



Training Path of Artificial Intelligence Innovation Practice under the Integration of Major and Industry

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Abstract. How to integrate major and industry is a problem faced by application-oriented undergraduate colleges with distinctive industry characteristics. This paper research the Artificial Intelligence (AI) major and water conservancy industry, and the cultivation path of innovative and practical intelligent water conservancy talents under the "integration of major and industry". The innovation practice teaching mode is based on industry problem and AI's advanced technology orientation, and realizes the organic unity of innovation practice connotation and path. We design a talent training path with "three databases" (basic database, project database, ideological and political database) as the main means and progressive practice teaching as the main means. This method has been implemented for 3 years in the AI major under the background of water conservancy industry, and has achieved good results in the innovation practice.

Keywords: Training Path; Artificial Intelligence; Innovative practice; Integration of Major and Industry; Intelligent water conservancy.

1 Introduction

With the continuous development of national science and technology innovation, China has entered the ranks of innovative countries. Science and technology are the primary productive forces, talents are the first resources, and innovation is the first driving force. In order to further let innovation lead the construction of a scientific and technological power in the new era, during the "14th Five-Year Plan" period, the Ministry of Education will deeply carry out the "double innovation" education of college students' innovation and entrepreneurship, and become a full coverage, multi-level and personalized innovation and entrepreneurship education system [1-2]. In the 14th Five-Year Development Plan for Higher Education in Zhejiang Province issued in September 2022, it is emphasized that in the innovation and entrepreneurship education project for college students [3-4], college students should be further guided to participate in innovation and entrepreneurship training plans, "Internet +" innovation and entrepreneurship competition for college students and other practical projects, and strive to achieve full coverage of innovation and entrepreneurship activities of college students in the province [5-6]. From the perspective of the demand of the talent mar-

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ket, the demand for innovative talents in enterprises reaches more than 80%, and the demand is large. However, at present, the main base for cultivating a large number of innovative talents is in enterprises and institutions, especially in the Artificial Intelligence (AI) field of new engineering, and technological innovation such as rapid technological update, big data, and the Internet of Things are changing rapidly [7-8]. Therefore, as an application-oriented undergraduate college that cultivates technologically innovative talents, the practice of cultivating AI innovative technical talents has become an important direction and major demand of innovation and entrepreneurship education, and improving the innovation and practice ability of AI major is an important research topic in current higher education [9-10].

2 Path of Innovative Practice

Firstly, by digitizing the elements of innovative practice and analysing their micro-connotation through the fit relationship between the data, the connotation model of innovative practice teaching based on deep learning is realized. Then, based on the connotation model, we construct the innovative practice training scheme, design the practical course sequence and the feasible path of the innovative practice library. Finally, a progressive implementation plan based on industry-university-research cooperation, innovation-oriented and practical evaluation is constructed.

2.1 Innovative Practice Connotation Expression

By investigating the core concept of innovation practice, the paper analyses the market demand of innovation practice in literature and computing, and refines the data set of innovation practice elements. The uncertainty relationship among the elements of innovation practice is analysed. This paper analyses the relationship between the uncertainty and the degree of innovation from the aspects of innovation strategy, innovation talent accomplishment and AI major innovation environment. This paper studies the correlation degree among uncertain innovation factors, quantifies the probability transfer relationship of innovation degree, and reveals the probability distribution characteristics of innovation degree. Further collect the innovation practice data of the AI major of the applicant's unit and the innovation practice data of the surrounding universities, use big data analysis technology to carry out large-scale empirical research, and establish a closed-loop training mechanism of connotation model to ensure the accuracy of model prediction and evaluation, and gradually promote the application in AI major.

2.2 Innovative Practice Leading Path

Design a Progressive CDIO (Conceive, Design, Implement and Operate) Training Practice Course System.

Based on the degree of innovation, it is successively divided into conceptual, R&D, results-oriented and application-oriented courses. The curriculum system of

innovative practice training is shown in Table 1. The "three libraries" mode is adopted to realize course flipping and tutoring. It mainly includes the basic knowledge ability training database (basic database), the ability training project database (project database) and the curriculum ideological and political database (ideological and political database). Basic library mainly includes basic theory questions, basic programming questions, each course of about 1000 questions, each question gives standard answers, test analysis, etc., so that students through the flip mode of self-help brush questions to guide students, improve basic knowledge and ability. The project library mainly includes project materials required for project-based teaching, practical training, comprehensive practice, graduation design, etc. Each project includes project introduction, basic project design, reference resources and completion effect display, etc., providing strong support for students' professional ability training. The ideological and political library mainly includes the ideological and political extension of the course, the display of excellent students, the display of excellent works, etc., which provides a learning example for students' campus study and life, and encourages students to study hard.

Table 1. Curriculum system of innovative practice training

No	Degree	Goal	Practical course	Supporting project	Expected result
1	Conceptual	Find the problem	Internship, scientific and technological innovation training	"Internet +", Challenge Cup	Win a prize in the competition
2	Basics	Solve basic problems	Course basic practical training, enterprise training	Big innovation, new seedlings	Hardware and software systems, algorithms, etc
3	Research ability	Solve professionalism	Professional special training, professional comprehensive practice,	Teacher research project	Hardware and software, software, patents, papers, etc
4	Applicability	Application and display of results	Graduation design (thesis), graduation internship, entrepreneurship, employment	School-enterprise cooperation	Satisfactory position/Successful postgraduate interview

Implement the curriculum through the CDIO model and formulate related requirements. Taking software engineering as an example, it still focuses on management system design and development, and its courses can reflect a certain level of technology (advanced technical solutions, such as the use of perfect business logic, AI technology, high performance, high-quality UI, etc.) and workload (complete functions); can be basically complete demonstration.

In the classroom, through the teaching practice of "mixed classroom", in the early stage of the course, the students learn online and the knowledge of innovative practice

course; in the offline teaching, discuss the students in the industry, guide them to establish innovative consciousness, pay close attention to the students' listening, and in hands-on practice, focus on guiding students to master the main idea to apply the professional ability to solve the industry problems, and improve the practical ability of the industry through strict operation norms.

Build Innovation Teams and Carry Out Scientific and Technological Activities.

Firstly, enhance interest, pay attention to peer guidance, and build science and innovation echelon. In order to improve college students' self-cognitive ability, improve college students' cognition and interest in Science and Technology Innovation (STI) activities, combined with professional knowledge education, make STI activities to form full participation, formed from the first year to the fourth grade full STI training mode, starting from the junior base, to strengthen the application training for the gripper, to the senior to carry out the practical training mode, discover real interest in STI students and training and training. Secondly, improve students' written expression ability, condense students' science and technology innovation achievements. In the process of long-term guidance of students' science and technology innovation practice, discipline competition and other activities, it is found that most students analyse problems and have poor ability of writing instructions, which is also an important reason for the low output of science and technology innovation achievements. For this kind of situation, first of all, at the beginning of STI, middle and concluding, in the form of lectures, by some teachers concentrated guidance, guidance project application, thesis, patent, concluding report, results introduction, let students learn to express their thoughts, combining the actual STI content to say, get rid of the habit of "empty" vice. Finally, in the process of science and innovation, timely help students to condense the achievements of science and innovation, write science and innovation papers, patents, etc., constantly exercise their written expression and logical analysis ability, constantly improve students' comprehensive ability under practice, and improve the quality of applied talents training. The condensation of students' achievements in science and innovation can also play a model role for other lower grade members in the form of achievements, and play a model role in adhering to the continuous development of science and innovation.

Introduce the Practical Exploration Mechanism of Industry Problems.

Firstly, the innovation practice instructor collects the technical problems in the industry, sorts out and analyses the problems, and forms a preliminary demand report and a preliminary design model. Then, the innovation team participates in the research and development of enterprises and institutions through competition topics, design solutions, innovative practice and industry-university-research cooperation platform, and helps to solve practical problems. Finally, the results of solving practical problems are solidified to form a series of soft works, patents, papers, reports and so on for the next batch of students to practice innovative practice, and form an innovative practice talent pool, so that students can realize face-to-face talent communication.

2.3 Progressive Practical Teaching Method

Deepening Industry-University-Research Cooperation.

The effective implementation of innovation practice education needs to give full play to the role of the government, enterprises and schools, take the social demand as the orientation, take the training of innovative practice talents as the goal, integrate all resources, and jointly build an innovation practice ecosystem. First of all, schools should combine the OBE (Outcomes-based Education) theory, on the basis of careful investigation of market demand, and under the support and guidance of the government, jointly discuss with enterprises the objectives, curriculum systems and teaching methods of innovative and practical talent training, and jointly build a school-enterprise cooperation platform to share resources and achieve win-win results in cooperation. Secondly, multi-party innovation practice guidance service system. On the one hand, with the project as the starting point, school-enterprise cooperation is carried out to build an innovation practice education practice platform, and the on-campus maker space, innovation laboratory, innovation practice project, intellectual property rights are integrated with off-campus practice bases, etc., so as to build a relatively complete support system of hardware and software facilities. On the other hand, promote the construction of three-dimensional teaching staff of government, school and enterprise. Application-oriented undergraduate colleges, first, should actively introduce government entrepreneurship consulting tutors to provide policy consulting and other services for students; Second, we should actively introduce business management and entrepreneurship mentors to guide students to conduct entrepreneurship management training; Third, through going out and introducing, we should actively train the school's innovation practice tutors to strengthen the students' entrepreneurship theory education and professional guidance in science and technology.

Improving Innovation Practice Mechanisms.

The transformation of AI scientific and technological achievements into enterprise products is a very important part of the innovation practice process. The establishment of an evolution process from technology to products and commodities requires the innovation practice mechanism of the algorithm, process and equipment secondary development of the achievements, and the cultivation of compound talents who understand both professional and marketing. With the help of the OBE concept, colleges and universities gradually pay attention to the output of learning results in talent training, which is conducive to the improvement of the transformation efficiency of scientific and technological achievements, and is consistent with the nature and demand of innovative practical activities.

Establish a Sound Evaluation System of Innovative Practice to Realize the effective Evaluation of Teachers and Students.

The curriculum evaluation system usually focuses on five aspects: teacher level, innovation mode, innovation achievement, value guidance and student development. By issuing and recycling questionnaires to students, the evaluation of innovative prac-

tice teaching effect is completed. Through the analysis and summary of the teaching evaluation questionnaire, combined with the students' opinions and suggestions, the problems are revised, and then put into application again, and revised and repeated many times, until the teaching effect is the best and the effectiveness of moral education reaches the best. In the evaluation of students' performance, the achievement orientation is changed into the innovation orientation, and the students' innovation cognition level, research and development level and achievement display and application level are comprehensively evaluated.

3 Implementation Method

Based on the training of intelligent water conservancy talents in AI major, the implementation method can be generally summarized as "basic practical training, exploratory training, comprehensive practice". "Basic training" refers to adhere to the innovation practice course based on the field standard unchanged, through in-depth analysis of practice content, with AI professional innovation system and classic industry case analysis as the breakthrough point for innovation practice, the innovation elements run quietly into the whole teaching process, achieve the integration of knowledge and value lead, teaching and education. "Exploratory training" encourages students to actively explore solutions to problems existing in the industries facing application-oriented undergraduate colleges and universities, actively explore cutting-edge AI technology problems, tolerate failures, and focus on the innovation process and the improvement of innovation ability. "Comprehensive practice" is based on "basic practical training" and "exploratory training", to further cultivate good professional quality of innovative practice, auxiliary and semi-assist students can basically complete the formed innovative practice projects, to achieve the basic goal of practical innovation.

4 Implementation Effect and Discussion

Taking the key practice course "Professional Special Training" in the past three years as an example, the teachers mainly give typical questions to the project database of innovative practice courses, and configure the project requirements, preliminary design, technical route, reference materials and assessment standards. The question bank fully embodies the characteristics of integration with the industry and practical applications. Students complete it through forming teams by themselves. In recent years, students' participation has become higher and higher. With the continuous updating and enrichment of the question bank and materials, as well as the coordinated design of the innovative practice series of courses, students' performance has gradually improved, as shown in Table 2.

Table 2. Achievements of innovative practice courses

Grade	2021		2022		2023	
	number of people	scale	number of people	scale	number of people	scale
outstanding	0	0.00%	1	2.33%	2	4.35%
good	5	14.71%	22	51.16%	33	71.74%
secondary	15	44.12%	17	39.53%	11	23.91%
pass a test	14	41.18%	3	6.98%	0	0.00%
fail	0	0.00%	0	0.00%	0	0.00%

From the grades of students majoring in artificial intelligence from 2021 to 2023, it can be seen that the increasing number of outstanding and good students, it is mainly relying on clever ideas and scientific design, teaching content, teaching methods and innovative practical education are closely combined, and with the help of online and offline tools such as Super Star Learning Pass, teaching and educating are integrated, fully displaying the art of teaching and reflecting the charm of teaching. Select practical projects to promote students' in-depth thinking, guide students to think and analyse their life perception, cultivate students' good quality of innovation, and become new people with ideals and beliefs and dare to take on responsibilities.

In short, to effectively integrate innovative practice education into AI major, it is necessary to connect with reality and explore the connotation of innovation. According to the characteristics of AI courses and the cognitive ability of the teaching objects, different teaching methods and means are adopted to integrate industry problems into the whole teaching process of AI major, and the innovative practical content is reflected in the process of teaching plan, classroom teaching process and performance assessment.

5 Conclusion

Aiming at the cultivation path of innovative and practical intelligent water conservancy talents under the "integration of major and industry", this paper gives the practical path, the main conclusions are as follows:

The talent training path dominated by innovative practice has been established, and the guiding path of inclusive teaching and training system, training methods and team cooperation has been realized. It is especially the talent training path with "three databases" (basic database, project database, ideological and political database) as the main means and gradual practical teaching as the main means.

Perfect teaching practice plan and the implementation method of "basic practical training, exploratory training and comprehensive practice", integrate industry problems into the whole teaching process of AI major, and reflect the innovative practice and reform content in the process of teaching plan, classroom teaching process and performance assessment. After three years of teaching practice, the innovative practice talent training path under the "integration of major and industry" has achieved good results.

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