on the application scenarios and educational characteristics of 3D printing, integrate 3D printing theories, technologies and equipment into the talent training system by building a diversified teaching platform; optimize the curriculum system and develop 3D printing curriculum contents adapted to different professional characteristics; improve practical teaching conditions and promote the application of 3D printing in practical teaching and extracurricular activities; strengthen the construction of teaching staff, improve teachers' ability to apply advanced technologies in teaching and scientific research, build an applied talent training system adapted to the needs of future industrial transformation, and continuously improve the matching degree between professional construction and industrial needs. Thus, more high-quality applied talents with practical ability, innovative thinking, and interdisciplinary thinking can be delivered to society, helping to realize the "Made in China 2025" strategy.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Yuan L, 2025, Discussion on the Cultivation of Applied "Digital Craftsmen" in Universities Based on 3D Printing Technology. Shanghai Fashion, 2025(12): 138–140.

[2] Liang Y, 2025, Research on the Talent Training Mode of Modern Processing Technology—3D Printing Direction for Mechatronics Major in Higher Vocational Colleges Under the Background of Intelligent Manufacturing. Auto & Driving Maintenance (Maintenance Edition), 2025(01): 67–69.

[3] Ge D, Zhao J, 2024, Practical Application of 3D Printing Technology in the Cultivation of Industrial Robot Talents. Internal Combustion Engine & Parts, 2024(11): 141–143.

[4] Ren X, Xian J, Wu H, et al., 2024, Practical Exploration of 3D Printing Functional Experimental Platform in the Cultivation of Agricultural Innovative Talents. China Agricultural Machinery Equipment, 2024(01): 100–102.

[5] Fan H, Wang S, 2023, Research on the Training Path of 3D Printing Innovative Talents Based on the Collaborative Education Mode. China Educational Technology & Equipment, 2023(23): 148–150.

[6] Yang J, 2022, Application of Internet + 3D Printing Technology in Universities. Science & Technology Information, 20(02): 185–187.

[7] Zhu S, 2023, Research on the Application of 3D Printing Technology in Industrial Design Major in Vocational Education. China Educational Technology & Equipment, 2023(24): 15–18 + 21.

[8] Guo P, Wen Z, Huang R, et al., 2022, Exploration on Practical Teaching Reform Under the Mode of Modern Industrial College—Taking the Course "3D Printing and Product Creative Design" as an Example. Packaging Engineering, 43(S2): 104–106.

[9] Luo H, Zhang H, Bie L, et al., 2025, Research on the Practical Path of Cultivating 3D Printing Technology Ability of Mechanical Majors Under the Digital Background. Internal Combustion Engine & Parts, 2025(20): 139–141.

[10] Li X, Zhang C, 2021, Breakthrough in the Cultivation of High-Tech Skilled Talents in 3D Printing—Based on Knowledge Structure and Skill Requirements. China Newspaper Industry, 2021(08): 86–87.

[11] Chen C, 2022, Research on 3D Printing Technology and Applied Talent Training. Industrial Technology Innovation, 4(06): 114–116.

[12] Han R, Wang B, Wang T, et al., 2022, Research on the Talent Training Mode of 3D Printing Technology in Applied

Undergraduate Colleges. Paper Making Equipment & Materials, 51(08): 236–238.

[13] Wang C, Wei T, Fan H, et al., 2021, Design and Thinking of Laboratory Opening Strategy for Local Applied Universities—Taking the 3D Printing Laboratory of Bengbu University as an Example. Journal of Jining Normal University, 43(05): 15–18.

[14] Lei L, Wang H, Chen S, et al., 2021, Comprehensive Experimental Design of 3D Printing Based on "Emerging Engineering" Talent Training. Laboratory Science, 24(01): 65–68 + 71.

[15] Chen X, Mao X, Zheng R, et al., 2024, Application of 3D Printing Technology in the Teaching of Basic Course of Mechanical Design. China Educational Technology & Equipment, 2024(16): 38–44.

[16] Fu J, 2021, Research on 3D Printing Process Optimization of ABS Plastic. Materials Development & Application, 36(3): 42–45.

[17] Guo X, 2018, Dynamic Characteristic Analysis and Structure Optimization of Industrial Grade FDM 3D Printer, thesis, Southeast University, Nanjing.

[18] Jin Q, 2024, 3D Printing Application Technology. China Machine Press, Beijing.

[19] Fitzpatrick V, Martín-Moldes Z, Deck A, et al., 2021, Functionalized 3D-Printed Silk-Hydroxyapatite Scaffolds for Enhanced Bone Regeneration with Innervation and Vascularization. Biomaterials, 276: 120995.

[20] Li X, 2022, Research on the Integration of 3D Printing Technology into the Talent Training Program of Automotive Major in Applied Undergraduate Colleges. Technology Wind, 2022(15): 34–36.