

# Research on the application of Artificial Intelligence tools in higher vocational education

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**Abstract.** With the rapid development of the artificial intelligence industry, its application in higher vocational education has gradually become a research hotspot. This study explores how AI tools can enhance the quality of teaching, assist teachers, and improve students' learning experiences. Through the research and analysis of various AI tools, it was found that AI tools can adapt to the learning needs of students in a personalized manner, provide effective teaching support, and thus improve teaching efficiency. AI tools can also help teachers handle heavy daily tasks, such as grading assignments and exams, allowing them to invest more energy in instructional design. These tools can also provide enlightening data feedback to help teachers and students better understand the progress and effectiveness of learning. The results of this study indicate that the application of AI tools in higher vocational education has enormous potential and may have a profound impact on teaching methods. This paper is dedicated to analyzing the research on the application of AI tools in the field of higher vocational education.

**Keywords:** Artificial Intelligence, Higher Vocational Education, Application of Educational Technology, Personalized Instruction.

## 1. Introduction

### *1.1. Research Background*

With the development of globalization and the knowledge economy, society's demand for higher vocational education is increasing day by day, and its importance is becoming more and more prominent. Higher vocational education is facing a series of challenges. According to a recent study [1], The author suggests that artificial intelligence can be used to cultivate high-end talents, as the future labor market will likely demand senior technicians who can operate intelligent systems and maintain intelligent equipment. The paper also calls for an improvement of traditional talent training programs, with a focus on strengthening the construction of the curriculum system, improving the teaching content, and increasing the proportion of high-tech applications in the teaching content. On the one hand, traditional teaching methods often cannot meet the needs of diversified and personalized learning, leading to difficulties in improving the quality of teaching; on the other hand, teachers' workload is increasing, including curriculum design, teaching implementation, student evaluation and other links, making the improvement of teachers' work efficiency also an urgent issue. How to meet the personalized learning

needs of students with different backgrounds, abilities, and interests is also a major challenge for current higher vocational education.

### *1.2. Research Objectives*

Based on the above background, this study aims to explore and research the application of artificial intelligence in higher vocational education. The main objectives of this study include: Firstly, understanding and analyzing how artificial intelligence can improve the quality of education and teaching, including providing personalized teaching and enhancing students' learning experience, etc.; Secondly, exploring how artificial intelligence can help teachers improve teaching efficiency and effectiveness, such as reducing teachers' daily workload and enabling them to focus more on teaching activities; Thirdly, studying how artificial intelligence tools can help students achieve personalized learning and development.

### *1.3. Research Value*

The value of this study is mainly reflected in two aspects. Academically, this study will provide new perspectives and understanding about the application of artificial intelligence in higher vocational education, which will contribute to the theoretical development in this field. For the practical field, the results of this study can provide valuable references and inspirations for educators, helping them better use artificial intelligence to improve teaching quality and efficiency, and meet students' personalized learning needs. This research can also provide references for managers in the field of educational technology, and provide technical support for the reform and development of higher vocational education.

## **2. Literature Review and Theoretical Framework**

### *2.1. Overview of the Development of Artificial Intelligence Tools*

As a breakthrough technology of the 21st century, artificial intelligence has developed rapidly in recent years, and its application fields have covered all aspects of life. Especially in the field of higher vocational education, the application of AI has developed from the initial simple auxiliary tools to the highly complex systems today. The main development areas of AI tools include machine learning, deep learning, and natural language processing. Machine learning enables computers to make decisions and predictions by learning from data, deep learning uses neural network models to discover complex patterns in big data, and natural language processing enables computers to understand and generate human languages. according to [2], The identified student clusters may help to better understand the individual student standpoints, whenteaching with or about AI-powered writing tools. These advancements enable AI tools to provide personalized teaching, understand students' learning needs, and provide targeted teaching resources and feedback.

### *2.2. Current Status of Higher Vocational Education*

Higher vocational education, as a major way of cultivating high-level skilled talents, has become an important part of the global education system. Current higher vocational education is facing many problems and challenges, including the traditionalization of teaching methods, heavy work pressure on teachers, and the difficulty of meeting students' personalized learning needs. These problems limit the development of higher vocational education and affect students' learning outcomes and satisfaction. According to [3] research, college students have a high evaluation of mobile technology and Moodle applications in personalized learning.

### *2.3. Application of Artificial Intelligence in Higher Vocational Education*

In recent years, more and more research has begun to explore the application of AI in higher vocational education. Some studies have shown that AI can help students learn more effectively through personalized teaching. Other studies have found that AI can help teachers reduce their workload and

improve teaching efficiency. Some studies have emphasized the role of AI in providing teaching feedback and evaluation. In general, these studies show that AI has broad application potential in higher vocational education and has the potential to change the status quo of education.

#### *2.4. Theoretical Framework*

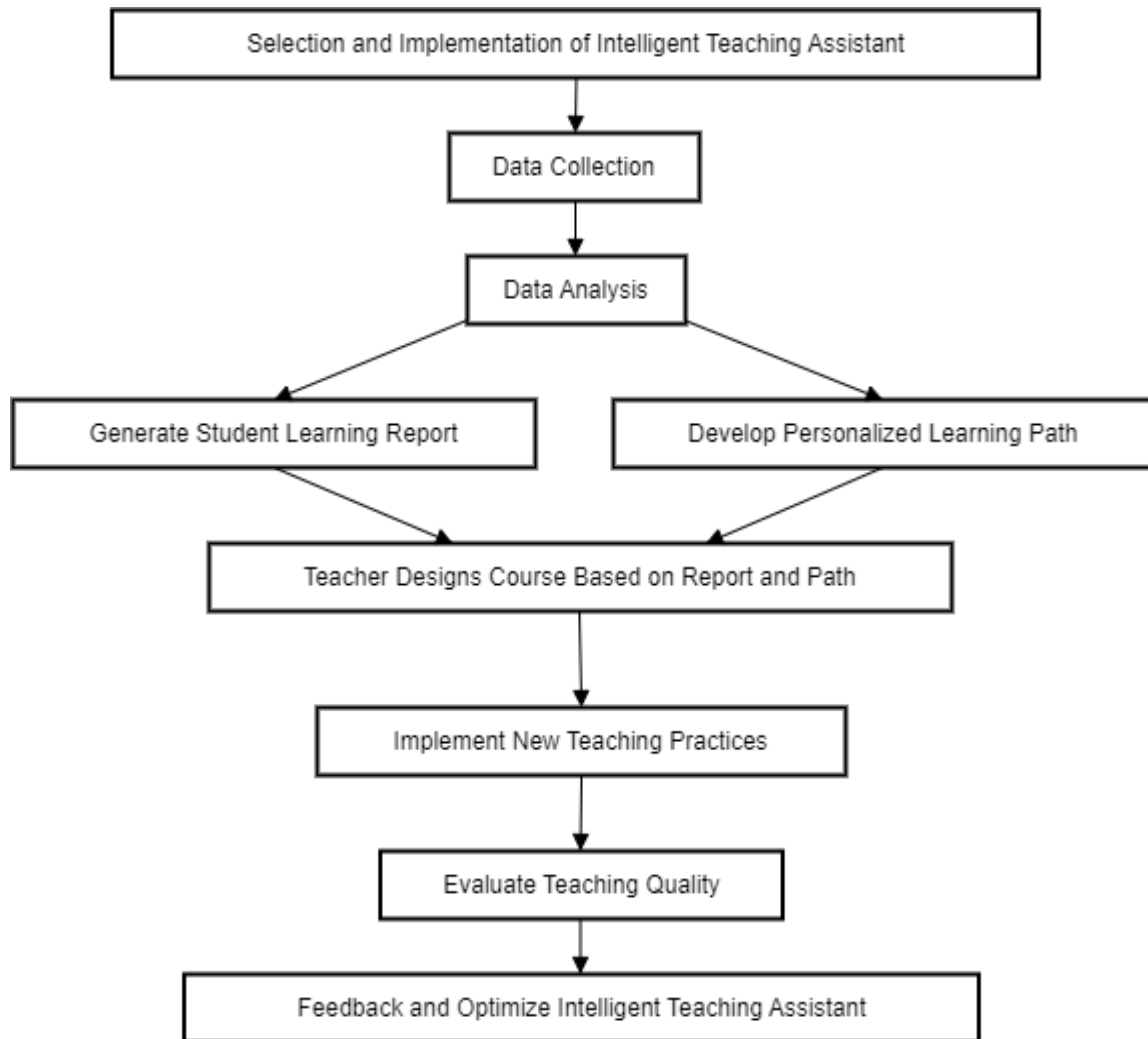
The theoretical framework of this study mainly revolves around the application of artificial intelligence in higher vocational education, with special attention to how to use AI to improve teaching quality, improve teacher work efficiency, and meet students' personalized learning needs. [4] research used a meta-analytic structural equation model to explain how teachers adopt digital technology. The study found that the Technology Acceptance Model (TAM) is an effective model that can explain how teachers adopt and use digital technology. Research [5] points out that the widespread use of technology in education is changing the way we teach. Artificial intelligence is a disruptive technology used to personalize the learning experience of various study groups, teachers and tutors.

This study will use the Technology Acceptance Model (TAM) to explore how teachers and students in higher vocational education accept and use AI tools. The TAM model points out that the degree to which users accept new technology depends on their perceived usefulness and ease of use. In this study, the usefulness and ease of use of AI tools in higher vocational education will be evaluated to understand the acceptance level of teachers and students of AI tools. Secondly, the theory of instructional design will be used to explore how to effectively integrate AI tools into the teaching process. Instructional design theory emphasizes that the design of teaching activities needs to consider factors such as students' prior knowledge, learning objectives, learning strategies, and feedback mechanisms. This study will explore how AI tools can assist teachers in effective instructional design in these areas. Finally, the theory of personalized learning will be used to analyze how AI can meet students' personalized learning needs. Personalized learning theory believes that each student has their unique learning style and pace, and education should provide a personalized learning experience for each student. This study will focus on how to use AI tools to achieve personalized teaching for each student.

### **3. Case Studies of Artificial Intelligence Tools**

#### *3.1. Case Study One: Application in Teaching Quality Management*

This case takes the "Q Intelligent Teaching Assistant" as an example, which employs machine learning technology to aid teachers in teaching management. This tool can automatically correct assignments, generate learning reports, and provide personalized learning suggestions. Studies have shown that teachers using the intelligent teaching assistant have seen significant improvements in their work efficiency, and students' academic performance has also improved. The "Q Intelligent Teaching Assistant" can enhance the quality of its course design and teaching process. This tool uses deep learning and natural language processing technologies to parse students' learning data, thereby assisting teachers in accurately identifying students' learning weaknesses and strengths.



**Figure 1.** Research flow chart.

At the end of each semester, the intelligent teaching assistant generates a personalized learning report, which includes students' learning progress, knowledge mastery, and areas where they might need additional help or in-depth study. This enables teachers to better understand each student's learning situation, thereby providing valuable references for the course design of the next semester. The intelligent teaching assistant also has an important function of automatically generating personalized learning paths according to each student's learning situation. This path not only guides students' autonomous learning but also provides a direction for teachers to carry out personalized teaching in the classroom.

By using the intelligent teaching assistant, faculty members reported that they saved a considerable amount of time in course design, and the quality of their courses significantly improved. Students also said they prefer this teaching method tailored to individual needs and believe it helps them better understand and master course content. This case demonstrates the potential of artificial intelligence tools in improving teaching quality and how it has changed teaching practices in higher vocational education.

### *3.2. Case Study Two: Application in Vocational College Skills Competition*

This case primarily comes from a national vocational college skills competition in China. In this competition, organizers extensively used artificial intelligence simulation tools to examine and evaluate students' skill levels.

The competition attracted over 99% of vocational colleges nationwide, where students had to demonstrate their skills in their respective professional fields. To more accurately and fairly evaluate students' skill levels, organizers introduced a large number of advanced artificial intelligence simulation tools. These tools used deep learning technology to create highly realistic working environment simulations. Students operated within these simulated environments, and the tool would score based on their actions. For instance, in the automobile repair skills competition, students had to inspect and repair cars in a virtual environment. The artificial intelligence tool can create various car failure scenarios, testing students' abilities to handle different problems. Moreover, the tool can simulate various working environment factors, such as temperature, humidity, and lighting, making evaluations more comprehensive and accurate.

According to the feedback from the competition organizers, the use of artificial intelligence simulation tools greatly improved the fairness and accuracy of the competition, and students' skill levels were more genuinely reflected. This case indicates that artificial intelligence tools can not only be used for teaching but also for testing and evaluating skill levels, undeniably opening up a broader field for its application in higher vocational education.

### 3.3. Case Three: AI Mentor Application

In an experiment, an "AI Mentor" was used to tutor 120 students at Q College. This tool uses natural language processing technology and machine learning algorithms to understand student's questions, generate detailed answers, and provide personalized learning suggestions. Compared to traditional teaching methods, the "AI Mentor" offers round-the-clock learning support, enabling students to learn anywhere, anytime.

The "AI Mentor" not only answers students' questions but also provides a personalized learning path based on each student's progress and understanding. For example, if the tool detects a student struggling with a certain knowledge point, it recommends relevant learning resources or provides a more in-depth, detailed explanation.



**Figure 2.** Histogram of Test Score Improvement.

The results after the experiment showed that students who used the "AI Mentor" saw significant improvements in knowledge mastery and skill enhancement. Their performance on tests was better than

those who did not use the "AI Mentor." Moreover, they highly praised the "AI Mentor," stating that this method helped them better understand and grasp knowledge. This case showcases the immense potential of AI tools in higher vocational education. It can serve not only as an auxiliary tool for teachers but also as a personal mentor for students, offering them personalized learning support.

### *3.4. Summary of Case Studies*

The above case studies demonstrate the application of artificial intelligence tools in higher vocational education. These tools can enhance teaching quality, improve teachers' work efficiency, and simultaneously increase student performance while catering to individualized learning needs. These results indicate that AI has broad application potential in higher vocational education.

## **4. Challenges and Solutions in the Application of Artificial Intelligence Tools**

### *4.1. Challenges of Applying Artificial Intelligence Tools in Higher Vocational Education*

Despite significant successes in applying artificial intelligence tools in higher vocational education, as demonstrated by the above cases, several challenges and issues persist. Firstly, the technical integration and adaptability remain prominent concerns. Tools such as "Q Intelligent Teaching Assistant" and "AI Tutor" require considerable time and resources for integration and adaptation. Various educational environments and student groups may necessitate different tools and features, necessitating extensive customization during the design and development stages, posing challenges to practical applications. Secondly, issues of data security and privacy protection come into play. These AI tools often require the collection and analysis of vast amounts of student personal information and learning data, and ensuring data security and students' privacy rights becomes a significant challenge. For example, if a tool's data security cannot be ensured, students' personal information could be leaked, causing severe implications. Lastly, the issue of educational fairness cannot be overlooked. For schools or regions with scarce resources that may not afford the high cost of AI tools, this could exacerbate the imbalance of educational resources. For instance, although AI simulation tools can provide fair and accurate grading in vocational college skills competitions, some schools with limited funding cannot afford these tools' cost, preventing these students from enjoying the benefits of these tools and consequently leading to educational fairness issues.

Artificial intelligence tools indeed hold immense potential in higher vocational education. However, we must address these problems directly, solving them through legislation, technological innovation, and social collaboration, to ensure the fair, secure, and efficient application of artificial intelligence in education.

### *4.2. Proposed Solutions or Suggestions*

In response to these problems, this study suggests several potential solutions. First, enhance technological integration and adaptability. To allow all types of educational institutions to integrate and adapt to AI tools, developers and educational institutions can collaborate to establish a series of standards and interfaces. Educational institutions can help AI tool developers optimize and refine their products to better adapt to the educational environment by providing practical teaching needs and feedback. Second, strengthen data security and privacy protection. AI tool developers and users must strictly adhere to data protection regulations, such as the EU's GDPR, to protect students' privacy rights. Advanced data encryption and anonymization technologies can be employed to ensure the security of data during transmission and storage. Educational institutions should explicitly inform students and parents about the collection, use, and storage of data to ensure their privacy rights. Lastly, improve educational fairness. For those schools or regions with scarce resources, the government and relevant institutions can provide subsidies or discounts, enabling them to afford the cost of AI tools. Developers can also consider offering low-cost or free versions to expand their market coverage and achieve more extensive educational fairness.

In conclusion, while the application of artificial intelligence tools in education faces some challenges, they can be overcome through continuous technological innovation, legislation, and social collaboration, promising a brighter future for the application of artificial intelligence in education.

## 5. Conclusion and Future Research Directions

### 5.1. Overview of Research Findings

This study conducted an in-depth analysis of three cases of artificial intelligence application in higher vocational education, exploring the role and effect of AI tools in teaching management, skills assessment, and personalized tutoring, among others. The research results indicate that AI tools can effectively enhance teaching quality, improve students' knowledge mastery and skill level, and have a positive impact on teaching management and educational fairness. The study also points out the problems existing in the practical application of AI tools, mainly including challenges in technical integration and adaptability, data security and privacy protection, educational fairness, and user education. In response to these problems, this research proposes a series of possible solutions and suggestions, including setting technical standards, strengthening data protection, providing subsidies and discounts, and conducting education and training. The study shows that although there are still some problems with the application of AI tools in education, the potential for improving teaching quality, enhancing student learning effects, etc., is tremendous and is expected to have a profound impact on higher vocational education in the future.

### 5.2. Future Research Directions and Questions

Future research can further explore the application of artificial intelligence in higher vocational education from multiple angles. The first is the interaction between teachers and AI. Current AI teaching tools have demonstrated clear advantages in course design, personalized teaching, and assessment feedback. How AI can better assist teachers rather than replacing their role requires further study. How to use AI to improve teachers' teaching efficiency while maintaining their control over the teaching process is a question worth in-depth research. Secondly, the application of AI in more fields. At present, AI applications in higher vocational education are mainly concentrated in science, engineering, and mathematics. Whether other fields such as literature, history, art, etc., can use AI to improve teaching quality and efficiency is not yet clear. Future research will need to explore the possible applications of AI in these fields. These studies can provide us with more knowledge and understanding about how to better use artificial intelligence tools for higher vocational education.

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