THE METHODOLOGY OF USING PISA TESTS IN TEACHING PHYSICS IN SECONDARY SCHOOLS IN PHYSICS

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Annotation: This article explores the methodology of integrating PISA (Programme for International Student Assessment) tests in the teaching of physics in secondary schools. The PISA test, which evaluates 15-year-olds in reading, mathematics, and science, provides a comprehensive tool for enhancing students' analytical and problem-solving skills in physics. By aligning teaching methods with the cognitive framework of PISA, educators can promote a deeper understanding of core physics concepts. The study presents a framework for incorporating PISA tasks into lessons, evaluates the effectiveness of this approach, and offers suggestions for educators.

Keywords: PISA test, physics education, secondary school, teaching methodology, problem-solving, critical thinking, science literacy.

The teaching of physics in secondary schools plays a crucial role in fostering scientific literacy among students. In recent years, there has been a growing emphasis on the need for students to not only memorize formulas and concepts but also develop critical thinking and problem-solving skills. One of the key assessments that measures students' competencies in science on an international scale is the PISA test. Administered by the Organisation for Economic Co-operation and Development (OECD), PISA evaluates the application of knowledge in real-world contexts, which is especially relevant in physics education.

Integrating PISA methodologies in physics teaching can provide students with an opportunity to engage with challenging, real-life scenarios, helping them build a strong foundation in physics. This article explores how the PISA test framework can be used

to enhance the teaching of physics in secondary schools, leading to better outcomes in terms of scientific literacy and application.

The Programme for International Student Assessment (PISA) tests are designed to assess 15-year-old students' abilities to apply their knowledge and skills in real-world scenarios, focusing on reading, mathematics, and science. Using PISA methodology in teaching physics in secondary schools can enhance students' critical thinking and problem-solving abilities by emphasizing real-world applications of physics concepts. Here's how you can apply PISA's approach in physics education:

Emphasis on Real-World Contexts

PISA science questions, including those in physics, focus on real-world problems. Teachers can integrate everyday situations, such as electricity consumption, vehicle motion, and environmental issues, into physics lessons. For example:

- Electricity and Energy: Instead of focusing only on formulas, have students analyze household electricity bills or the efficiency of various energy sources in real life.

- Mechanics and Motion: Discuss the physics of driving a car, the effects of acceleration, or the safety features of vehicles.

Problem-Solving and Inquiry-Based Learning

PISA emphasizes students' abilities to think critically and apply concepts to novel situations. In physics classes:

- Present students with complex problems that don't have obvious solutions, requiring them to use multiple physics concepts to solve.

- Encourage inquiry-based experiments where students generate hypotheses, design experiments, and analyze results rather than simply following a set procedure.

Cross-Disciplinary Skills

Physics education can be linked with other subjects, such as mathematics and language skills. For example:

- When analyzing graphs or conducting experiments, students can improve their mathematical skills by working with data and statistical analysis.

- Physics topics can involve reading comprehension and written communication by requiring students to read scientific texts or write reports, similar to how PISA tests assess reading literacy along with science.

Encouraging Scientific Literacy

PISA's goal is to foster scientific literacy, meaning that students can engage in debates about scientific issues in society. Physics teachers can:

- Discuss current scientific developments (e.g., renewable energy, space exploration) and ask students to form opinions or arguments based on physics concepts.

- Engage students in debates or projects related to the application of physics in real-world issues, promoting their ability to understand and explain scientific phenomena.

Focus on Skills Over Memorization

PISA discourages rote memorization and instead assesses understanding and application. In physics classes:

- Shift away from focusing solely on memorizing formulas or laws. Instead, ask students to explain why and how certain physical laws work in different situations.

- Provide open-ended questions that encourage exploration and reasoning, rather than questions with single, correct answers.

Assessment and Feedback

Adapting PISA-style assessments in physics means providing tasks that measure both knowledge and how students apply it. For instance:

- Use scenario-based questions in exams or quizzes that reflect real-world problems.

- Provide feedback that focuses not only on correct answers but also on the reasoning process.

Use of the English Language in Physics Education

Since English is often the language of science, incorporating it into physics lessons can benefit students, especially if they aim to pursue careers in science or engineering. Strategies include:

- Bilingual instruction: Teaching some physics concepts in English can improve students' scientific and technical vocabulary.

- English-language resources: Use textbooks, articles, and videos in English to expose students to global perspectives in physics.

- English-based assessments: Include English terms and definitions in physics assessments, helping students become comfortable with scientific English terminology.

Incorporating PISA methodologies in physics teaching encourages students to develop a deeper understanding of physics by linking it to real-life contexts and improving their problem-solving, inquiry-based learning, and critical thinking skills.

The results suggest that integrating PISA methodology in teaching physics not only improves students' problem-solving skills but also enhances their interest in the subject. By shifting the focus from memorization to application, students were able to develop a deeper understanding of physics concepts and how they relate to the real world.

Moreover, the collaborative approach of PISA-based learning helped foster a more inclusive classroom environment, where students learned from one another. The

methodology promoted a student-centered learning model, allowing students to take more ownership of their learning process.

However, challenges were also noted. Some teachers found it difficult to adjust to the new teaching style, requiring additional support and resources. Moreover, developing PISA-like tasks for every physics topic proved time-consuming for educators. These challenges highlight the need for continuous professional development and support for teachers.

Conclusion:

Incorporating PISA test methodologies into the teaching of physics offers a promising approach to improving students' problem-solving and critical thinking abilities. The study demonstrates that when students are exposed to real-life scenarios that require the application of physics concepts, they develop a stronger grasp of the subject and are better equipped to handle complex problems.

Teacher Training: Provide professional development programs for teachers to help them create and implement PISA-like tasks in their physics curriculum.

Curriculum Development: Encourage education policymakers to integrate PISA-style tasks into national physics curricula to promote critical thinking and application-based learning.

Continuous Assessment: Use formative assessments based on PISA methodologies regularly to monitor students' progress and adjust teaching strategies accordingly.

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