



Exploration of health teaching case based on scientific storylines on middle school physical education

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Abstract

This study investigates the impact of teaching cases based on science storylines on middle school physical education and health students' learning. This study analyzed teachers' and students' experiences through a literature review and empirical research methods and assessed students' learning outcomes. The results indicate that the science storyline approach enhances students' learning motivation and comprehension and fosters their long-term interest in science. Additionally, the study reveals challenges teachers may face in implementation, such as curriculum adjustments and accessing teaching resources. Based on these findings, it is suggested that science storyline approaches be actively adopted in educational practice to provide students with more prosperous and engaging learning experiences, thereby promoting effective implementation of science education.

Keywords: Science Storylines, physical education and health, teaching cases, learning outcomes

Introduction

As a teaching method integrating scientific concepts into coherent contexts, the science storyline has received widespread attention ^[1]. Currently, many studies have explored the application of science storylines in education and their impact on student learning. However, research on teaching cases based on science storylines, still needs to be available. This paper will review the current research status of science storyline teaching methods, focusing on teaching cases to reveal their potential value and challenges in middle school education.

Research Background

Introduction to the Teaching Model of Science Storylines

The science storyline teaching model is based on real-world problems and situations, guiding students to engage in thinking processes similar to those of scientists and cultivating their ability to think and solve problems from a scientific perspective. The theoretical basis of this teaching model mainly includes the following aspects:

1. Conceptual Structure Construction

The science storyline teaching model emphasizes building conceptual structures in curriculum design, connecting relevant scientific concepts and knowledge so students can understand and apply this knowledge in practical exploration. Students can better understand scientific principles and phenomena through a solid conceptual structure, thereby improving their scientific literacy and comprehension.

2. Interdisciplinary Integration

The science storyline teaching model advocates interdisciplinary integration, promoting the fusion and intersection of knowledge in different disciplinary fields in teaching design, allowing students to understand and explore problems from multiple perspectives. Through interdisciplinary integration, students can better understand that real-life problems are complex and diverse, requiring the comprehensive application of interdisciplinary knowledge to solve, thus cultivating their comprehensive thinking and innovation ability.

3. Problem-Based Learning

The science storyline teaching model emphasizes problem-based learning by designing specific problem scenarios or cases to stimulate students' learning motivation, cultivate their ability to identify problems ^[2], propose hypotheses, conduct empirical research, and explore. This helps students actively engage in learning, understand the practical application of knowledge, and develop the ability to solve real-world problems.

4. Student-Centered Learning

The science storyline teaching model encourages students to actively participate in the learning process through posing questions, conducting empirical research, organizing data, and drawing conclusions, fostering students' abilities in self-directed and collaborative learning. Student-centered learning can stimulate students' interest in enhancing their learning initiative and motivation ^[3].

Research Objectives and Significance

1. Research Objectives

- Analyze the implementation process of teaching cases based on science storylines in middle school physical education and health.
- Evaluate the impact of teaching cases on students' learning motivation, comprehension, and interest in science.
- Explore teachers' and students' perceptions and feedback on teaching cases based on science storylines.
- Provide suggestions for teaching practice to promote the effective implementation of science education.

2. Research Significance

Science education is a meaningful way to cultivate students' scientific literacy and innovation ability. The science storyline method, embedding scientific concepts into coherent contexts, effectively enhances students' interest and deep understanding of learning. This study has several important implications.

- **Filling Research Gaps:** Science storylines have recently been applied in education, but research on teaching cases based on is relatively scarce. This study will fill this research gap, providing a deeper understanding of the effectiveness of science storylines in practice.
- **Promoting Educational Reform:** Exploring the impact of teaching cases based on science storylines on student learning can provide a reference for educational reform. Understanding the implementation process and effects of teaching cases can help educators better design and select teaching resources to improve teaching quality.
- **Promoting Student Learning Motivation and Interest:** The science storyline method emphasizes enhancing student engagement and learning motivation through contextualized learning. The research results reveal the positive effects of this teaching method on students' learning motivation and scientific interest, providing theoretical and practical support for stimulating students' enthusiasm for learning.
- **Providing Teaching Practice Suggestions:** By studying teachers' and students' feedback on teaching cases, problems and challenges in teaching practice can be identified, and corresponding improvement suggestions can be proposed. This helps education practitioners better deal with difficulties in teaching practice, optimize the teaching process, and improve teaching effectiveness.

Development and Implementation of Teaching Cases Based on Science Storylines

Storyline: Exploring the Relationship between Obesity and Healthy Lifestyles

1. Scenario Introduction: Make students aware of the prevalence of obesity in today's society and understand the impact of obesity on physical health and the risk of chronic diseases.

2. Problem Introduction

Students begin to consider the relationship between obesity and healthy lifestyles and the potential impact of obesity on various body systems.

Practical Exploration: Extract relevant data from the American Nahan database, then use Python scripts to import and process this data for various calculations and analyses, such as calculating BMI and waist circumference, plotting relevant charts, and conducting correlation analysis. By collecting Body Mass Index (BMI) data,

- **Waist Circumference:** Waist circumference reflects fat accumulation in the body. A vast waist circumference is often associated with the accumulation of fat in the abdomen, which is closely related to the risk of cardiovascular disease and diabetes. Body Fat Percentage: Measuring body fat percentage through methods such as skinfold tests, bioimpedance analysis, or Dual Energy X-ray Absorptiometry (DEXA) helps directly assess the impact of fat accumulation on health.

- **Blood Pressure and Lipid Levels:** There is a close relationship between obesity, high blood pressure, and high cholesterol levels. Therefore, when evaluating the impact of obesity on cardiovascular health, these indicators should also be considered.
- **Physical Activity Level:** Assessing individual physical activity levels and exercise habits is essential for understanding the relationship between obesity and health. Lack of exercise significantly contributes to obesity and related health problems.
- **Metabolic Health:** Measuring biochemical indicators such as blood sugar, insulin, and inflammation markers can help evaluate the impact of obesity on metabolic health, such as insulin resistance and diabetes risk.

By comprehensively considering the above indicators and methods, the impact of obesity on health can be more comprehensively assessed, helping to guide individuals in developing effective health intervention measures to improve obesity-related health problems. By observing dietary and exercise habits, students analyze the association between obesity and healthy lifestyles, understanding the potential impact of obesity on physical health.

3. Concept Learning

Introduce relevant concepts such as energy balance, nutritional needs, physical activity, metabolic health, etc., to help students understand the scientific basis of the relationship between obesity and healthy lifestyles.

4. Integration and Summary

Through practical data analysis and discussion, students summarize the impact of obesity on physical health and the importance of adopting healthy lifestyles to reduce obesity and improve health.

Through this case, students will enhance their understanding of the relationship between obesity and Healthy lifestyles are achieved through participation in storyline exploration and by improving their understanding of scientific concepts. This teaching model enables students to connect scientific concepts with everyday life, gaining a deeper understanding of the impact of healthy lifestyles on physical health.

Discussion

Previous research has demonstrated the effectiveness of the science storyline approach and explored its application in education^[4]. Studies have shown that teaching based on science storylines can enhance students' interest, motivation, and achievement in learning, promoting their deep understanding of science. The science storyline approach has also improved teachers' effectiveness, promoting teaching innovation and resource sharing^[5].

While there is relatively less research on the case curriculum, some studies have focused on its implementation effects and student learning outcomes. These studies have found that the case curriculum significantly improves students' scientific knowledge and skills and their interest and engagement in science.

However, there are still some research gaps regarding the application and effects of the curriculum. This study aims to fill this gap by further exploring the impact of case-based

teaching cases on student learning and the challenges and opportunities involved in its implementation.

Conclusion

1. Application outcomes of the science storyline teaching model

By integrating real-world contexts and scientific concepts, this teaching approach has effectively enhanced students' learning motivation, comprehension, and interest in science. Students have shown improved engagement and understanding of scientific principles and the ability to apply them to practical situations. The coherent and integrated nature of the curriculum, along with its emphasis on inquiry-based learning and social interaction, has contributed to creating a stimulating learning environment for students.

2. Research limitations and future research suggestions

Despite the positive outcomes, there are limitations to this study and areas for future research. Firstly, the study mainly focused on analyzing student learning outcomes and did not delve deeply into teachers' perspectives and experiences in implementing the curriculum. Future research could explore teachers' perceptions, challenges faced during implementation, and strategies for overcoming them.

Additionally, while the study provided insights into the effectiveness of the curriculum, further research is needed to examine its long-term impact on students' academic performance and career aspirations in science-related fields. Longitudinal studies could track students' progress over time to assess the sustained benefits of the curriculum.

Furthermore, the study primarily targeted middle-school students. Future research could extend to other grade levels to examine the scalability and effectiveness of the science storyline teaching model across different age groups and educational contexts.

Lastly, investigating the effectiveness of specific components or modules within curriculum could provide valuable insights for curriculum design and optimization. By identifying areas of strength and areas needing improvement, educators can refine teaching materials and strategies to meet the needs of diverse learners better.

Appendix

NHANES : [https:// www.cdc.gov/ nchs/nhanes/index.htm](https://www.cdc.gov/nchs/nhanes/index.htm)
The National Health and Nutrition Examination Survey)

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