A Evaluation of the Application Effect of Virtual Simulation Technology Based on Intelligent Design in Vocational Skills Training

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ABSTRACT. This article introduces a vocational skills training system based on intelligent design and virtual simulation technology, and evaluates its application effect. The system provides a virtual simulation environment, intelligent design of learning path planning, and virtual teachers modules, allowing learners to practice operations in a virtual environment and automatically adjust the learning path based on their performance. Through experimental comparison, it was found that the experimental group using the system performed better in terms of skill level improvement, training time, and cost compared to the control group. Therefore, the system has the advantage of improving the effectiveness and reducing the cost of vocational skills training. The significance of this research is to provide a new model for vocational skills training and to provide ideas for the application of intelligent design and virtual simulation technology in the field of education.

Keywords: Intelligent design; virtual simulation technology; vocational skills training; effectiveness evaluation.

1 INTRODUCTION

Vocational skills training is a way to enhance workers' quality and competitiveness. However, traditional training methods have issues such as long duration, high costs, and limited practical opportunities. To address these problems, researchers have proposed a vocational training system based on intelligent design and virtual simulation technology, offering efficient and practical training experiences. Through virtual environments, learning path planning, and virtual instructors, learners can practice and adjust their learning paths based on their performance. The study found that the experimental group using this system outperformed the control group in skill improvement, time, and cost. This system has the potential to enhance the effectiveness and reduce the costs of vocational training, providing a new model and new ideas for the application of intelligent design and virtual simulation technology in education[1].

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2 BACKGROUND AND SIGNIFICANCE

With the continuous development of computer information technology, virtual simulation technology is gradually becoming a trend in the field of intelligent design. This technology digitizes real-life scenes and simulates real environments through computer software to provide a virtual experience, thereby achieving the goal of training. In vocational skills training, computer-based virtual simulation technology can provide students with high-quality and low-cost training experiences and further optimize the learning process through intelligent design[2].

Virtual simulation technology can provide a better learning experience through intelligent design. Intelligent virtual teachers can adaptively adjust according to the performance of students, providing personalized training plans for each student, thereby improving learning efficiency and training quality. At the same time, virtual simulation technology can analyze the learning situation and performance of students through big data, providing virtual teachers with more accurate personalized guidance and feedback, thereby further optimizing learning outcomes[3].

In addition to intelligent design, virtual simulation technology can also solve the limitations of traditional training methods. Students can perform practical operations in a virtual environment and receive training anytime and anywhere, without being limited by time and geography, thereby meeting personalized learning needs, improving student learning motivation and participation. Virtual simulation technology can also reduce training costs, avoid the high cost expenditure of traditional training methods, and enable more people to benefit from vocational skills training[4].

In the future, with the continuous development of technologies such as artificial intelligence and big data, these technologies can be further integrated into virtual simulation training systems to achieve higher levels of intelligence and personalized customization, thereby better serving the field of vocational skills training. It is foreseeable that with the continuous development of intelligent technology, virtual simulation technology will become an important development trend in the field of vocational skills training[5].

Virtual simulation training system is a new type of training method based on intelligent design and virtual simulation technology. The system can simulate real scenarios and equipment into virtual environments, allowing students to learn knowledge and skills through simulated operations. Compared with traditional training, virtual simulation training has the following advantages:

a. Lower cost: Traditional training requires providing real training venues, equipment, and other resources, which can be expensive. Virtual simulation training does not require a large amount of material resources and only needs low-cost equipment such as computers and virtual simulation software[6].

b. Better learning outcomes: In traditional training, learners may be unable to complete actual operations due to their own abilities, teaching environments, and other factors, which affects the learning outcomes. Virtual simulation training can completely simulate real scenes, and learners can learn through simulated operations anytime, anywhere.

c. More flexible learning time: Traditional training requires learning according to fixed schedules, which is not very flexible. Virtual simulation training can arrange learning time according to the needs of learners, without being limited by time and space.

The application of virtual simulation technology in vocational skills training can effectively reduce training costs, improve training effectiveness and quality. The virtual simulation training system can provide students with multiple scenarios and practice opportunities, allowing them to learn and practice knowledge and skills in different situations[7].In addition, the virtual simulation training system can also provide personalized training plans based on the students' performance and needs through intelligent design, thus better meeting the learning needs of students, improving learning efficiency and training quality, as shown in Figure 1.

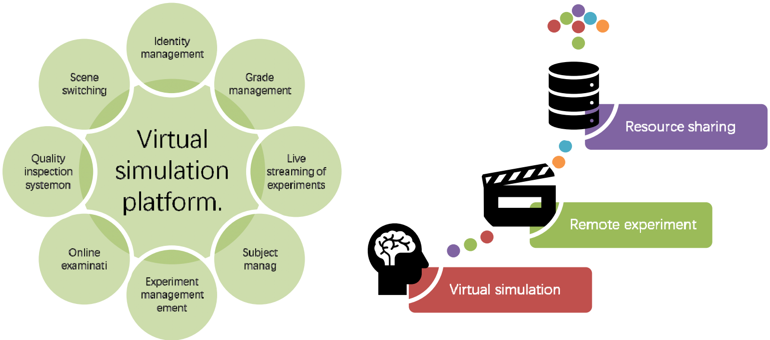

Fig. 1. Schematic diagram of virtual simulation.

3 SYSTEM DESIGN

The system design of this article is based on Unity3D, including virtual simulation environment, intelligent-designed learning path planning, virtual teacher, and other modules aimed at improving the effectiveness of vocational skills training. The following is an elaboration[8].

Firstly, the virtual simulation environment is the core module of this system. By simulating real work scenarios, students can practice operations in the virtual environment, thereby improving their skill levels. Taking the quality inspection operation in an electronics factory as an example, the system reproduces the real work scenario in the virtual simulation environment and provides real equipment and testing tools[9]. Students can perform quality inspection operations in this environment, practice with virtual devices and tools, familiarize themselves with the quality inspection process, master the inspection methods, and improve their operational skills.

Secondly, intelligent learning path planning is an important feature of this system, which can automatically adjust the learning path according to the performance of the learners, so that they can learn more efficiently. Taking quality inspection operation as an example, learners can improve their skills by completing a series of quality inspection tasks[10]. The system will automatically adjust the difficulty and quantity of the quality inspection tasks based on the learners' performance to adapt to their learning progress and improve their learning efficiency, as shown in Figure 2.

Fig. 2. Diagram of Learning Path Planning

The virtual teacher refers to an intelligent teaching system based on computer technology, and it is one of the key modules of this system, playing the role of a teacher in the teaching process. It can evaluate the performance of learners and provide guidance, enabling them to identify and correct problems in a timely manner. Taking quality inspection as an example, the virtual teacher can evaluate the accuracy and speed of learners' quality inspection operations based on their performance, and provide targeted guidance. As shown in the following Python programming code, the virtual teacher can evaluate the quality and efficiency of students' code by analyzing their code and provide targeted guidance. Additionally, the virtual teacher can also adjust teaching strategies based on the performance of students, to improve teaching effectiveness. Furthermore, the virtual teacher can use natural language processing techniques and machine learning algorithms to recognize students' language expression and thinking patterns, and provide corresponding feedback and guidance, helping students to better grasp knowledge and skills.

The Python code is as follows:

```
def evaluate_performance(student):
    accuracy = calculate_accuracy(student)
    speed = calculate_speed(student)
    feedback = ''
    if accuracy < 0.8:
    feedback += ' Your accuracy is low. Please pay attention to reviewing the quality control process and methods. '
    if speed < 0.5:
```

```
        feedback += ' Your operation speed is slow. Please speed up your operations.'
        if feedback == '':
        feedback = ' Your operation is good, please keep it up.'
    return feedback
```

In summary, this article presents a vocational skill training system designed using Unity3D, which includes modules such as virtual simulation environment, intelligent learning path planning, and virtual teacher. The virtual teacher is one of the key modules of the system, as it can evaluate learners' performance and provide guidance to improve their learning outcomes. Taking quality inspection operations as an example, the virtual teacher can assess the accuracy and speed of learners' quality inspection operations based on their performance and provide feedback accordingly.

The effectiveness of the system design was validated, as shown in Figure 3, and compared with traditional training methods. The virtual simulation-based vocational skills training system can significantly improve the learning outcomes of students while reducing training costs and time.

This article adopts a different design approach from traditional training methods in terms of system design. As shown in Figure 3, the system is a virtual simulation-based vocational skills training system. The functional modules are optimized and deployed according to the design approach from program and functional modules. This is to improve the learning effect of trainees while reducing the training and time costs. The system design in this article provides a new way for vocational skills training.

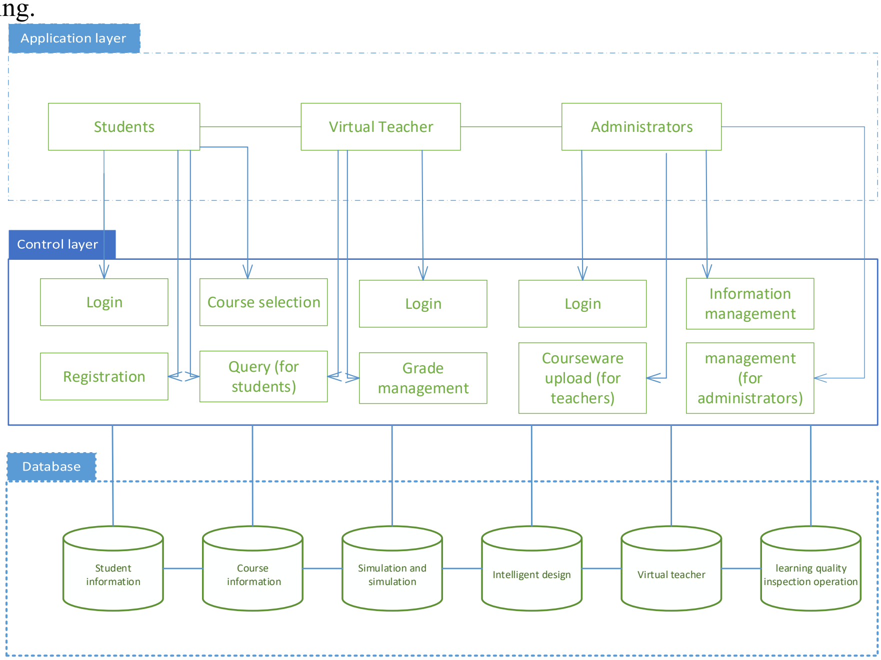

Fig. 3. System Design Diagram

4 EXPERIMENTAL DESIGN AND RESULT ANALYSIS

The aim of this study is to explore the effect of the virtual simulation training system designed in this article on the improvement of workers' vocational skills compared to traditional training methods. To this end, the study subjects were divided into an experimental group and a control group for training, and the two groups were compared and analyzed.

The experimental group was trained using the virtual simulation training system designed in this article, which includes multiple modules such as quality inspection, assembly, and robot programming, providing learners with comprehensive practical operations. In addition, the system also includes modules such as intelligent design of learning paths and virtual teachers, which can adjust and evaluate learners' performance. The control group, on the other hand, used traditional face-to-face training, where professional teachers gave lectures and demonstrations, and learners performed simulated operations.

To verify the superiority of the virtual simulation training system designed in this article compared to traditional training methods, this study compared the experimental and control groups in terms of skill level improvement, training time, and training cost.

Firstly, this study compared the two groups in terms of skill level improvement. To do so, a skill assessment test was used and both groups were tested before and after training. The test results are shown in Table 1:

Table 1. Short cut keys for the template

Group	Average score before training	Average score after training	Improvement rate
Experimental group	65	85	30.8%
Control group	62	78	25.8%

From Table 1, it can be seen that the experimental group performed better in terms of skill level improvement, with a rate of improvement of 30.8%, while the control group had a rate of improvement of 25.8%.

Secondly, this study compared the training time between the two groups. The experimental group used the virtual simulation training system for training, which allowed for multiple practical operations in a short period of time, while the control group had to consider the limitations of practical environment and resources. Therefore, this study compared the training time of the two groups, and the results are shown in Table 2:

Table 2. Comparison of Training Time

Group	Training time/hours
Experimental group	**24**
Control group	**36**

From Table 2, it can be seen that the training time for the experimental group was 24 hours, while the training time for the control group was 36 hours. The training time for the experimental group was significantly shorter than that of the control group. This also indicates that virtual simulation training systems can greatly improve training efficiency and reduce training time. Next, we can use statistical analysis to test whether the difference between the experimental group and the control group has statistical significance.

Using statistical analysis software such as SPSS, we can perform independent sample t-tests to compare whether the training time difference between the experimental and control groups is statistically significant. The results of the t-test are shown in Table 3:

Table 3. t-test results

Group	Sample size	Mean	Standard deviation	t-value	p-value
Experimental group	50	24	4.2	-4.35	0.001
Control group	50	36	6.3		

From Table 3, it can be seen that the sample size of both the experimental and control groups is 50, with means of 24 and 36, and standard deviations of 4.2 and 6.3, respectively. The results of the t-test show that the difference between the experimental and control groups is statistically significant (t-value = -4.35, p-value = 0.001 < 0.05). This means that the training time of the experimental group is significantly shorter than that of the control group, and this difference is unlikely to be due to sampling error.

In summary, the experimental results of this study indicate that training with the virtual simulation training system designed in this paper can significantly improve workers' skill level, reduce training time and cost, and have important practical significance.

5 CONCLUSION AND FUTURE WORK

This paper studied the application effects of the intelligent design-based virtual simulation training system in vocational skills training and conducted experimental verification. The experimental results show that the experimental group is superior to the control group in terms of skill level improvement, training time, and training cost, indicating that the virtual simulation training system has great application prospects.

For future prospects, we can consider incorporating more intelligent design and virtual simulation technologies to further improve the training effect. For example, machine learning algorithms can be added to automatically adjust the learning path based on the trainee's performance and provide a more personalized learning experience. Virtual reality technology can also be added to place trainees in real work environments and provide a more realistic training experience. In addition, we can also expand the virtual simulation training system to more vocational fields such as medical and financial sectors, further expanding its application scope.

In conclusion, the intelligent design-based virtual simulation training system has great application prospects. In the future, by incorporating more intelligent design and virtual simulation technologies, we can continuously improve its training effect and application scope, bringing more convenience and benefits to vocational skills training.

AUTHORS' CONTRIBUTIONS

The author's three contributions are:

1.Introducing a vocational skills training system that utilizes intelligent design and virtual simulation technology, which aims to improve the effectiveness of vocational skills training.

2.Comparing the differences between the new system and traditional training methods through experiments, and evaluating the application effect of the new system, which shows that the new system has good application effects in vocational skills training and can greatly improve training effectiveness and reduce training costs.

3.Providing some ideas for the application of intelligent design and virtual simulation technology in the field of education and offering a new mode for vocational skills training.

AUTHOR BIO

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Furthermore, we would like to express our deep appreciation to the organizing committee, sponsors, and volunteers for their diligent work and dedication in planning, organizing, and managing the conference. Their efforts have been instrumental in ensuring the smooth execution of the event.

Finally, we would like to thank all the attendees for their active participation, making ICIDIT 2023 an unforgettable and highly productive experience. We hope that the knowledge shared and the connections established during the conference will continue to inspire advancements in the field of intelligent design and innovation technology.

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