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Digital Information System (DIS) and the Current Situation of Its Application in Middle School Experiment Teaching

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Abstract: In recent years, artificial intelligence and other digital technologies have developed rapidly. The issue of "digital" empowerment for the development of "teaching" has gradually become a hot spot. This paper, using the literature research method, finds that physics experiment teaching combined with DISLAB sensors has a significant positive effect and can have a positive impact on students' learning interest, learning quality, and teachers' teaching models. DISLab sensors have achieved the integration of information technology and physics experiment teaching, providing a better perspective for teachers and students to effectively complete the "teaching" and "learning" of experiments.

Keywords: DISlab; PASCO system; Physical experiment teaching; Middle school

1. Introduction

The digital information system (DIS) is composed of "sensor + computer". Its powerful functions in data acquisition and data processing can greatly promote students' physical thinking ability and hands-on practice ability[1].The practice of integrating sensors into physics experiments and physics teaching in middle schools has become a kind of consciousness and behavior. The sensor has many irreplaceable advantages, which has important research value for students to improve their ability of experimental exploration and innovation. The integration of the sensor and middle school physics experiment will certainly become the focus of middle school physics experiment research in our country, and become a breakthrough to improve students' innovation ability and scientific literacy.[2]

Physics experiment exploration teaching emphasizes the cultivation of students' active participation and practical abilities, aiming to enhance their scientific literacy and innovative spirit.[3].Physics experimental inquiry teaching can change the traditional teaching approach that focuses too much on knowledge and skill transmission, allowing students to learn scientific knowledge and research methods through the process of scientific exploration, and cultivate the spirit, practical ability, and innovation ability of scientific exploration[4]. After the new curriculum reform, experimental exploration teaching has become an important means and content to achieve the goals of the new curriculum[5].

2. Research content and status quo

This article uses journal articles from the China National Knowledge Infrastructure (CNKI) Academic Journal Network Publishing Database as the data source, with the themes of "Physics Experiment Teaching" and "DISlab Sensors". The journals selected from the database are used to search, analyze, and statistically analyze relevant literature on the impact of DISLab on physics experiment teaching. The retrieved literature is then subjected to quantitative visualization analysis.

DISLab sensor technology not only makes up for the shortcomings of traditional physics experimental teaching tools, but also innovates physics experimental instruments and methods, expanding the content of physics experiments. This also aligns with the true purpose of experimental exploration, which can more effectively cultivate students' innovative thinking ability.[6]Currently, domestic DISLabs have the following functions: First, DISLab has multiple sensor probes that can be directly or indirectly measured using different methods and sensors[7]. Second, DISLab can achieve real-time data collection of different experimental processes by setting the collection frequency and mode of the computer, and conveniently and efficiently record the changes in physical quantities detected by sensors;[8]Third, The built-in data processing function of DISLab can not only analyze and process the measured physical quantities.

3. Main Issues and Prospects

3.1 DISlab sensors pose technical barriers for teachers

The application of sensor technology in secondary education, although greatly enriching teaching methods and improving the accuracy and interactivity of experiments, also poses a significant technological barrier to the teacher community. This barrier stems from the challenge of teachers in updating their knowledge structure and practical operational abilities when facing emerging technologies[9].Many teachers grow up under traditional teaching models, and their professional training and daily teaching experience may not fully cover the theory and practice of sensor technology, resulting in them often feeling inadequate when trying to integrate this advanced technology into classroom teaching[10].

The scarcity of resources is also an undeniable factor. Sensors and their supporting software are expensive and update rapidly, making it difficult for many schools to afford sustained equipment investment and maintenance costs. This not only limits the practical opportunities for teachers to operate, but also affects their understanding and confidence in the value of sensor teaching[11].The difficulties that middle school teachers encounter when using sensors for teaching are multifaceted, involving technical abilities, training resources, economic conditions, and time management. To address this situation, it is necessary for the education department, school management, and teachers themselves to work together to gradually enhance their ability to use sensors for efficient teaching by providing continuous professional development opportunities, optimizing resource allocation, and adjusting teaching strategies[12].

3.2 DISlab system is rarely applied in practical teaching

Many scholars have designed and developed lesson examples for DISlab sensors. Behind these lesson examples, it can be seen that Chinese science education researchers and frontline teachers are constantly trying to introduce technology into classroom teaching. However, based on the number of literature and research trends, DISlab technology has not become an alternative solution for teachers. In addition to the technical barriers mentioned earlier, even if teachers are proficient in using this system, they may feel difficult to implement it due to the lack of relevant reference cases and the difficulty in evaluating student learning effectiveness.

The current middle school science textbooks also rarely mention engineering tools such as sensors, without guidance from curriculum standards. Innovative experimental teaching is also difficult to implement, and students can only simply repeat the teacher's instructions, which is also detrimental to the cultivation of their creative thinking[13]

4. Conclusion

The experience abroad and the actual situation in China indicate that the application of DISLab sensors in middle school physics experiments in China lacks systematic and comprehensive approaches,[14]Through systematic research, it is possible to promote the effective application of DISLab sensor technology in middle school physics teaching, making DISLab sensors an important and common operating platform in middle school physics experimental teaching.The integration of DISLab sensors into physics experimental exploration teaching will undoubtedly provide valuable reference and inspiration for the in-depth promotion of physics experimental teaching and the reform of the new physics curriculum. Through the deep integration of this technology and education, we are expected to witness a significant improvement in the effectiveness of physics teaching, as well as the dual enhancement of students' learning interests and abilities, thereby promoting the entire physics education system towards a more modern and efficient direction.

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