

# Exploration and Practice of Online and Offline Integrated Teaching of Production Practice of Automation

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**Abstract:** *Production practice is an important practical teaching aspect of automation major, especially for local application-oriented undergraduate colleges and universities, it is an important carrier for students to integrate theory with practice, establish engineering awareness, cultivate unity and cooperation ability, and exercise hands-on practice ability. Especially in the "Internet +" era and the normalized prevention and control of the Covid-19 epidemic, expanding the traditional on-site and offline form of production practice to online and offline integrated teaching will provide important support for further improving the quality of talent training. Based on the OBE teaching concept, this paper expounds the difficulties and deficiencies encountered by traditional on-site production practice under the new situation, discusses the necessity of optimizing the teaching aspect of production practice, and sorts out the exploration and practice of using online form as an important supplement to offline production practice. In order to provide reference for the follow-up reform and development of the practice teaching aspect of intelligent manufacturing engineering majors.*

**Keywords:** *automation; production practice; online and offline; teaching reform*

## 1. Preface

The national strategy of "Made in China 2025" proposes to "emphasize adherence to the basic policy of 'innovation-driven, quality-first, green development, structural optimization, and talent-oriented', and accelerate the transformation and upgrading of the industrial structure." And intelligent manufacturing engineering technology is listed as a key development One of the directions [1]. As an important reform support for the "Made in China 2025" strategy in the field of education, the Ministry of Education approved the establishment of the first batch of undergraduate majors in intelligent manufacturing engineering in 2018. In the same year, Wuchang Shouyi University, undergraduate-level universities featuring locality and application-oriented, adjusted automation major and mechanical manufacturing and automation major to the direction of intelligent manufacturing, and launched a new version of the talent training program. It is expected that after professional study and training, these students would not only have solid basic theoretical knowledge, but also strong practical ability and engineering practice ability, which put forward higher requirements for the quality of personnel training.

In 2015, the Ministry of Education and other three ministries and commissions pointed out that "strengthen the aspects of experiments, practical training and internships, and the class hours of practical training and practice account for more than 30% of the total teaching hours of professional teaching, and establish a quality assurance mechanism for practical training and practice. Establish the integration and collaboration of production and education. In 2019, the Ministry of Education further pointed out that "strengthen the reform and research of practice teaching, and improve the practice teaching system, standardize internship arrangement, strengthen condition guarantee and organizational management. Strengthen the construction of internship teaching system, rationally arrange internship organization forms, and scientifically formulate internship programs. Strengthen internship informatization construction, establish an internship informatization management platform, and realize the internship demand information of both schools and enterprises. Docking, strengthen the whole process management of practice. [3]" puts forward higher requirements for doing a good job in production practice in colleges and universities under the new situation, and provides basic guidelines for strengthening and improving practical teaching aspects such as production practice. At the same time, there are some incompatibility between the traditional offline production practice and the new requirements, and it is necessary to reform and innovate with the times.

## **2. The deficiencies and problems encountered in traditional offline production practice**

Production practice is an important part of the cultivation of applied undergraduate talents, an important part of deepening classroom teaching, and an important way for students to understand the society, contact production practice, and acquire and master relevant knowledge on production sites. It plays an important role in establishing a sense of professionalism and responsibility. As a typical engineering major, automation major is closely integrated with engineering practice, and has high requirements for students' practical ability.

In 2016, the automation major of Wuchang Shouyi University was one of the first majors to carry out the pilot reform of the OBE education model based on learning output, and has always implemented the OBE education concept of "student-centered, output-oriented, and continuous improvement". On the basis of the reform pilot, the 2018 version of the talent training plan has been compiled and completed. It is expected that through the training and training of practical teaching aspects such as production practice, students will have the awareness of environmental protection and sustainable development and the awareness of environmental protection and sustainable development in the process of automation system control engineering practice. Responsibility, there must be evaluation of sustainable development in social and environmental aspects; They will be able to use basic systems engineering, project management knowledge and economic decision-making methods to evaluate and evaluate project planning and design, implementation and operating costs for automation system control problems and decision-making, and they will be able to master independent learning methods through effective means, and have the ability to continuously learn and adapt to social progress and development.

Through production practice, students can combine the theory and professional knowledge learned in classroom teaching with the basic production knowledge of technology, equipment, automatic detection, display, control and other aspects adopted by the production site automation system, and train students to integrate theory with practice, analyzing problems, researching problems and solving problems from the actual point of view; and make students have a perceptual understanding of industrial automation, production, manufacturing, maintenance and management, etc. It can also broaden students' professional vision, professional knowledge and understand our country. The current state of production and technology in industrial automation inspires love for the profession and cultivates the spirit of hard work and dedication. At the same time, by keeping practice diaries, writing practice reports, etc. Students can exercise and cultivate their ability to observe, analyze problems, and collect and organize technical data. In recent years, automation majors have all arranged to go to Hubei Shiyuan Dongfeng Commercial Vehicle Co., Ltd to carry out production internships. However, due to various reasons of enterprise production and operation and epidemic prevention and control, students mainly visit factories and listen to lectures. There is a gap.

It can be found that the current traditional offline field production practice has some deficiencies in the new situation, and faces some problems at the same time.

### ***2.1 Few professional counterparts or related companies are willing to accept students for internships***

Before the national college enrollment expansion and reform at the end of the 20th century, many colleges and universities were subordinate colleges or were closely related to the industry. The employment of graduates was packaged and assigned, and they basically worked in these enterprises. Therefore, higher-level departments coordinated and arranged production internships for enterprises to receive students relatively easy and convenient. Now graduates choose careers by themselves, and many companies are reluctant to accept students for 1-6 weeks of production practice due to production, operation, management, efficiency and other considerations<sup>[4]</sup>. In addition, under the haze of the new Covid-19 epidemic, even in the case of normalized epidemic prevention and control, and the risk is very low, many companies are often more reluctant to accept students for production internships in order to ensure absolute safety and worry about taking any responsibility for the epidemic risk.

### ***2.2 The result of production practice is worse than expected***

Although some companies with a strong sense of social responsibility are willing to host students for production internships, the companies often have concerns about production plans, personal and equipment safety, etc. At the same time, because the production resources of the company are relatively concentrated, there is no redundant equipment and enough guidance personnel to be dispatched.

Therefore, students are often required to "see more, listen more, memorize more, ask more, and do not touch" at the internship site, which means that the current production practice lacks opportunities for hands-on practice, which is close to a fancy visit and different from traditional sense of the interns and the employees of the company eat, live and work together. In addition, because the production workshop generally has production and processing personnel, quality inspection personnel, large-scale equipment and machines, and storage areas for semi-finished and finished products.

### ***2.3 The existing internship assessment and evaluation system need improvement***

At this stage, the assessment and evaluation of students in the production practice teaching process mainly include daily performance, practice report, practice defense, etc. The usual performance mainly includes attendance, practice attitude, topic discussion, practice log, etc. On the one hand, the attendance is basically the same, and it is difficult for the leading teacher to pay attention to the performance of each student during the on-site internship process. The internship log and internship report often lack quantitative evaluation indicators. The ability to speech is closely related, and it is difficult to aspect with the time and energy actually invested in the internship. Therefore, it is difficult to distinguish the internship effect of different students in the evaluation.

## **3. Exploration and practice of online and offline integrated teaching in production practice**

### ***3.1 Adjust the internship schedule and expand the internship site***

In the past, production internships were generally arranged in the middle of the semester. The development of production internships meant the suspension of ongoing theoretical courses. On the one hand, it affected the continuity of theoretical courses. On the other hand, it was difficult for students to have extra time and energy to take care of production practice. Due to the preparatory work, especially under the influence of the epidemic, there are various kinds of certification materials. Therefore, the on-site production practice time is adjusted to the first week of the spring semester of the junior year. Before the winter vacation in the autumn semester, a production practice mobilization meeting was held to publicize the preparation work and precautions for the practice. Online learning was started one week before returning to school in the spring semester. The offline field practice was mainly conducted by watching videos, pictures and learning electronic textbooks and other reference materials. Preview, enter the learning state in advance, require students to record the confused questions during online learning, and ask questions to the on-site instructors in time during the offline internship. At this time, it is still during the winter vacation, and students also have time and energy to prepare various materials. During the on-site internship, carefully record the content of the day's internship, thoughts and feelings, opinions and suggestions in the internship logbook every day. One week after the offline internship is completed, students will complete the internship report in the spare time after returning to school and focusing on the study of the follow-up courses to enhance the Coordination and coherence between courses.

In addition to relying on the practice base to connect with units that are willing to receive student internships, we actively use the advantages of some teachers inside and outside the school to have close contact with industry and enterprises, as well as resources from school-enterprise partners, alumni and other aspects, and strive to expand internship units and places.

### ***3.2 Increase online learning aspects to improve the result of internships***

Before the end of the autumn semester of the junior year, the teacher who leads the internship team uses the Superstar Learning Platform to offer production practice courses. During the winter vacation, nearly 200 real photos and more than 50 real scenes of Dongfeng Commercial Vehicle Co., Ltd. and many auto parts manufacturers were launched on the platform. Videos and animations, more than 10 volumes of related theoretical electronic textbooks and courseware, etc., show the main production process of the automobile industry in an all-round way. The content covers engine crankshaft technology, connecting rod technology, camshaft technology, cylinder head technology, cylinder block technology, automobile assembly technology and equipment, transmission technology, automobile gear technology, metal cutting tools, stamping processing and frame stamping technology. There are 13 categories including stamping process, automobile welding fixture, body coating process, bearing bush and leaf spring processing technology, and some videos involving expansion and extension of interdisciplinary, advanced technology, and industry frontier. And arranging corresponding task points

and thinking questions, so that students can learn for problems and goals, and students are required to use the winter vacation time to complete online learning tasks and self-assessment questions before returning to school in the spring semester, so as to prevent the on-site practice from facing new problems.

### ***3.3 Increase the online discussion and communication aspect, review the daily content of the on-site practice***

Using the Superstar Learning Platform to arrange practice thinking questions, guiding students to pay attention to the important and difficult content of daily practice, and conduct free speech and discussion. After the completion of the daily practice content, using the Tencent conference platform for about half an hour in the evening for leading teachers and students to communicate and interact, summarize and sort out the practice content of the day, teacher answers students' confusion, listens to students' opinions and suggestions, and predicts the content and precautions of the next day internship. It will help students increase their own thinking and perception in the internship log, enrich their internship life, set up feedback channels, and increase students' sense of internship gain.

### ***3.4 Develop teaching plans for offline internships that cannot be implemented normally under the epidemic conditions***

The Covid-19 which broke out at the end of 2019 continued to shroud the world, especially the Omicron mutant strain that appeared in the autumn of 2021, known for its fast spread and strong concealment, which brought great influence to domestic epidemic prevention and control under normal conditions. In view of the severe domestic epidemic situation and strict epidemic prevention and control requirements, on-site production practice may face difficulties that cannot be implemented at any time, so it is necessary to make alternative plans. The main purpose is to switch the on-site internship and craft lectures to the form of live workshop video live broadcast and online craft lectures of the internship instructors using the Tencent conference platform. Students who are already at school will participate in the multimedia classroom, and students who cannot return to school due to the epidemic will go online by themselves. Participate in activities synchronously, appropriately increase the time for students and instructors to ask questions and communicate, and try to reduce the impact on the effect of the internship due to the inability to attend the internship in person.

## **4. Exploration and practice of optimizing the assessment aspect**

Reasonable practice assessment methods can more effectively guide and motivate students to participate in production practice and invest time and energy, which is conducive to improve the overall practice effect <sup>[5]</sup>. In response to the previous emphasis on the practice log and practice report, the production practice assessment method has been optimized, and a multi-level and multi-dimensional assessment and evaluation system has been adopted. Comprehensive evaluation of activity, online topic discussions, practice log standardization and reflection depth, practice defense performance, professionalism and cutting-edge nature of practice reports, learning and browsing of learning materials, etc., to stimulate the enthusiasm of students to participate in production practice, exert their subjective initiative in the practice process, and improve the ability of independent learning, which is also conducive to improving the effect of production practice. The survey after the internship shows that the online-offline integration of production practice teaching mode is highly accepted among students. 88% of the students believe that the production practice teaching aspect is very fulfilling and rewarding, and 84% of the students think that this form of production practice is very helpful for improving the awareness and ability of aspecting theory with practice and engineering practice ability.

## **5. Conclusion**

The automation major is closely related to industrial production. Under the national strategy of promoting new industrialization, informatization and Made in China 2025, new requirements are also put forward to improve the quality of talent training in this major. Especially for local application-oriented general undergraduate colleges and universities, the improvement of students' practical ability, engineering practice ability, innovation consciousness and innovation ability through practical teaching aspects such as production practice puts forward higher requirements. Relevant ministries and commissions also pointed out that it pointed out that more attention should be paid to the

practical teaching aspect.

The traditional offline on-site production practice is faced with difficulties and deficiencies such as the lack of professional counterparts and related internship companies that are willing to accept students for internships, the unsatisfactory results of the internships, and the incomplete assessment and evaluation system, especially under the cover of the new crown pneumonia epidemic. Production internships present more challenges. In view of this, under the guidance of the OBE teaching concept, the automation major of Wuchang Shouyi University has improved the talent training plan, adjusted the practice time arrangement, expanded the practice place, added online practice and exchange and discussion aspects, formulated emergency alternative plans, and optimized the practice assessment and evaluation methods, etc. The production practice of online and offline integrated teaching has been explored and practiced, and good results have been achieved.

In the later stage, the result of production practice can be further improved by adding a virtual simulation practice teaching platform, special testing of practice content, and encouraging students to write industry research reports, helping to improve the quality of automation professional talent training.

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