

The Use of Artificial Intelligence by Students in Vocational Colleges in China and the United States

An Yan^{1,a,*}

¹Department of Education, Johns Hopkins University, Baltimore, MD 21218, United States

a. ayan9@alumni.jh.edu

*corresponding author

Abstract: The rapid development of artificial intelligence, while promoting the progress of the times, has also brought unprecedented employment pressure on vocational school students. To adapt to the requirements of the times, vocational schools in both China and the United States have updated their curricula and teaching concepts to ensure that vocational school students can maximize their mastery of modern AI technology. This article employs interview and questionnaire surveys, combining qualitative and quantitative analysis to investigate the usage and proficiency of AI technologies among vocational school students. The research finds that the use of various AI technologies by students in vocational colleges varies across majors, with equipment availability, the scheduling of hands-on classes, and the frequency of school-enterprise cooperation all contributing to this difference. Although China and the United States share the same reform policies and educational goals, there are still differences in the details of teaching and learning implementation due to different national conditions. However, the findings suggest that it is still beneficial to offer AI-related courses at school. Familiarity with basic theoretical knowledge and practical experience can alleviate students' social anxiety and employment pressure to a certain extent. It can be seen that the reform of vocational education in the era of artificial intelligence in China and the United States is beginning to bear fruit.

Keywords: artificial intelligence, vocational education, employment pressure, educational reform.

1. Introduction

With the rise of the AI era, the growing need for technical talents in all walks of life underscores the escalating significance of vocational education's status and role. Because artificial intelligence can replace simple and repetitive mental labor to a certain degree, traditional social employment systems and career models are also subtly changing along with it. In the context where artificial intelligence is increasingly replacing human labor, one important aspect that vocational education needs to emphasize is learning how to learn [1]. In other words, it is about teaching students how to use artificial intelligence, rather than being replaced by it. As the main position of training technical talents, vocational colleges must first recognize the impact of artificial intelligence on the job market, improve the vocational education system, innovate the curriculum and teaching system, rationally plan the personnel training model, and put all reforms into practice.

The advent of AI software such as chatGPT has revealed the current situation that vocational education must face in the era of artificial intelligence: Teaching should be primarily oriented toward employment [2]. It means that an important teaching goal of vocational colleges is to teach students how to accurately and skillfully use artificial intelligence to assist them in work. However, the fact is that popularizing AI in vocational colleges may be more difficult than in ordinary colleges and universities. Staffing and funding have contributed to the problem. Students in vocational colleges have a relatively poor academic foundation, and their learning ability is far inferior to that of students in general universities. Secondly, compared with general colleges and universities, it is common for vocational schools to have backward teaching equipment and fragmented resources [3]. These problems have created an imbalance in the job market for vocational education: enterprises need high-level technical talents, but vocational colleges rarely meet the demand. A large number of vocational graduates need jobs, but failure to master advanced AI technology makes them struggle to gain a foothold in the workplace. To solve this problem, vocational institutions need to start with the content of the curriculum, giving students a systematic theoretical literacy first. Secondly, it is also necessary to add substantive exercises to avoid playing on paper in the workplace. To assess the practical implementation of current educational policies, this study conducted a campus-based investigation to gather students' authentic feedback on the new teaching policies in the AI era, aiming to enhance the value of future vocational higher education.

2. Literature Review

Driven by the tide of the times, many vocational colleges have embarked on reform, focusing on the integration of artificial intelligence technology and traditional technical training systems, thereby setting a new course for the development of vocational education in the era of artificial intelligence and embracing new challenges. Throughout the world, against the backdrop of the AI era, vocational colleges in China and the United States have many similarities and differences in curriculum reform and teaching innovation. In October 2023, the Department of Vocational Education and Adult Education of the Ministry of Education of China mentioned that vocational colleges across the country should closely focus on constructing a modern industrial system, with a key emphasis on serving the manufacturing industry by adhering to high-end, intelligent, and green development [4]. AI technology should be genuinely integrated into campuses, with the establishment of relevant experimental sites, to broaden the exposure of vocational college students to the field of artificial intelligence.

According to the data from the China Vocational Colleges Program Setting Management and Public Information Service Platform, in 2024, a total of 618 higher vocational colleges nationwide have registered programs related to the application (or service) of AI technology, accounting for nearly 40% of the 1,547 higher vocational colleges in China [5]. For instance, Beijing Vocational College of Electronic Science and Technology has added artificial intelligence technology application majors and industrial Internet application majors, which will welcome new students enrolled in September this year. Yunli Zhu, the vice president of the school, remarked that from the AI language model ChatGPT in 2023 to the video generation model Sora in 2024, a series of artificial intelligence technologies have come out, undergoing swift updates and iterations [6]. Consequently, the influence of AI has become increasingly pervasive, making people acutely aware that the "future" once envisioned has now arrived. The reason why the school has specially added AI-related majors is to speed up the pace to catch up with the trend of the times. From a macro perspective, the development of artificial intelligence is a major strategy to enhance national competitiveness and safeguard national security. For vocational colleges, AI technology application majors have broad employment prospects, and the opening of AI technology application majors is also in line with the professional layout and discipline positioning of the school. Pinyin Wu, the secretary of Fujian Information

Technology Vocational College, stated that since 2020, the school has expanded its offerings to majors such as electronic information, computer networks, and artificial intelligence, all of which are based on information technology [7]. Furthermore, the school has also incorporated artificial intelligence into the general curriculum and built a special AI training laboratory last year. At Fujian Information Technology Vocational College, students majoring in the application of artificial intelligence technology are required to learn professional courses such as "Machine Learning", "Machine Vision and Graphics Processing", and "Data Visualization Technology and Application". Nanjing Institute of Information Technology has also done a lot of prospective exploration work. Since 2017, the school has begun to build an artificial intelligence college to jointly carry out exploratory training of applied talents in artificial intelligence with leading enterprises. In September 2020, it took the lead in setting up this major among vocational colleges in China [6,7].

It can be seen that China's higher vocational colleges have always paid close attention to the development of the information industry, especially to the demand for talent in emerging fields. Actively exploring and developing cutting-edge new majors, while emphasizing hands-on experience and training for innovative talents, is a key focus of reform in China's vocational high schools. So for the United States, what have vocational colleges done to cope with the rapid development of the AI era?

Community colleges in the United States are the main institutions that carry out higher vocational education. Since the development of the Junior College Movement in the late 19th century and early 20th century, the main task of American community colleges is to engage in vocational education. Scholars Arthur M. Cohen and Jan M. Ignash also emphasized that the most important task of community colleges is to train workers, and should be adequately funded. In 2023, the National Science Foundation (NSF), in cooperation with the National Institute of Standards and Technology (NIST), the University of Maryland, the University of California, Santa Barbara, Carnegie Mellon University, and other community colleges of higher education institutions, established seven national artificial intelligence research institutes, to achieve the first step of artificial intelligence equipment coverage of vocational schools [8]. In the further updated policies for 2023, emphasis has been placed on the necessity of popularizing AI technologies in vocational schools and enhancing the proficiency of vocational college students in AI equipment. The main measures include setting up artificial intelligence awards and funding digital practices based on artificial intelligence and big data so that the United States can truly achieve the full coverage of artificial intelligence education [8]. In addition, in recent years, vocational colleges and enterprises have also strengthened cooperation. Many vocational schools have formed partnerships with industry leaders to develop specialized training programs that meet the needs of the industry. Through internships, apprenticeships, and industry-sponsored projects, students gain hands-on experience using AI technologies and solutions. That way, students won't be confused when they enter the workplace. Obviously, as a global technological superpower, the U.S. cannot possibly lag behind any other country in terms of policy and market sensitivity.

It is clear that upon entering the age of AI, the two education powers, the United States and China, have gone all out to develop a variety of measures to cope with the impact of artificial intelligence on vocational schools. However, there seems to be almost a gap in research on whether the reformed approaches are effective. To explore whether educational reforms in vocational institutions help students familiarize themselves with various AI technologies, this study examined the following questions through questionnaires and interviews: 1) How do students in vocational schools differ in their mastery of AI technology? 2) Which AI technology do students have the most exposure to at school?

3. Research Design

This study aims to investigate the familiarity of vocational school students with different AI technologies, thus contributing to an in-depth analysis of current or future educational trends in vocational schools amidst the wave of artificial intelligence. The survey consists of two parts. First, interviews will be conducted with teachers at Nanjing Institute of Information Technology in China and Irvine Valley College in the United States. The main purpose of the interviews is to find out what AI equipment the school has introduced, what related courses it has set up, and to what extent the students are practicing different AI technologies. The specifics of the interview are as follows: 1) Please briefly describe what AI equipment is currently in use at the school. 2) What are the current AI-related courses? What is the format of the classes? 3) What are some on-campus or off-campus opportunities for students to practice AI techniques? How often? The second part is the questionnaire survey. Thirty-six students from each school will be randomly selected for the questionnaire survey. Students are of all ages, grades, and majors. The questionnaire will be completely anonymous and consist of 9 questions including multiple-choice and structured, open-ended questions. Because the survey was conducted at schools in the United States and China, the questionnaire was available in English and Chinese. The English version was distributed to U.S. students and the Chinese version was distributed to Chinese students.

4. Result and Discussion

4.1. Questionnaire Result

A total of 72 responses were received for the questionnaire in both Chinese and English, of which 36 were from Irvine Valley College (USA) and 36 were from Nanjing Institute of Information Technology (China).

4.1.1. Irvine Valley College (USA)

The survey showed that the average age of the respondents was 18-25 years old, with a variety of majors. Students at Irvine Valley College all responded that the school offers AI-related courses, and to some extent, they are related to their majors.

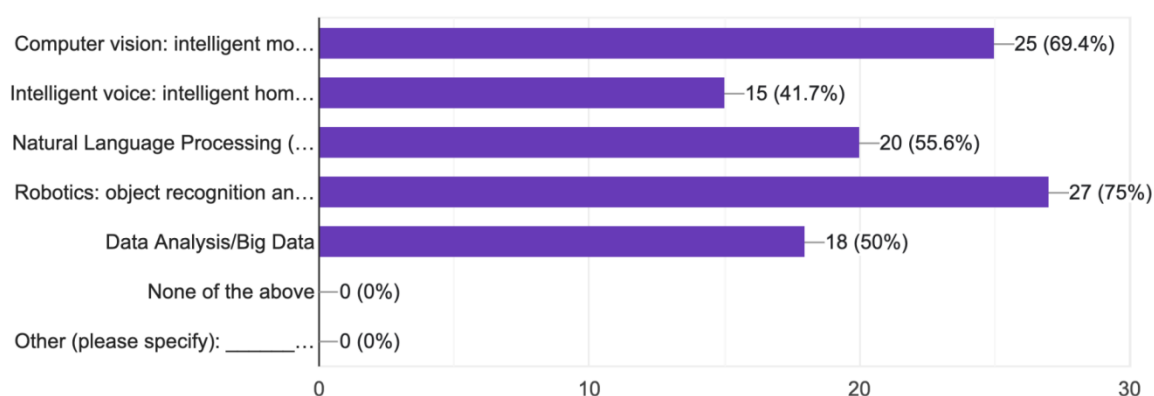


Figure 1: Students' exposure to AI technology at Irvine Valley College.

As Figure 1 shows, the coverage of AI-related courses offered by Irvine Valley College is relatively comprehensive, involving computer vision, intelligence voice, natural language processing, robotics,

and big data. Robotics and computer vision are two of the courses that students are most exposed to at the school. The survey results for course satisfaction were overwhelmingly positive. According to Figure 2, 63.9% of students were satisfied with the courses offered at the school and felt that they met their professional needs, with room for improvement. A small percentage of students considered the courses to be acceptable to moderate. Students who chose this option included those whose majors did not involve many AI-related components. No students voted dissatisfied.

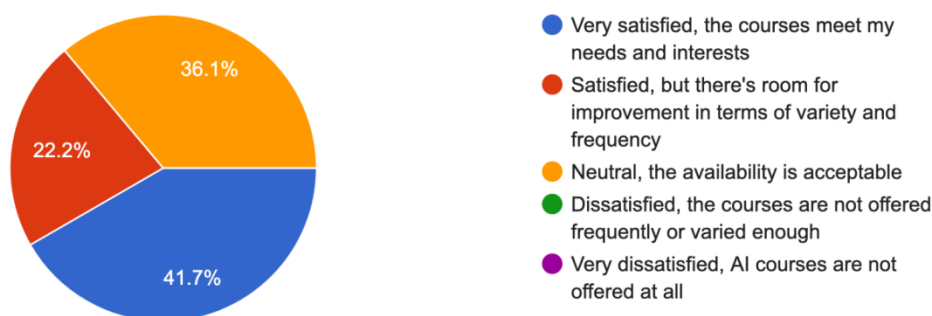


Figure 2: Students' Satisfaction with AI Courses at Irvine Valley College.

In the open-ended question section, students said they wanted the school to pay more attention to the frequency and consistency of classes. Students reported that some courses are scheduled irregularly, some once a week, some once a month, and others are based on the availability of equipment for that semester. Their inability to form a consistent and regular memory for practical operations makes it challenging for them to grasp the overall concept of AI technology clearly, leading them to feel disconnected from this era.

4.1.2. Nanjing Institute of Information Technology (China)

The responses from Nanjing Institute of Information Technology share many similarities and differences with Irvine Valley College. First, the age of the students was also generally concentrated in the 18–25-year-old stage, with a variety of majors. The AI technology that students were most exposed to was natural language processing, but there were few opportunities for hands-on experience in the field of robotics. Students said that the school introduced limited equipment resources, and a fixed number of equipment had to be used regularly and quantitatively for students in specific majors every day, so not every major had regular opportunities for hands-on practice. Secondly, when the equipment occasionally fails and needs to be repaired, the professional maintenance personnel can not be present in time or the maintenance fund is insufficient, resulting in the number of available equipment being tight. Students report that most of the courses are helpful for future internships or formal jobs. The basic theoretical knowledge taught in school gave them a certain degree of confidence, and despite the limited opportunities for hands-on practice, it largely alleviated the social anxiety of not knowing and being unaware of AI technology.

4.2. Interview Result

What the students reported through the questionnaire matched what the teachers interviewed stated. First, Irvine Valley's Dean of Academic Affairs stated that the AI equipment introduced to the school mainly includes high-performance computers, AI development tools and platforms, sensors, virtual reality, and augmented reality equipment. The specific curriculum is also designed around these

devices and in accordance with the standards of the AI application policy issued by the Ministry of Education. "We have strictly formulated the course content and teaching methods by the current reform standards of vocational higher education promulgated by the government," said the academic director, "The theoretical courses focus on the five major areas of natural language processing, computer vision, speech recognition, biometrics, and embodied intelligence, and the teaching form is a combination of online and offline forms." Teachers customize hands-on opportunities according to the needs of different majors. For instance, students majoring in auto repair, optoelectronics, and mechanics often use industrial robots to experience workshop automation and intelligent manufacturing. Students in fields such as logistics, healthcare, and services are required to learn how to give instructions for applications such as warehouse robots and logistics automation. At the same time, the school also sends students to enterprises for observation and practice from time to time according to their specialties and school-enterprise cooperation [9]. Similarly, the vice president of Nanjing Institute of Information Technology also said that the school has introduced high-performance computers and AI development boards like Arduino to support students in the development, testing, and verification of AI algorithms. Meanwhile, open VR and AR devices help them better understand AI principles and application scenarios. The school is also equipped with a robot teaching suite, a variety of programming robots, educational robots, etc., to support students in robot programming, control and debugging, and other aspects of learning and practice. Most of them are in the form of 1:1 theoretical + practical classes, but due to insufficient funds and resources, the school currently has restrictions on the use and personnel. "Hopefully we can speed up the pace and match demand with supply sooner." The Vice Principal said.

4.3. Discussion

To sum up, there is a great convergence between the new approaches adopted by China and the United States in vocational higher education. The two teachers interviewed said that schools are strictly following the government's policy on vocational high education. The school also has all the necessary courses and basic equipment. From the overall reflection of the students, the implementation of the school's policy is very in place. Theoretical courses can alleviate the anxiety of The Times caused by the rapid development of AI to a certain extent. However, due to the different specialties, there is a gap between individuals in the mastery of AI technology. In some majors that do not involve many AI components, students take AI-related courses as electives, just to broaden their knowledge or interests [10]. For majors with high AI technology requirements, such as multimedia technology and computer maintenance, students should not only be proficient in how to utilize AI to assist in their work but also stay sensitive to iterative updates so that they do not fall behind the needs of the enterprises [11]. Neither school has given a clear answer to how much practical work students can currently accomplish through school-enterprise partnerships. This also means that the connection from campus to business cannot be achieved overnight, it is not something that any one party decides, and it requires many policies to promote.

5. Conclusion

This study provides information on how vocational school students in China and the United States respond to their schools' educational policies in the age of AI, and whether they feel that the school's reforms and courses offered to keep up with The Times are of practical help to them. The findings demonstrate that the two countries have similar policies and approaches, but the details of implementation vary according to national context. Vocational colleges in the U.S. are very perfect in the introduction of equipment, but due to there is much room for self-arrangement of theoretical courses, and because there is no careful allocation of equipment use, students may feel lagged and

fragmented in their knowledge system. In contrast, China's vocational schools have a solid foundation in theory courses, but because of the large population base, which is several times that of American schools, the supply of equipment does not meet the demand. Education has no borders, and technology should be shared worldwide. This study is crucial to provide an analysis of the development of digital transformation of vocational schools in China and the United States as vocational schools in different regions and with different backgrounds. Of course, this study has limitations in terms of sample size and region. The 72 responses are an occasional sample and do not represent the majority. Regarding regional limitations, the benchmark cities in China and the United States were unequal, as differing population bases and educational levels across regions impacted the results as external factors. Future sample selection could be more detailed and balanced, which would be conducive to horizontal comparisons regardless of objective factors. Nevertheless, this study still provided a fundamental assessment of the current state of vocational education in terms of curriculum and equipment standards. In the future, vocational education must uphold its fundamental values and address issues like curriculum content and type selection through a dialectical approach. On the one hand, formulating the basic theoretical content precisely to prevent an unorganized influx of knowledge into the course. On the other hand, building a curriculum system that meets the needs of enterprises to cultivate talent standards for the AI era. This not only lightens the academic load on students but also enhances the alignment of course content with industry requirements.

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