

THE RELEVANCE OF USING THE PISA INTERNATIONAL ASSESSMENT PROGRAM IN TEACHING PRIMARY SCHOOL SCIENCE

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Abstract: The Programme for International Student Assessment (PISA) provides a valuable framework for evaluating and improving science education. While primarily designed for 15-year-olds, its principles can enhance primary school science instruction by promoting inquiry-based learning, critical thinking, and real-world problem-solving. Integrating PISA's methodologies helps develop scientific literacy, encourages hands-on exploration, and aligns teaching practices with global educational standards. This paper explores how PISA's approach can be adapted to primary education, addressing benefits, challenges, and the role of technology in fostering scientific understanding. By aligning early science education with PISA principles, students gain essential skills for future academic and real-life applications.

Keywords: PISA, primary science education, inquiry-based learning, scientific literacy, critical thinking, real-world applications, education assessment, technology in education

The Programme for International Student Assessment (PISA) is one of the most influential international assessment programs, evaluating students' proficiency in reading, mathematics, and science. Conducted by the Organisation for Economic Co-operation and Development (OECD), PISA measures how well 15-year-old students apply their knowledge to real-world problems. Although PISA assessments focus on students nearing the end of compulsory education, its principles can be highly relevant for shaping primary school science education. By integrating PISA's methodologies and frameworks into early education, teachers can enhance scientific literacy, foster critical thinking, and better prepare students for future academic success.

Science education in primary schools serves as the foundation for developing scientific inquiry skills, problem-solving abilities, and logical reasoning. Traditionally, science instruction has often emphasized memorization of facts rather than application of knowledge. However, PISA advocates for an approach that prioritizes understanding and real-world application, ensuring students are equipped with the skills necessary to navigate scientific challenges in everyday life. Implementing PISA's principles in primary education can help young learners develop curiosity, engage in inquiry-based learning, and apply scientific concepts to practical situations.

PISA assesses students' scientific knowledge, competencies, and attitudes, focusing on their ability to explain phenomena, interpret data, and evaluate evidence. It measures not just what students know but how effectively they can use that knowledge in new and unfamiliar contexts. This approach is crucial for primary school science, as it encourages students to develop analytical skills, experiment with different hypotheses, and explore the world around

them. When young learners engage in hands-on scientific exploration, they build a deeper understanding of fundamental concepts and become more motivated to pursue science-related learning.

The integration of PISA-aligned strategies into primary science teaching promotes inquiry-based learning, which shifts the focus from rote memorization to active problem-solving. Inquiry-based learning encourages students to ask questions, formulate hypotheses, conduct experiments, and analyze results. Instead of merely presenting information about plant growth, for instance, teachers can guide students to plant seeds under different conditions and observe how various factors influence their development. This interactive learning method mirrors the scientific processes assessed in PISA, reinforcing critical thinking and practical application.

Real-world applications of science concepts further enhance primary education by making lessons more relevant and engaging. PISA assessments evaluate students' ability to apply scientific principles to everyday life, such as understanding climate change, health issues, or technological advancements. Introducing real-life problems into the classroom—such as investigating the effects of pollution on local ecosystems or exploring how simple machines work—helps young learners see the relevance of science in their daily lives. This approach not only deepens understanding but also nurtures a sense of responsibility and curiosity about the world.

Another essential aspect of PISA's framework is fostering scientific reasoning, which involves interpreting data, making predictions, and drawing evidence-based conclusions. Primary school students can develop these skills through activities such as analyzing temperature patterns, predicting the weather, or classifying different materials based on their properties. Encouraging young learners to think critically about the information they receive, rather than simply accepting facts, builds their ability to assess scientific claims and form reasoned opinions.

Incorporating technology into science education also aligns with PISA's emphasis on modern scientific competencies. Digital tools, simulations, and interactive applications provide students with engaging opportunities to experiment, visualize abstract concepts, and collaborate on projects. Virtual labs and science-based educational games can enhance learning by allowing students to test hypotheses in a controlled environment and observe the effects of their actions. These digital resources support inquiry-based instruction while making science more accessible and enjoyable.

Teacher training plays a vital role in effectively implementing PISA-based strategies in primary education. Educators need to be equipped with the skills and knowledge to design lessons that emphasize problem-solving, experimentation, and application. Professional development programs focusing on inquiry-based learning, real-world connections, and data analysis can help teachers create dynamic and effective science curricula. When educators are well-prepared, they can better engage students in meaningful scientific exploration and critical thinking activities.

Despite the benefits of aligning primary science education with PISA principles, challenges remain. One concern is the emphasis on assessment-driven learning, which can sometimes lead to test-focused instruction rather than a genuine exploration of scientific

concepts. To avoid this, teachers must balance assessment with hands-on experiences and creative problem-solving. Additionally, not all schools have equal access to resources, technology, or teacher training, which can impact the effectiveness of science instruction. Addressing these disparities requires investment in educational infrastructure and support for professional development.

Furthermore, cultural and curricular differences among countries may influence how PISA-aligned teaching methods are adopted. While PISA provides a standardized measure of scientific literacy, educational systems must adapt its principles to fit local contexts. For example, science education in one country may emphasize environmental sustainability, while another focuses more on engineering and technological advancements. Integrating PISA-based approaches should be flexible and adaptable to ensure they meet the unique needs of each educational system.

Ultimately, using PISA's international assessment program as a guide for primary school science instruction can lead to significant improvements in student learning outcomes. By fostering inquiry-based learning, emphasizing real-world applications, encouraging critical thinking, and integrating technology, educators can cultivate a strong foundation in scientific literacy from an early age. This approach prepares students not only for future assessments but also for a lifetime of scientific engagement and problem-solving.

As global challenges such as climate change, health crises, and technological advancements continue to shape the world, equipping young learners with strong scientific skills is more critical than ever. By adopting educational strategies informed by PISA, primary schools can nurture a new generation of scientifically literate individuals who are capable of understanding and addressing complex global issues. The integration of PISA-aligned methodologies ensures that science education remains dynamic, relevant, and impactful, fostering a lifelong passion for discovery and innovation.

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