

Provincial physics competition as a tool for reflection on physics competencies in Polish primary schools – case study

Mirela Kaczmarek (1), Marta Młyńczyk (2), Tomasz Greczyło (1), Paweł Nowak (3)

(1) *Institute of Experimental Physics, University of Wrocław, Max Born Square 9, 50-204 Wrocław, Poland*

(2) *Lower silesian centre for teachers' training in Walbrzych, Rynek 6, 58-300 Walbrzych, Poland*

(3) *Wrocław Board of Education, Plac Powstańców Warszawy 1, 50-153 Wrocław, Poland*

Abstract The article presents a preliminary idea of how local physics competitions serve as a platform for assessing physics competencies, especially among gifted Polish elementary school students. Focusing on the provincial "zDolny Ślązak" competition, the authors will analyze the participants' solutions to the competition tasks together with the students' physics competencies, especially those related to experimental tasks and solving computational tasks.

Introduction

Nowadays, physics competitions serve as a valuable tool for motivating students to explore the subject and for developing a range of competencies, such as problem-solving, computation, and experimental planning. Such competitions offer opportunities for gifted students to excel and are tailored to specific interests, ages, and abilities, ranging from primary school to university. There are numerous national and international competitions, which range from written competitions that focus on problem-solving skills, such as the Polish or International Physics Olympiad or PLANCKS, to competitions that focus on popularizing science, such as Science on Stage. These competitions also motivate the development of soft skills.

In the Lower Silesian Voivodeship, which is a Polish administrative region, the official provincial competition 'zDolny Ślązak', organized by the Lower Silesian Superintendent, plays an important role. It is a contest with a rich tradition, and its form and scope have changed over the years in line with changes in education in Poland [1]. Currently, primary school pupils can participate in competitions for the following school subjects: Polish, Mathematics, History, Biology, Geography, Chemistry, Physics, English, and German. The competition consists of three stages: school, district, and provincial. Experts in each respective field prepare the tasks for each stage. The competition holds a prestigious status, and its winners are granted exemption from the eighth-grade exam and given priority in the application process for all secondary schools in the Lower Silesia province. Being a finalist also awards additional points in the recruitment process.

The focus of this work is on a physics competition. In Poland, physics is taught as a subject in primary schools during the 7th and 8th grades. The contest aims to stimulate and enhance students' interest in physics, expand their knowledge of the subject, and improve their skills and competencies in the areas specified in the contest rules. Additionally, the competition aims to popularize knowledge of physics, introduce students to self-improvement, support their self-assessment in the context of their educational goals and aspirations, recognize and support young people demonstrating special talents in physics, and promote the region's achievements in fostering talent [2].

Literature research and theoretical background

A number of articles in the recent literature refer to physics competitions and recognize their potential for teaching and shaping attitudes [3]. Various aspects related to competitions are

addressed, such as motivating learning and developing soft skills [4], or the correlation with mathematics and its importance in solving olympic tasks [5].

The authors of the paper intend to use the data and the competition sheets to analyze the most important aspects related to the physics-related skills of the elementary school students.

Methodology

The analysis of the solutions of the 2023 contest tasks at the district and provincial final levels allows to formulate reflections about the knowledge and skills of the studied group of gifted students. The authors plan to determine, among others indicators, the ease of the tasks and the frequency of performance (how many unattempted solutions occurred for the tasks). Among other things, they plan to analyze in detail the solutions to the experimental task and its individual parts, such as the ability to plan an experiment, design a measurement table, and evaluate the uncertainty of measurements. In selected computational tasks, the authors want to identify the most common problems and look at the notation skills of physical units. We will picture results in a broader perspective based on the results of some previous competitions. Statistical analysis is also planned, regarding the number of participants, gender distribution, and comparison of the number of participants from the provincial city and individual districts.

Results

So far, the school stage (10/25/2023), the district stage (12/5/2023) and the final (4/03/2023) of the contest have been held. Until the finalists and winners are selected and the competition is officially closed, it is not possible to analyze the students' sheets. Only general statistics are available now, according to which 1,955 students participated in the school stage, of which 253 qualified for the district competition. 239 students participated in the district competition, of which 68 qualified for the finals.

Conclusions

Competitions are becoming an interesting material for research in the field of education. They can serve both to motivate students to learn and to provide information about the understanding of physical concepts and phenomena, as well as the level of mastery of various competencies relevant to learning physics. In the Polish educational system, physics competencies and knowledge are not yet verified at the end of elementary school. Some actions towards this verification are considered, so our results might soon be especially valuable. From this point of view, although the research focuses on a select group of gifted and physics-oriented students, data from the competition can provide relevant and interesting information for further educational research.

References

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