

Research on Application and Quality Evaluation of Intelligent Teaching Model of AI Three Teachers in the Course of Motion Control Technology

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Abstract: Motion control technology is an important branch of automation, and is one of the important development directions of the emerging industry of high-end equipment manufacturing. As a comprehensive discipline with the intersection of mechanical, electrical and electronic, its teaching mode faces many challenges. There are practical problems that need to be solved, such as teaching content not matching seamlessly with post knowledge and skill literacy requirements, teaching project design is not high in modularity, and teaching evaluation system is not perfect. These problems seriously restrict the cultivation of students' technical practical ability. This project proposes the "intelligent teaching model of AI three teachers for the course of Motion Control Technology", which emphasizes student-centered, builds a core curriculum system that connects with the technology of field engineers in enterprises, and proposes the three-way collaborative teaching and education strategy of "vocational school Teacher + AI Teacher + enterprise tutor" to enable students to participate in learning in an all-round way. And timely access to feedback information, the formation of continuous improvement of the teaching cycle. Optimize the teaching team and teaching mode, improve the teaching quality, meet the diversified learning needs of students, and promote the continuous innovation and development of education and teaching.

Keywords: Motion Control Technology; Teaching Mode; Intelligent Teaching Model; AI Three Teachers.

1. Introduction

Motion control is to control and manage the position and speed of the mechanical moving parts in real time, and make them move according to the expected motion trajectory and specified motion parameters through the developed algorithms and programs^[1]. With the industrial upgrading of the manufacturing industry, a large number of machines and equipment with motion control as the core have developed rapidly in various industries, such as medical robots, offset printing equipment and packaging machinery, which puts higher requirements on the skills of electrical automation technology students in motion control^[2].

Therefore, with the rapid development of motion control technology today, high-end manufacturing enterprises need a large number of field engineers with motion control technology as the core to enrich the production line to engage in technology application, achievement transformation and process innovation. However, while increasing the supply of higher vocational education through enrollment expansion, it also faces the problem of mismatch in education structure, talent training structure and professional structure^[3]. Most graduates can only work as on-site manufacturing personnel, equipment operators and product quality inspectors in the traditional manufacturing industry at the beginning of their employment. There is a tendency to disconnect the supply side of graduates for high-end manufacturing from the demand side of enterprises.

In recent years, artificial intelligence technology has changed the way the world operates, triggered the integration of technology and education, expanded the time and space dimension of education, changed the education ecology, and caused explicit or implicit, positive or negative, temporary or permanent impact on traditional school education^[4, 5]. It is strongly advocated that curriculum teaching gradually change

from experience teaching to precision teaching, so the wisdom analysis and personalized precision teaching of the whole teaching process are increasingly urgent^[6, 7]. The intelligent teaching method of the three teachers of AI makes a detailed analysis of the classroom process of students and excavates its deep application^[8, 9], and gives full play to the advantages of artificial intelligence through systematic classroom teaching to achieve accurate and personalized teaching^[10].

2. Problems Existing in Traditional Teaching

At present, many engineering colleges and universities have included "Motion Control Technology" in their professional courses, but this course covers a wide range of knowledge, strong practice, coupled with the limitation of class hours, teaching and learning are difficult, so it is particularly important to reform its teaching mode. Automation field engineers based on motion control technology belong to compound talents, so they must have strong field ability, and field ability is mainly cultivated through practical teaching. Although some colleges and universities have explored a series of practical teaching modes in combination with the actual situation of their own schools, conducted research on them from the aspects of teaching concept form, teaching content selection, teaching project design, teaching implementation and evaluation, and achieved some innovative results, but in terms of the practical teaching system as a whole, There are still some practical problems that need to be solved, such as teaching content not matching seamlessly with post knowledge and skill literacy requirements, teaching project design modularization degree is not high, and teaching evaluation system is not perfect. These problems seriously restrict the cultivation of students' technical practical ability. The following will focus on

analyzing the practical difficulties faced by the high-quality training of field engineers.

(1) The traditional learning mode is inefficient and fails to accommodate students' personalized adaptive learning needs.

As depicted in Figure 1, the comparison diagram illustrates the differences in content arrangement between the traditional learning mode and artificial intelligence adaptive learning mode. In the traditional learning mode: 1) the transition logic between different learning contents is linear and singular, requiring students to invest time even after mastering certain content; 2) Students are unable to receive immediate feedback or assistance when encountering difficulties, as most students essentially follow a uniform learning path without personalized adjustments. In contrast, AI adaptive learning aims to assess students' current level and state of learning through computational means, subsequently adjusting subsequent content and pathways to enhance their efficiency^[11, 12]. However, given that education is a complex and nuanced process, achieving optimal results with simple computer programming can be challenging^[13, 14]. The utilization of artificial intelligence technology for artificial intelligence adaptive learning represents an advancement from traditional adaptive methods while also exploring new approaches to education reform.

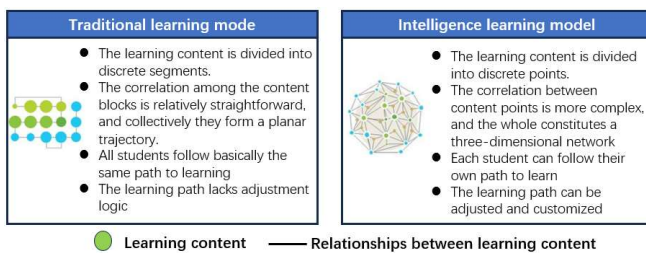


Figure 1. Comparison of learning content arrangement between traditional learning mode and intelligent learning mode

(2) The original motivation of the enterprise is insufficient, and the school's continuous power is insufficient

For enterprises, a considerable part of higher vocational students have the need for transfers. Usually spend a lot of time in re-reviewing. The professional knowledge level cannot meet the needs of the post. The proportion of students who meet the needs of jobs and stay in the post, which leads to the lack of motivation to continue to participate in the integration of production and education in enterprises. At present, although many companies have participated in on-site engineer projects, they still lack confidence in the landing of the project^[15].

For colleges and universities, although some vocational colleges currently have set up on-site engineers, only for provincial or national or national vocational education site engineers special training programs have successfully passed the application, evaluation and acceptance. The project progress is in the stagnation stage, and the participation of corporate leaders and technical backbones only stays in tables and materials. At the same time, most institutions lack mature project construction experience. For how to cultivate high-quality on-site engineers, there is no unified standard for the time being.

(3) Teaching content is inconsistent with job needs

At present, professional courses for vocational colleges are generally "large and wide" professional curriculum setting methods based on the subject knowledge system^[16]. This

method can meet students' diverse development needs and have certain advantages. However, their teaching content It does not fit the purpose of germination and innovative talents that on-site engineers need to cultivate.

At present, the classroom teaching content design cannot fully enable higher vocational students to achieve a very thorough level of knowledge of job needs. In other words, the content design of classroom teaching cannot be simply made by chapters, but should summarize teaching knowledge points by actual project needs. The teaching content of a certain lesson may involve multiple courses and multiple disciplines. At this time, the school and enterprise need to fully communicate, to reasonably correct the original teaching content, correspond to the needs of the teaching content from the position of the post, and use the theoretical teaching and enterprise projects. match. This can not only reduce the original theoretical knowledge teaching that is not related to positions, but also improve students' learning interest and sense of accomplishment through accurate docking theoretical knowledge and practical content, so as to cultivate live engineers who can truly meet the needs of enterprise.

(4) Fixed training form, lagging teaching mode

The current way of cooperating in vocational colleges and enterprises is generally a freshman and sophomore in the school to complete the study of basic and professional courses in the school. When the sophomore summer vacation or junior year, it is arranged to go to the enterprise for internship. The school is generally completed by the full-time teacher in the school, and the school engineer is guided and practiced outside the school. The school training process is low in connection with production practice, and the characteristics of classroom teaching theoreticals in schools and emptiness of practical teaching have caused many students to lack practical experience and practical experience. As a result, students did not master the basic skills necessary for their posts when they arrived in the internship position. Enterprise engineers needed extra time to re-guidance and explanation to waste manpower and material resources.

(5) The evaluation method is solidified, and the evaluation efficiency is not enough

Reasonable evaluation methods can not only mobilize the enthusiasm of students to learn, but also promote the improvement of teachers' teaching, thereby improving the quality of on-site engineers. The main problems currently exist are as follows:

1) The method of evaluation of school curriculum generally adopts the combination of procedural evaluation and results evaluation. Among them, the process evaluation mainly considers students' attendance rate, homework situation, classroom performance, and so on. The results of the results are mainly roll testing, practical operations, experimental reports, and so on. This evaluation method has certain advantages compared to trial education, but it is far from the target of on-site engineers.

2) At present, only in terms of evaluation system, only pay attention to the level of knowledge and practical operation, and ignore the ability quality of the cooperative ability, management ability, engineering thinking, and innovation awareness of on-site engineers. However, these capabilities and qualities are difficult to inspect the fixed evaluation methods or quantitative evaluation indicators. Therefore, enterprises and schools need to jointly design more reasonable and more effective evaluation methods to improve the quality of on-site engineers.

3. Intelligent Teaching Model of AI Three Teachers

Intelligent teaching model of AI three teachers refers to the tripartite collaborative precise teaching and education strategy of "vocational school teachers + AI teachers + enterprise mentors", which is based on information technology such as big data and Internet of Things and driven by AI. "AI Teacher" is an artificial intelligence adaptive education system, which aims to gather and quantify the valuable experience of excellent teachers, use data and technology to drive teaching, maximize the difference in teacher level, and improve the overall teaching efficiency and effect. As shown in Figure 1, the traditional teaching mode relies on the words and deeds of vocational school teachers and enterprise tutors. However, whether it is vocational school teachers or enterprise tutors, these "human teachers" are experience-driven in teaching. Although the whole teaching process follows certain methods and logic, the "heat" of each step depends very much on the accumulation of teaching experience. Therefore, teachers with short teaching age are often suitable for answering questions, and there is a lack of teaching system, and teachers with long teaching age are often good at overall control, but slightly insufficient in affinity; Different teachers have different judgments on students' learning, which leads to their different learning paths. Even if two teachers have the same experience value, there will be differences in temperament, teaching style and salary expectation, which will affect the teaching effect.

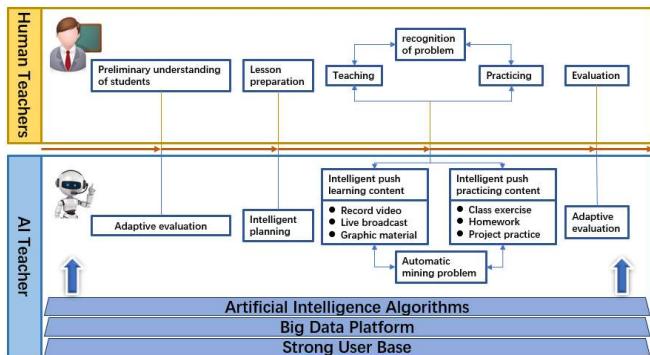


Figure 2. The difference between human teachers and "AI teachers"

"AI Teacher" takes AI (Artificial Intelligence) as an important engine to drive classroom teaching innovation. In the classroom teaching under the background of AI support, whether it is in the analysis of students' learning situation, in the Teacher's lesson preparation, or in the behavior identification, cognitive diagnosis, emotional state diagnosis, teaching process analysis and after-class teaching effect evaluation of teachers and students in the classroom, "AI Teacher" can penetrate artificial intelligence technology into every core link of teaching. It is helpful to fundamentally improve the idea and method of education. Classroom teaching supported by AI, with its multi-modal, all-round and long time series data processing capabilities, is developing in the direction of intelligence, scale and normalization, which is a subversive innovation and change to the traditional classroom quality management and evaluation. The significance of "intelligent teaching of AI three teachers" is to jointly promote the development and progress of vocational education through the innovation of teaching mode, the

sharing of educational resources, the improvement of students' professional quality and the optimization of education ecology.

(1) Teaching model innovation

Introduction of AI Teacher: As a new teaching force, AI Teacher can provide students with personalized and precise learning paths and learning resources, making teaching more efficient and intelligent.

Participation of business mentors: The participation of business mentors can pass on the experience and skills in actual work to students, help students better understand the industry dynamics and career development path, and improve students' professional quality and employment competitiveness.

(2) Sharing of educational resources

Teacher resource sharing: Vocational school teachers, AI teachers and enterprise mentors together form a strong teaching team, and the three parties can share teaching resources, teaching methods and teaching experience to improve the overall teaching quality.

Learning resource sharing: Through the three-party collaborative education strategy, students can have access to more learning resources and information, including the teaching resources of vocational school teachers, the learning paths and personalized learning resources provided by AI teachers, and the practical experience and cases provided by enterprise tutors.

(3) Students' professional quality improvement

Improvement of practical ability: The participation of enterprise mentors enables students to get in touch with the real working environment and work tasks, and improve their practical ability and problem-solving ability through practice.

Professional literacy training: Corporate mentors can teach students the knowledge of code of conduct, professional ethics and professional literacy in the workplace, and help students establish a correct career outlook and values.

(4) Education ecological optimization

Transformation of education model: The tripartite collaborative education strategy helps to promote the transformation of vocational education from traditional knowledge impartation to an education model oriented towards ability cultivation, quality improvement and career development.

Education quality improvement: Through the introduction of new teaching forces and resources such as AI teachers and enterprise tutors, teaching content and teaching methods can be optimized to improve teaching quality and students' learning results.

4. Implementation

This project proposed "Motion Control Technology Course AI intelligent teaching model application and quality evaluation research", emphasizing student-centered, construction of core curriculum system with technology docking with enterprise field engineers, and proposed "vocational school Teacher + AI Teacher + enterprise tutor" three-way collaborative precise teaching and education strategy. Let students participate in learning in an all-round way, and get feedback information in time to form a continuous improvement of the teaching cycle.

This project adapts to the characteristics of the automation intelligent equipment development industry with motion control technology as the core, in accordance with the "work ability as the standard, professional practice as the main line",

integrates the project curriculum concept of "task-driven, module decomposition, evaluation improvement, and results-oriented", trains students to serve the automation motion control application industry and supports the regional industrial automation upgrading. Through the project, the purpose is to make professional students become field engineers in the field of high-end automation equipment manufacturing complex talents, can efficiently design motion control schemes, skilled installation of motion control systems, accurate configuration of motion module parameters, optimization and development of motion control programs, beautify the design of the upper computer interface, rapid debugging of motion control equipment, help enterprises reduce costs and increase efficiency. Therefore, under the background of the training of compound talents of field engineers, it is imperative to carry out the teaching construction and teaching reform of "Motion Control Technology" course to meet the current needs of enterprises.

4.1. Build a Core Curriculum System for Technical Docking with the Company's On-site Engineer Positions

The construction of curriculum system should be closely related to the ability of field engineers to form knowledge, ability and quality indicators. This project will go deep into the enterprise's ability requirements for automation field engineers based on motion control technology. After the demonstration of experts from the expert consultation office, the personnel training specifications will be determined, and the positions and job contents for field engineers will be defined. It can be seen that the teaching standards of the course are relative to the technical standards of the enterprise post, relative to the professional qualification and relative to the professional standards.

1) The training of post basic ability focuses on students' post-learning, and the basic course aims at the post content of intelligent equipment field engineer with motion control technology as the core. From the four dimensions of basic digital design ability of drawing design, basic mechanism assembly ability of equipment installation, basic electrical assembly ability of PLC and machine vision, basic programming and debugging ability of C program design and ladder diagram, we can help students build digital design ability, mechanism assembly ability, electrical assembly ability and programming and debugging ability.

2) The cultivation of project practical ability is completed by students in the process of job rotation training. The comprehensive practical training course is mainly led by enterprise tutors and completes the practical training tasks in the form of project bearing, further improving the core competence requirements of the post, including comprehensive installation measurement ability, installation process design ability and equipment programming joint adjustment ability.

3) The cultivation of management operation and maintenance ability depends on students' on-the-job practice. Through the design process of graduation works, students are required to go to the customer site for practical practice, communicate with customers, and solve practical problems. And according to customer requirements, design motion control non-standard automation equipment, debugging equipment, troubleshooting, improve comprehensive project management capabilities.

4.2. "Vocational School Teacher + AI Teacher + Enterprise Tutor" Tripartite Collaborative Precision Teaching and Education Strategy

Education in the era of artificial intelligence is to give full play to the advantages of artificial intelligence technology under the premise of giving full play to the main role of teachers. Therefore, the full integration of artificial intelligence technology and education and the implementation of man-machine collaborative education strategy can effectively improve the "education power". According to the types and characteristics of vocational education, this paper puts forward the strategy of "vocational school Teacher + AI Teacher + enterprise tutor".

1) From the two-division escort to the three-division classroom, the "AI Teacher" of vocational education enters

The traditional "double teacher" mode refers to the joint guidance of "vocational school teachers and enterprise mentors" to students, emphasizing that students should not only be guided by vocational school teachers' classroom theoretical teaching, but also by enterprise mentors' practical ability. This project takes "AI Teacher" as a new teaching assistance system to reform the vocational education curriculum. Through the use of AI technology, the artificial intelligence technology has penetrated into every core link of the teaching process, which helps to fundamentally improve the learning concept and education method, so as to achieve personalized teaching, learning path planning, voice interaction, intelligent question answering, intelligent search and data analysis and other functions, providing teachers and students with more efficient and convenient teaching support.

2) "Vocational school Teacher + AI Teacher" collaborative education strategy

Under the background of full integration of artificial intelligence and vocational education, vocational school teachers, AI teachers and vocational school students together constitute a closed-loop vocational college wisdom classroom. In the wisdom classroom, the teachers and students of vocational schools use AI teachers as the medium, and form a "guidance and feedback" interactive relationship between teachers and students, and between students and AI teachers. In the traditional classroom, it is mainly composed of teachers, students, teaching content and teaching tools. Teaching tools are the auxiliary means of teachers' teaching content and play the role of teachers' tools in the teaching process. In the smart classroom, it is transformed into four parts: Teacher, student, teaching content and AI Teacher. AI Teacher plays the role of teacher's assistant to a certain extent, undertakes some repetitive and complex teaching tasks of teachers, and forms a closed-loop teaching system with teachers and students.

3) "Enterprise mentor + AI Teacher" collaborative education strategy

The cross-border characteristics of vocational education require that the teacher team of vocational school must have the cross-border characteristics, and the school-enterprise cooperation is an effective form to realize the cross-border characteristics of the teacher team. Through the implementation of school-enterprise cooperation, it is beneficial to realize the purpose of school-enterprise dual education to a certain extent. Most teachers in vocational schools have a reserve of professional theoretical knowledge, plus certain education and teaching methods, which can better realize the transmission of explicit knowledge, but there is a

shortage of typical tasks of enterprises and the acquisition of new technology and new process knowledge. In contrast, enterprise mentors focus on the front-line practical work of enterprises. They have rich practical experience, are familiar with the typical work tasks of enterprises, master the advanced internal technology and process of enterprises, and know what kind of people enterprises need, but there is a lack of knowledge about vocational education teaching methods and education rules.

In order to effectively make up for the "defects" of vocational school teachers and enterprise tutors, the school-enterprise cooperative education strategy came into being. Under the cooperative strategy, vocational school teachers focus on the cultivation of students' theoretical knowledge and basic practical skills, while enterprise tutors focus on the cultivation of students' practical technical knowledge. The cultivation of technical knowledge is essentially a process of knowledge sharing between different subjects. Only when knowledge sharing is realized can the knowledge transfer process between mentors and apprentices be considered to be over. Therefore, the "enterprise mentor + AI Teacher" collaborative education strategy is proposed.

Most of the enterprise tutors have rich tacit knowledge, but there are shortcomings in education strategies, knowledge transfer rules, education and teaching methods. AI Teacher is a resource platform based on advanced technologies such as big data and cloud computing, which can provide massive data for students and enterprise tutors, effectively make up for the "defects" of enterprise tutors, and make the collaborative education strategy of "enterprise tutor + AI Teacher" possible. In addition, through the reproduction of the tacit knowledge transfer process of excellent corporate mentors, knowledge sharing between apprentices can be realized, and the "knowledge sharing hostility" between masters and apprentices can be minimized, which is conducive to improving the efficiency of human resources of enterprises.

5. Conclusion

Under the background of intelligent teaching of AI three teachers and the training of compound talents of field engineers, the core curriculum system is built to connect with the post technology of enterprises, and the strategy of "vocational school Teacher + AI Teacher + enterprise tutor" is proposed. By integrating AI technology and teaching resources, the teacher team and teaching mode are optimized to improve the teaching quality. To meet the diverse learning needs of students and promote the continuous innovation and development of education and teaching. Explore the practical path of AI-enabled "three education" reform, including the construction of "four modernizations" such as teaching team structure, three-dimensional teaching materials, intelligent teaching methods, and ubiquitous learning.

Acknowledgments

The authors are grateful to the anonymous reviewers for their comments, which have helped to improve this paper. The authors acknowledge supporting funds from University-level general scientific research projects (Project No. WZY2023053).

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