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Research on the Post Competencies of Students from the Artificial Intelligence and Digital Creativity Professional Group in Employment and Internship at Intelligent Manufacturing Enterprises

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Abstract

Against the backdrop of the deep integration of the digital transformation of the manufacturing industry and the construction of "new engineering disciplines", intelligent manufacturing enterprises have an increasingly urgent demand for compound technical and skilled talents. As a key discipline cluster connecting technological R&D and industrial application, the artificial intelligence (AI) and digital creativity professional group directly affects the efficiency of enterprise transformation and the quality of talent training through the post adaptability of its graduates. Based on the enterprise survey data from intelligent manufacturing industry agglomeration areas such as Wenzhou, Zhejiang, this paper analyzes the types of employment and internship positions and core competency requirements for students of the AI and digital creativity professional group in intelligent manufacturing enterprises, examines the current pain points in the adaptation between talent training and industrial needs, and proposes a "technology + creativity + industry" trinity competency training path. It provides references for the construction of professional groups in higher vocational colleges, the deepening of industry-education integration, and enterprise talent recruitment.

Keywords

Artificial Intelligence; Digital Creativity; Professional Group; Intelligent Manufacturing; Employment and Internship; Post Competency.

1. Introduction

With the implementation of the "14th Five-Year Plan for the Development of Intelligent Manufacturing", China's intelligent manufacturing industry has entered a stage of large-scale development. The in-depth application of technologies such as industrial robots, intelligent production lines, digital twins, and industrial design has promoted the transformation of enterprise post structures from traditional operational types to technological R&D types, creative design types, and cross-border integration types. As the core professional cluster in higher vocational colleges serving the intelligent manufacturing industry, the AI and digital creativity professional group covers multiple majors including AI technology application, industrial robot technology, digital media art design, and virtual reality application technology. Its talent training goals are highly consistent with the technological upgrading needs of intelligent manufacturing enterprises.[1]

However, the construction of some professional groups in higher vocational colleges still has problems such as "emphasizing theory over practice, technology over creativity, and single skill over cross-border integration". This leads to phenomena such as low post adaptability, insufficient core skills, and lack of industrial thinking among students during employment and internships. Based on this, this paper takes intelligent manufacturing enterprises in Wenzhou, Zhejiang as the research objects. Through on-site visits, questionnaire surveys, enterprise

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interviews, and other methods, it systematically sorts out the types of employment and internship positions for students of the AI and digital creativity professional group, clarifies the core competency requirements of the positions, and provides empirical support for optimizing talent training programs and deepening industry-education integration.[2]

2. Research Design and Implementation

2.1. Research Objects

This research selected 32 intelligent manufacturing enterprises in Wenzhou and surrounding areas of Zhejiang Province, covering key fields such as auto parts manufacturing, electronic information, equipment manufacturing, and smart home. Among them, there are 21 large-scale enterprises and 18 high-tech enterprises, involving post types including technological R&D, production operation and maintenance, creative design, and project management. At the same time, 126 intern students of the 2023-2024 cohort from the AI and digital creativity professional groups of 5 higher vocational colleges including Wenzhou Polytechnic and Zhejiang Industry & Trade Vocational College, as well as 38 enterprise human resource managers and technical department heads, were surveyed.

2.2. Research Methods

Questionnaire Survey: Two questionnaires were designed, namely the "Questionnaire on Post Competency Requirements of Intelligent Manufacturing Enterprises" and the "Questionnaire on Internship Post Adaptability of Students". A total of 32 enterprise questionnaires were distributed, with 30 valid ones recovered; 126 student questionnaires were distributed, with 118 valid ones recovered. The effective recovery rates were 93.75% and 93.65% respectively.

On-site Interviews: In-depth interviews were conducted with 10 representative enterprises. Discussions were held with enterprise leaders on issues such as post settings, competency requirements, intern performance, and talent training suggestions, resulting in approximately 50,000 words of interview records.

Data Analysis Method: SPSS 26.0 was used for statistical analysis of the questionnaire data. Core viewpoints were extracted from the interview content to clarify post competency requirements and talent training pain points.

3. Types and Distribution of Employment and Internship Positions for Students of the AI and Digital Creativity Professional Group

Based on the research results, the employment and internship positions of students from the AI and digital creativity professional group in intelligent manufacturing enterprises are mainly concentrated in three major fields: technology application, creative design, and operation and maintenance services. The specific post types and distribution are shown in the following table:

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Table 1. Types and Distribution of Employment and Internship Positions for Students of the AI and Digital Creativity Professional Group

Post Field	Specific Post Types	Proportion	Core Skill Requirements
Technology Application	Intelligent Equipment Operation and Maintenance Post	58.47%	Equipment installation and commissioning, fault diagnosis, PLC control
	AI Algorithm Application Post	-	Python programming, TensorFlow framework, model optimization
	Digital Twin Modeling Post	-	3D modeling (SolidWorks/Unity), simulation technology
Creative Design	Industrial Product Design Post	23.73%	Rhino/KeyShot operation, engineering thinking, appearance and structure design
	Digital Media Design Post	-	Video editing, 3D animation, VR/AR production, interaction design
	Brand Visual Design Post	-	Aesthetic ability, market insight, promotional material design
Operation and Maintenance Services	Intelligent System Operation and Maintenance Post	17.80%	MES/ERP system operation, data analysis, data management
	Customer Technical Support Post	-	Technical consultation, problem-solving, communication and coordination
	Project Assistant Post	-	Basic project management, cross-departmental collaboration

3.1. Technology Application Posts

Such positions are the core employment direction for students of the professional group, accounting for 58.47%. They mainly focus on the application of AI technology and industrial robot technology in production scenarios, including:

Intelligent Equipment Operation and Maintenance Post: Responsible for the installation, commissioning, and maintenance of industrial robots, intelligent sensors, and PLC control systems, requiring mastery of equipment principles and fault diagnosis skills;

AI Algorithm Application Post: Conduct machine learning algorithm adaptation, data annotation, and model optimization based on enterprise needs, requiring proficiency in Python programming and the TensorFlow framework;

Digital Twin Modeling Post: Construct digital twin models of production workshops and the entire product lifecycle, requiring mastery of 3D modeling software (such as SolidWorks, Unity) and simulation technology.[3]

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3.2. Creative Design Posts

Such positions account for 23.73%, connecting the product R&D and market promotion links of intelligent manufacturing, including:

Industrial Product Design Post: Conduct product appearance and structure design combined with user needs and production processes, requiring design software operation (such as Rhino, KeyShot) and engineering thinking;

Digital Media Design Post: Produce product promotional videos, VR/AR display content, and intelligent interactive interfaces, requiring mastery of video editing, 3D animation production, and interaction design skills;

Brand Visual Design Post: Responsible for the creative design of enterprise brand images, product packaging, and promotional materials, requiring aesthetic ability and market insight.[4]

3.3. Operation and Maintenance Service Posts

Such positions account for 17.80%, focusing on service support and project management after technology implementation, including:

Intelligent System Operation and Maintenance Post: Responsible for the daily operation and maintenance and data management of intelligent manufacturing management systems such as MES and ERP, requiring mastery of system operation and data analysis skills;

Customer Technical Support Post: Provide technical consultation and problem-solving for customers regarding intelligent equipment and software systems, requiring communication skills and technical reserves;

Project Assistant Post: Assist in promoting the implementation and coordination of intelligent manufacturing projects, requiring basic project management and cross-departmental collaboration capabilities.

From the perspective of post distribution, technology application posts have the highest proportion, reflecting the urgent demand of intelligent manufacturing enterprises for technology implementation capabilities; the proportion of creative design posts is gradually increasing, reflecting the integrated development trend of "technology + creativity"; operation and maintenance service posts emphasize the combination of technology application and service awareness, and have high requirements for students' comprehensive abilities.

4. Core Competency Requirements for Employment and Internship Posts in Intelligent Manufacturing Enterprises

Based on the survey data and interview results, the core competency requirements of intelligent manufacturing enterprises for intern students of the AI and digital creativity professional group can be summarized into three dimensions: technical practical ability, creative innovation ability, and industrial adaptability. The details are as follows:

4.1. Technical Practical Ability: Foundation of Core Post Competitiveness

Technical practical ability is a prerequisite for students to be competent in their positions, with 92% of enterprises paying attention to it. It mainly includes:

Professional Tool Application Ability: Proficiency in operating software and equipment related to intelligent manufacturing, such as industrial robot debugging software (ABB RobotStudio), AI programming tools (Python, PyTorch), design software (Rhino, Unity, Premiere), and simulation software (ANSYS);

Technology Implementation Ability: Ability to transform theoretical knowledge into practical applications, such as optimizing AI algorithms according to production needs, solving

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intelligent equipment faults, and completing the engineering implementation of product design schemes;

Data Processing Ability: Basic data collection, cleaning, analysis, and visualization capabilities, able to use tools such as Excel, SQL, and Tableau to process production data and optimize production processes.

4.2. Creative Innovation Ability: Key Element of Differentiated Competition

With the upgrading of intelligent manufacturing from "technology substitution" to "value creation", creative innovation ability has become an important criterion for enterprises to select talents, with 78% of enterprises paying attention to it. It mainly includes:

Creative Design Ability: Ability to conceive and design product appearances, interactive interfaces, and digital content, and propose innovative schemes combined with user needs and market trends;

Cross-border Integration Ability: Ability to integrate AI technology with digital creativity, such as using AI algorithms to optimize product design processes and VR/AR technology to enhance product display effects;

Innovative Problem-solving Ability: Faced with complex problems in production, able to jump out of traditional thinking frameworks and propose solutions combining technology and creativity.

4.3. Industrial Adaptability: Essential Literacy for Long-term Development

Industrial adaptability determines students' growth space in enterprises, with 85% of enterprises paying attention to it. It mainly includes:

Industrial Cognition Ability: Understanding the development trends of the intelligent manufacturing industry, enterprise production processes and technical standards, and being familiar with industry-related policies and norms;

Team Collaboration Ability: Ability to effectively communicate and collaborate with personnel from technical, production, marketing and other departments, and participate in the promotion of cross-departmental projects;

Professional Literacy: Possessing a sense of responsibility, professionalism, learning ability, and pressure resistance, able to quickly adapt to the enterprise work rhythm and post requirements.

5. Current Adaptation Pain Points between Talent Training and Industrial Needs

Through research and analysis, there is a significant adaptation gap between the talent training of the AI and digital creativity professional group in higher vocational colleges and the needs of intelligent manufacturing enterprises. The specific pain points and manifestations are shown in the following table2:

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Table 2. Adaptation Pain Points and Specific Manifestations in Vocational Education

Adaptation Pain Points	Specific Manifestations
Disconnection between skill training and post requirements	Courses focus on theoretical teaching, and practical content is disconnected from enterprise production scenarios; AI majors lack practical training in industrial algorithm application, while digital creativity majors ignore the combination with intelligent manufacturing processes, resulting in insufficient practical ability of students
Insufficient training of cross-border integration ability	Various majors within the professional group operate independently, lacking cross-major integrated courses and project practical training; students only master single skills, making it difficult to meet the demand for compound talents with "technology + creativity" in enterprises
Lack of industrial cognition and professional literacy	Cooperation between higher vocational colleges and enterprises remains at a shallow level such as the construction of internship bases and lectures by enterprise lecturers; students lack opportunities to deeply understand enterprise production processes and industry standards; professional literacy training mainly relies on theoretical teaching, lacking scenario-based training, resulting in weak communication and adaptability
Insufficient practical teaching resources	Restricted by funds, venues, and equipment, there is a lack of intelligent equipment, simulation software, and real practical training scenarios synchronized with enterprises; most teachers are college teachers who lack front-line technical and management experience in enterprises, resulting in insufficient practical guidance ability

5.1. Disconnection Between Skill Training and Post Requirements

The curriculum setting of some higher vocational colleges still focuses on theoretical teaching, and the practical teaching content is disconnected from the actual production scenarios of enterprises. For example, AI majors focus on algorithm theory teaching and lack practical training in algorithm application in industrial scenarios; digital creativity majors focus on software operation and ignore the combination with intelligent manufacturing processes. This leads to insufficient practical ability of students, making it difficult for them to quickly adapt to their positions.

5.2. Insufficient Training of Cross-border Integration Ability

There is a phenomenon of "operating independently" among various majors within the AI and digital creativity professional group, lacking cross-major integrated courses and project practical training. Students often only master single professional skills, making it difficult to meet the demand of enterprises for compound talents with "technology + creativity". For example, some students have AI programming ability but lack design thinking, or have design skills but do not understand the logic of technology implementation.

5.3. Lack of Industrial Cognition and Professional Literacy

Cooperation between higher vocational colleges and enterprises mostly stays at a shallow level such as the construction of internship bases and lectures by enterprise lecturers. Students lack opportunities to deeply understand enterprise production processes and technical standards, resulting in weak industrial cognition ability. At the same time, professional literacy training mainly relies on theoretical teaching, lacking scenario-based training, leading to problems such

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as insufficient sense of responsibility, poor communication ability, and weak adaptability among students during internships.

5.4. Insufficient Practical Teaching Resources

Restricted by funds, venues, equipment, and other factors, some higher vocational colleges lack intelligent equipment, simulation software, and practical training scenarios synchronized with enterprises, making it difficult for students to carry out practical training on real projects. At the same time, the teaching staff is mainly composed of college teachers who lack front-line technical and management experience in enterprises, making it difficult to effectively guide students' practical operations and industrial adaptation.

6. Training Paths for Post Competencies of Students in the AI and Digital Creativity Professional Group

6.1. Construct an "Industry-oriented" Curriculum System

Optimize Curriculum Setting Based on Post Requirements: Reconstruct the curriculum system based on the post competency requirements sorted out through research, add cross-border integrated courses such as "Industrial AI Application", "Digital Twin Technology", and "Intelligent Manufacturing Processes and Design", reduce pure theoretical courses, and increase the proportion of practical teaching hours (not less than 50%).

Introduce Real Enterprise Projects into Classrooms: Cooperate with intelligent manufacturing enterprises to develop project-based courses. For example, combined with the production needs of auto parts manufacturing enterprises, set up projects such as "Intelligent Production Line Optimization" and "Product Digital Twin Modeling", allowing students to improve their technical practical ability and problem-solving ability in real projects.

6.2. Deepen the "Industry-education Integration" Practical Teaching Model

Co-build Internal and External Practical Training Bases: Jointly build "Intelligent Manufacturing Industry Colleges" and "AI + Digital Creativity Practical Training Centers" with leading intelligent manufacturing enterprises in Wenzhou, introduce real enterprise production equipment and software systems, and provide immersive practical training scenarios for students; at the same time, establish a two-way linkage mechanism of "enterprise internship + on-campus practical training", allowing students to alternately participate in enterprise production and on-campus project practical training.

Implement the "Dual Mentor System": Assign college mentors and enterprise mentors to students. College mentors are responsible for theoretical teaching and learning guidance, while enterprise mentors are responsible for practical operation and post skill training, ensuring that students not only master theoretical knowledge but also are familiar with actual enterprise needs.

6.3. Strengthen the Training of "Cross-border Integration" Capabilities

Carry Out Cross-major Project Practical Training: Organize students from majors such as AI technology application, digital media design, and industrial robot technology to form cross-major teams, and participate in projects such as "Intelligent Product Design and Development" and "Industrial Digital Content Production" to cultivate students' cross-border collaboration and integrated innovation capabilities.

Set Up Compound Skill Training Modules: Set up skill modules such as "AI + Design" and "Digital Twin + Creative Display". Students can independently choose according to their interests and career plans to supplement cross-border skills and improve post adaptability.

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6.4. Improve "Industry-adapted" Professional Literacy

Strengthen Industrial Cognition Education: Invite enterprise leaders and technical backbones to give industry lectures, organize students to visit enterprise production workshops to understand intelligent manufacturing production processes and industry development trends; integrate industrial policies and industry norms into curriculum teaching to improve students' industrial cognition ability.

Strengthen Scenario-based Training of Professional Literacy: Set up scenario-based tasks such as team collaboration, communication and expression, and problem-solving in practical teaching. Cultivate students' sense of responsibility, communication ability, and pressure resistance through project reports, role-playing, and workplace simulations; introduce enterprise performance appraisal standards to evaluate students' practical performance, allowing them to adapt to enterprise workplace requirements in advance.

7. Conclusion and Prospects

The employment and internship positions of students from the AI and digital creativity professional group in intelligent manufacturing enterprises cover three major fields: technology application, creative design, and operation and maintenance services. The core competency requirements are concentrated in three dimensions: technical practical ability, creative innovation ability, and industrial adaptability. Currently, there are pain points such as skill disconnection, insufficient cross-border integration, and lack of industrial cognition between talent training and industrial needs. These need to be solved through paths such as constructing an industry-oriented curriculum system, deepening the industry-education integration practical teaching model, strengthening the training of cross-border integration capabilities, and improving industry-adapted professional literacy.

In the future, with the continuous upgrading of the intelligent manufacturing industry, the integration of AI and digital creativity will be deeper, and enterprises' demand for compound talents will further increase. Higher vocational colleges need to continuously deepen industry-education integration and school-enterprise cooperation, dynamically adjust talent training programs, strengthen cross-professional and cross-field competency training, and transport more high-quality technical and skilled talents with solid technology, outstanding creativity, and industrial adaptability to intelligent manufacturing enterprises, so as to assist the digital transformation and high-quality development of the manufacturing industry.

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