

Assessing Science Proficiency of Future Educators: Inputs on College of Teacher Education – Science Majors Preparedness

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ABSTRACT: This study investigates the orientation of pre-service science teachers at Pamantasan ng Lungsod ng San Pablo toward the Programme for International Student Assessment (PISA) and assesses their science proficiency, with the goal of informing teacher preparation strategies. With the Philippines' historically low performance in international assessments such as PISA—where only 22% of students reached the minimum level of science literacy—this research addresses a critical gap in teacher readiness and curriculum alignment. Using a quantitative approach, data were collected from 36 science education majors through surveys and PISA-aligned assessments that measured critical thinking, problem-solving, and information literacy. Findings reveal that awareness of PISA among participants is limited, with 52% having no prior knowledge of the program. Nonetheless, the respondents demonstrated generally positive attitudes and a moderate to high interest in integrating international benchmarks into their professional practices. Proficiency levels varied across the assessed domains, with the highest performance in problem-solving and the lowest in information literacy. A moderate positive correlation ($r = 0.49$) between PISA orientation and science proficiency suggests that increased familiarity with global standards may enhance teaching competence. The study underscores the need for curriculum reforms that incorporate international assessment frameworks and 21st-century skills development into teacher education. It also recommends targeted professional development to bridge existing gaps in scientific reasoning and digital literacy. By embedding global benchmarks into local teacher training programs, institutions can better prepare future educators to foster scientifically literate students and align national education outcomes with international expectations.

KEYWORDS: PISA; Pre-service teachers; Readiness; Science proficiency; Scientific literacy

1. INTRODUCTION

Scientific literacy is the capacity of individuals to engage with science-related topics as informed citizens. It involves understanding scientific concepts, applying evidence-based reasoning, analyzing data, and making informed decisions in various personal, societal, and global contexts. As science and technology increasingly shape modern life, nurturing scientifically literate citizens becomes a vital priority in educational systems. In this regard, teachers play a crucial role as facilitators of scientific understanding.

In the Philippines, the results of the 2018 Programme for International Student Assessment (PISA) brought to light critical concerns. Only 22% of Filipino students achieved at least the minimum proficiency level in science, which is significantly below the OECD average. This performance placed the country among the lowest-performing nations in the assessment. The low achievement levels raise questions about the preparedness of teachers, especially those still undergoing training, to foster the necessary scientific skills among learners.

The study focuses on assessing the preparedness of science education majors at Pamantasan ng Lungsod ng San Pablo (PLSP) by evaluating their familiarity with PISA and their competence in science. The investigation is grounded on two theoretical foundations: metacognitive theory, which emphasizes self-regulation and awareness of one's cognitive processes; and instructional scaffolding, which highlights the value of guided learning within a learner's zone of proximal development. Through these lenses, the study explores how awareness of international benchmarks may influence future teachers' readiness.

2. METHODOLOGY

The study employed a quantitative design to examine the relationship between PISA orientation and science proficiency. This design is ideal for identifying trends and establishing correlations using numerical data. The research used total population sampling, targeting all 36 science majors enrolled in the College of Teacher Education at PLSP during the academic year 2024–2025.

The research instrument comprised two components. First, a validated and adapted survey from Ioannidou et al. (2017) was used

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to assess awareness, attitude and perception, and interest toward PISA. This tool included both binary and Likert-scale questions. Second, a 24-item standardized test derived from the OECD PISA framework assessed three domains of science proficiency: critical thinking, problem-solving, and information literacy. The data collection process combined online and face-to-face formats to ensure both efficiency and data integrity.

Statistical methods such as frequency distribution, mean scores, standard deviation, and Pearson's correlation were used to analyze the data. These tools helped evaluate how pre-service teachers' orientation toward PISA relates to their performance in scientifically relevant tasks.

3. RESULTS AND DISCUSSION

3.1. Orientation Towards PISA

The majority of respondents (52%) indicated they had no prior awareness of PISA, while 28% had slight awareness and only 20% reported being fully aware. This indicates a significant information gap about global educational assessments among pre-service teachers. Given that PISA results are widely used to inform education policy, curriculum reforms, and teaching strategies across nations, this lack of awareness is a missed opportunity for developing globally competent educators.

Despite the limited awareness, many respondents expressed positive attitudes. Seventy-two percent believed that PISA promotes educational quality, recognizing its potential to enhance academic standards. However, only 34% believed that PISA aligns with their current curriculum, suggesting a disconnect between global assessment frameworks and local teacher education content. This mismatch reflects a broader challenge in adapting global insights to localized classroom contexts.

Encouragingly, 60% of respondents expressed a strong interest in learning more about PISA and its implications. Nearly half indicated a willingness to incorporate PISA frameworks into their future teaching practices. This enthusiasm suggests that, with proper exposure and training, science majors could become effective mediators of international best practices in science education.

3.2. Science Proficiency

The respondents were assessed in three core domains: critical thinking, problem-solving, and information literacy. In critical thinking, participants achieved an average score of 58%. While this suggests moderate competence, many had difficulty in evaluating scientific claims, constructing logical arguments, and interpreting evidence. These challenges align with findings from Facione (2015), who emphasized the need for deliberate instructional strategies to develop higher-order reasoning in pre-service teachers.

Problem-solving was the strongest domain, with an average score of 66%. Respondents demonstrated the ability to navigate structured scientific scenarios and apply appropriate strategies to arrive at solutions. Nonetheless, many struggled when problems required creative thinking or multidimensional reasoning, indicating room for improvement in authentic, real-world problem-solving experiences.

Information literacy scored lowest, with an average of 42%. Respondents struggled with tasks involving source evaluation, graphical data interpretation, and synthesizing information from varied formats. This deficiency is concerning given the digital nature of today's classrooms and the increasing importance of data-driven decision-making. Equipping future educators with digital literacy and information evaluation skills is imperative.

3.3. Correlation Between Orientation and Proficiency

A Pearson correlation coefficient of $r = 0.49$ ($p < 0.05$) was observed between orientation toward PISA and proficiency levels. This moderate positive relationship indicates that respondents with greater awareness, more favorable attitudes, and stronger interest in PISA tended to perform better in scientific tasks. This finding reinforces the notion that engagement with international standards can drive professional competence.

The result also supports the argument by Hargreaves and Fullan (2012) that meaningful teacher learning happens when global experiences are connected to local practices. Integrating internationally recognized benchmarks such as PISA into teacher education programs may foster more reflective, knowledgeable, and future-ready educators.

4. CONCLUSIONS AND RECOMMENDATIONS

1. Curriculum Gaps:

The low level of awareness of PISA among science pre-service teachers highlights a significant curricular oversight. International assessments such as PISA provide critical feedback on national education systems and are widely used for comparative evaluation. However, the findings indicate that such frameworks are not well-integrated into the current teacher education curriculum. This gap limits future educators' exposure to global educational trends and hinders their ability to align classroom practices with international standards.

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2. Attitude-Practice Discrepancy:

While attitudes toward PISA were generally positive, practical integration of its principles remains weak. Many respondents agreed that PISA promotes quality education, but few saw direct links to their learning experiences. This discrepancy points to a missed opportunity to operationalize global benchmarks in local pedagogy. Without proper application, positive perceptions do not translate into meaningful instructional improvements.

3. Proficiency Challenges:

The variability in science proficiency across domains indicates uneven preparation among pre-service teachers. Critical thinking and information literacy, both crucial for fostering scientific inquiry and digital competence, scored lower than problem-solving. These results call for targeted interventions such as inquiry-based learning modules, critical reading workshops, and digital information analysis activities that reinforce scientific competencies beyond rote knowledge.

4. Potential for Improvement:

The moderate positive correlation between PISA orientation and science proficiency underscores the potential benefits of embedding global frameworks into teacher training. Familiarity with PISA not only boosts performance but also encourages reflective teaching practices aligned with international standards. By capitalizing on student interest and providing structured opportunities for engagement, institutions can significantly enhance the preparedness of future science educators.

RECOMMENDATIONS:

Integrate PISA Content: Teacher education programs should include PISA case studies, sample items, and policy discussions to build familiarity with international benchmarks.

Professional Development: Organize workshops on scientific reasoning, digital literacy, and inquiry-based strategies to address identified proficiency gaps.

Curriculum Reform: Revise modules to explicitly align learning outcomes with global standards in science education.

Further Research: Conduct longitudinal studies to assess the long-term impact of PISA-integrated training on classroom teaching and student outcomes.

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