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Enhancing student motivation and learning engagement in physics through science olympics

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ABSTRACT

Science olympics is a comprehensive educational initiative designed to foster active student engagement and motivation within a school-wide framework. This study explored the impact of science olympics on students' motivation and learning experiences in physics contexts. Rooted in design thinking and problem-based learning, the science olympics program encourages collaborative and competitive activities, aligning with Kolb's experiential learning theory. A total of 220 participants from grades 7-12 were divided into competing teams within 4 different houses, employing a multilevel categorization approach within each house. Utilizing an embedded mixed-method research design, this study collected quantitative data through surveys and post-event evaluations, then qualitative data were derived from student perceptions, interviews, and teacher feedback. The results demonstrated a significant increase in student learning engagement in physics, across all grade levels. Moreover, science olympics emerged as a potent avenue for developing 21st-century skills and reinforcing acquired knowledge, both inside and outside the classroom. This innovative approach positively influenced students' conceptual understanding of physics and enhanced their motivation to learn, showcasing the potential of such dynamic and interdisciplinary educational initiative.

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1. INTRODUCTION

Physics, as a fundamental science, is crucial for understanding the natural world, yet it consistently presents as a challenging subject that can fail to engage students effectively. This disconnect results in lower student motivation and engagement, which are critical drivers of learning and academic performance in science education [1], [2]. The traditional lecture-based approach to teaching physics has been noted for its limitations in fostering deep understanding and enthusiasm among students [3]. In response, teachers and educators have been exploring various innovative teaching strategies to improve students' motivation and engagement in science. These strategies include project-based learning, where students work on hands-on projects that require problem-solving and critical thinking [4]; gamification, which incorporates elements of game design in the learning process [5]; and problem-based learning in which students working in groups learn through the experience of solving an open-ended problem presented in a real-world context [6]. As educational design processes evolve, there is a growing emphasis on authentic instructional activities for learning. This shift is supported by global organizations like the National Academy of Sciences, which advocates for enhanced science literacy through its framework for K-12 science education [7]. This framework outlines essential competencies such as understanding scientific explanations, generating evidence, and engaging in scientific reasoning. It aims to deepen students' understanding of science, equipping them to address complex problems and make informed decisions in a rapidly advancing scientific landscape.

Moreover, one evidence-based teaching practice to elevate learning science is through the creation of creative, engaging, relevant, and personalized learning strategies and experiences for all learners that mirror and prepare them for the reality of their future [8], [9]. These learning tasks are designed as interdisciplinary activities where students can demonstrate their knowledge. These tasks help deepen understanding, apply relevant real-life contexts, and naturally integrate science, mathematics, arts, and other subjects. They enable students to combine insights from multiple specializations to tackle complex problems. While existing research has highlighted the effectiveness of active learning strategies in improving student engagement and motivation in the sciences, there remains a significant gap in specifically tailored interventions in physics education that seamlessly integrate these strategies and utilize competitive formats like science olympics. Most studies have broadly focused on non-competitive interactive methods, with less attention given to how structured competitions can specifically enhance understanding and interest in physics. Furthermore, there is limited empirical evidence on the long-term impacts of such competitive educational events on students' intrinsic motivation (IM) and their continuous engagement with the subject. It is in this premise where science olympics was created and conceptualized utilizing competition-based approach across grade levels. This study aimed to fill these gaps by empirically evaluating the impact of science olympics on student motivation and engagement in physics, offering insights into how competitive educational strategies can be effectively implemented to enhance learning outcomes in this critical subject area.

Science olympics are competitive events that require participants to apply physics concepts creatively and practically, thereby offering a dynamic and interactive learning experience. Its utility was structured in the light of performance tasks and contextualization to increase student engagement through hands-on activities, collaborative problem-solving, and competitive challenges. Such educational initiative is grounded on student-centered learning approach which utilizes constructivist and creative problem-solving such as design thinking process, problem-based learning, and an interdisciplinary approach rooted from experiential learning theory [10]. These methodologies emphasize practical learning through the real-life application of lessons and experiential learning [11], [12]. Design thinking process [13], along with problem-based learning [6], [14], served as the main ground of science olympics during the activity proper where students first understood and defined what the problem was, generated wide range of creative solutions quickly, then modeled and built prototypes of their best ideas, created concrete devices out from local materials, evaluated and refined their prototype, used their finished product, and lastly, they showcased and pitched their project to the experts and learning audience. Students learn through facilitated problem-solving [15]. Science olympics tasks were presented in the form of a scenario where students worked in small groups, formulated and analyzed the problem by identifying the relevant facts, identified gaps in their knowledge, took ownership of their learning and applied what they have learned to provide solutions and presented their findings. Through collaborative efforts and interactive processes among small group partners, students can develop problem-solving, higher-order thinking skills and active involvement in learning. Design thinking has rooted in Kolb's experiential learning theory [16]. Therefore, it further supports this study in which it asserts that the creation of knowledge comes from the transformation of experience or learning by doing. It provides a holistic perspective of combining experience, reflection, and perception, cognition and behavior. These essential facets were synthesized together which give rise to a more synergistic learning experience in the form of the science olympics.

This application-oriented and contextualized approach not only deepens students' comprehension but also demonstrates the relevance and utility of physics in everyday life, motivating students to engage more meaningfully with the subject. Eventually, it leads to the creation of scientific understanding by unlocking and synthesizing physics concepts and principles on the presented tasks they performed through facilitated and open-ended guide questions. Such activities are gateways to increase effort and interest that will positively influence students' conceptual understanding of physics and promote more positive attitudes towards the physics concepts and its application. Under the tenets of experiential learning, learning by doing plays an important role in the development of 21st-century skills and competencies [17], [18]. Therefore, this study provides fresh perspectives in developing a greater understanding of how science olympics activities promote positive attitudes towards physics, thereby increasing student motivation and their learning or mastery of physics concepts.

2. METHOD

This study utilized an embedded mixed-methods research design that simultaneously employs qualitative and quantitative approaches. Quantitative data were gathered from students' responses to questionnaires, including the activity perception questionnaire and the science motivation questionnaire II: physics version (SMQ-II). These instruments helped assess students' perceptions of the science olympics and the effectiveness of integrating subjects through this event, as well as their motivation toward learning physics. The qualitative method informed the interview protocol and involved analyzing responses regarding student perceptions and teacher feedback on the science olympics. Common themes and categories were identified from the transcriptions of these responses. Both qualitative and quantitative data were cross-validated to confirm the findings.

2.1. Participants

The participants were selected from classes one each from grades 7 to 12, and all teachers as the working committee. Table 1 presents the distribution of students by house and grade level who participated in the science olympics. Each grade level was divided further into 4 competing houses: Earth, fire, water, and wind. The identification of group members was randomly selected and organized by the assigned facilitators per level. A total of 220 participants were re-grouped on a multi-level approach as competing teams for the purposes of competition, inter-level camaraderie, and community building within the school. This study was conducted at a private high school in Las Pinas City, a highly urbanized city located in the southern part of the National Capital Region (NCR), Philippines.

Table 1. Distribution of students by house and grade level in the science olympics

Grade level	Earth	Fire	Water	Wind	Total
Grade 7	13	12	13	12	50
Grade 8	11	12	11	11	45
Grade 9	10	10	10	9	39
Grade 10	8	7	7	7	29
Grade 11	8	9	8	8	33
Grade12	6	6	6	6	24
Total	56	56	55	53	220

2.2. Instruments

This research utilized a diverse array of instruments, such as interdisciplinary lesson plans (ILP), task sheets, and various assessment tools to evaluate this educational initiative. Task sheets were crafted, expert-validated and assessed using a rubric, complemented by planning and reflection sheets for student notes during activities. The effectiveness of the physics instruction was further gauged through an open-ended conceptual questionnaire designed to measure students' conceptual understanding post-activity, emphasizing higher-order cognitive skills and real-life problem-solving capabilities. Additionally, the SMQ-II for physics was employed, a standardized Likert-type tool that analyzes students' motivation across multiple dimensions such as IM, self-determination (SD), self-efficacy (SE), career motivation (CM), and grade motivation (GM) [19]. Feedback mechanisms included activity perception questionnaires to assess students' engagement and attitudes toward the activities, and post-activity interviews or reflection journals from both students and teachers to collect immediate feedback and detailed reflections on the science olympics. The qualitative data from these journals and teacher discussions were analyzed using thematic content analysis to identify prevalent themes and insights, which aided in evaluating the event's strengths, weaknesses, and areas for improvement. These instruments collectively aimed to provide a comprehensive understanding of the educational impact and motivational dynamics of the science olympics.

2.3. Procedure of the study

Conducting the science olympics required meticulous planning and execution across 3 key phases: preparation, implementation, and evaluation. Figure 1 illustrates the procedural framework for the study, organized into these 3 phases. Phase I involved preparation tasks such as developing interdisplinary lesson plans and gathering materials. Phase II centered on the implementation of the science olympics, while phase III focused on evaluating the event through surveys, interviews, and data analysis. This structured approach ensured the event effectively enhanced student motivation and engagement in physics.

2.3.1. The preparation

Phase I included the preparation and development of ILP and instructional materials. The development of ILPs consisted of 5 stages: establishing the interdisciplinary core, proposing activities, course mapping and performance mapping, establishing student assessments, and finally, creating the lesson plan. The stages of ILP creation were based on the study by Kodkanon and Pinit [20], however, slight modifications were made to suit the needs of this research study. The ILP contained the objectives of the activity, content and performance standards, learning competencies, topics/content, learning resources, procedures, and an assessment tool to evaluate students' performance and output. The development of instructional materials included designing task sheets and constructing higher-order questions for the quiz bowl. The designed activities and task sheets for the science olympics were assessed and reviewed by the department head and in-service science teachers using a rubric. Face validation comments and suggestions were considered for the improvement of the learning materials.

Organizing the science olympics also involved assigning point persons, facilitators, and technical working committees, establishing competing teams, setting up the floor plan/physical workspace, and identifying the materials needed for the event. The event required significant manpower, so collaboration among school personnel and staff was vital and paramount. Advocates of teacher collaboration assert that when teachers work collectively, they positively influence one another and naturally drive school improvement [21]. This is supported by numerous studies, which indicate that collaborative environments enhance teacher effectiveness and improve educational outcomes [22]. Teachers working together in teams, sharing responsibilities, providing feedback, and building trust led to a better learning environment and greater student success.

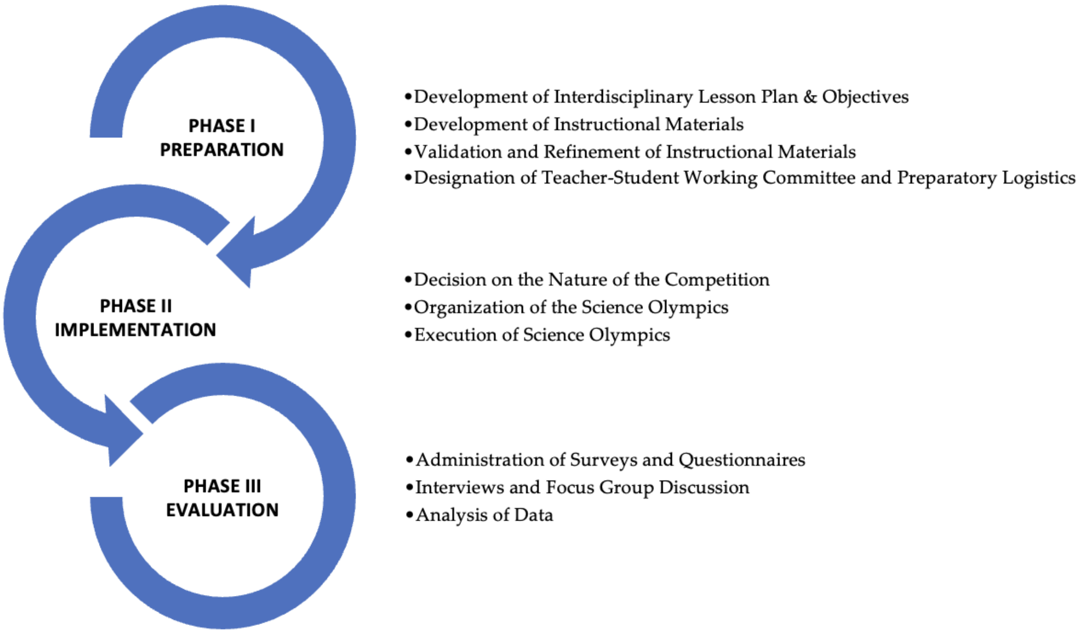

Figure 1. Flowchart of the procedural framework structured into 3 phases: preparation, implementation, and evaluation

2.3.2. Execution of science olympics

The science olympics activities were grounded in design thinking and problem-based approaches, where students were tasked with creating tangible projects to address and solve the challenges presented. Table 2 outlines the various activities in the science olympics, specifying the participants involved and the objectives for each activity. Each activity was tailored to specific grade levels and was designed to integrate various scientific principles while encouraging creativity, problem-solving, and teamwork among participants. Events in the science olympics across grade levels were conducted simultaneously. Points for each team at each grade level were gathered and collected to determine the winning team. Students' work and team performances were evaluated by a panel of judges, science experts, and evaluators.

2.3.3. Post-analysis

Research instrument questionnaires were administered to student participants who were selected through cluster sampling across grade levels from grades 7-12. The raw scores of students' conceptual understanding in post-assessment using the open-ended conceptual questionnaire were determined. Raw scores obtained were analyzed through descriptive statistics and measures of variability. Boxplots and histograms as graphical presentations for each grade level were displayed to provide a quick examination of the distribution of scores. Also, students constructed ideas and concepts were presented and analyzed in themes as a basis for further intervention. Being aware of their intellectual demands through their experience allows teachers to recognize the students' developmental level and the intervention needed is appropriate for them. This content-based assessment guided the students in the learning process and conceptual development. Data analysis was conducted using IBM SPSS statistics version 25 to address key research questions and explore underlying dimensions identified by students in their responses to the activity perception questionnaire and SMQ: physics version.

Table 2. Activities in science olympics, specifying the participants involved and the objectives for each event

Activities	Participants	Objectives
Logo design contest	Representative per team	Create a unique and visually appealing logo that symbolically represents the theme of the science olympics
Bench cheering	All	Demonstrate teamwork, creativity, and knowledge of scientific themes by developing and performing a bench cheer that promotes school spirit and enthusiasm for the science olympics
Quiz bowl	Qualified representative per team	Apply critical thinking and quick reasoning to answer questions accurately under time constraints
Tropical island water challenge	Grade 7	Improvise a filtration device
Balloon-powered racers	Grade 8	Design and construct a race car that will be completely powered by a balloon
Naked egg drop	Grade 9	Create a device “catcher” to save a naked egg from breaking
Stranded	Grade 10	Design and buils a boat oit from PET bottles
Space lander mission	Grade 11	Design and build a shock-absorbing lander
Up, up, and away	Grade 12	Design and construct a bottle rocket

3. RESULTS AND DISCUSSION

Results revealed significant findings in 2 key areas: students' conceptual understanding and motivation, and their general perceptions towards the science olympics. The quantitative analysis revealed significant improvements in students' conceptual understanding of physics after participating in the science olympics. Additionally, there was a positive shift in students' motivational levels. The SMQ-II physics version highlighted that those students displayed considerable enthusiasm and interest in physics, which can be attributed to the dynamic and interactive environment of the science olympics. Qualitative feedback from students and teachers was overwhelmingly positive. Students expressed a high level of enjoyment and engagement, highlighting the integration of multiple subjects as a factor that enriched their learning experience. Teachers noted an increase in student collaboration and active participation during the event. The analysis of interview transcripts and responses identified common themes such as increased curiosity, teamwork, and appreciation for the practical application of scientific concepts.

3.1. Students' conceptual understanding and motivation

Post-activity conceptual questions requiring short, free-form responses were administered to students from grades 7 to 12, with a maximum possible score of 25 points. The raw scores were collected and analyzed using descriptive statistics. Additionally, box-and-whisker plots in Figure 2 and histograms in Figure 3 were utilized to display the distribution of raw scores, providing immediate feedback and direct information for comparing distributions across grade levels, and the overall students' score distribution on the post-activity conceptual questionnaire. Figure 2 shows that the median scores across the grade levels are fairly consistent, ranging between 15-20, suggesting a uniform level of conceptual understanding achieved across the different grades. The plots for each grade level displayed similar distributions, with most grades showing the majority of scores clustered around the median, and with a somewhat symmetrical spread in scores indicated by the whiskers. This uniformity across grades suggests that the science olympics was similarly effective across different age groups.

Figure 3 presents the general raw score distribution of the students on the post-activity conceptual questionnaire. From this study, it was found that students' conceptual understanding and learning are clearly demonstrated in the science olympics (M=15.88, SD=5.372), mirroring results from other studies on design thinking [23], [24], which is employed to engage students actively and enhance their grasp of STEM content. The distribution of scores is negatively skewed which implies that the scores are lumped toward the higher side of the scale. Suffice it to say after the quick examination held using a box plot and histogram of scores for each grade level, the results positively showed a desirable outcome of students' conceptual understanding and performance in the science olympics. This provides new evidence of why there is a need to incorporate and implement the design thinking process in K-12 education.

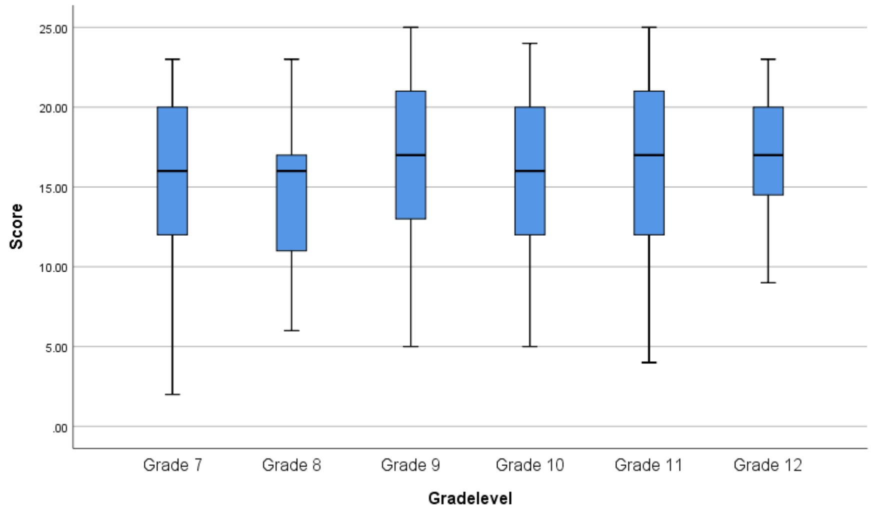

Figure 2. Box-and-whisker plot of students' score distribution on the post-activity conceptual questions for each grade level

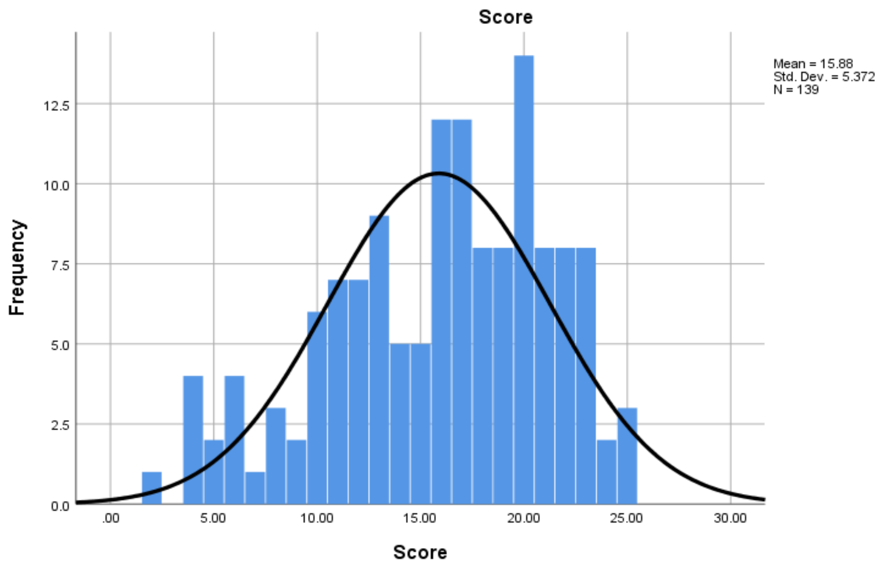

Figure 3. General raw score distribution of the students on the post-activity conceptual questionnaire

It shows a successful implementation that the science olympics, with the incorporation of design thinking in one of its major activities, increased students' ability to think, innovate, solve problems, and create conceptual understanding. The study of Kettler *et al.* [25] found that design thinking, being utilized by the teachers as a strategy for classroom instruction, promotes academic learning, thereby increasing students' motivation, especially when learners experienced on hand and at sight how these concepts worked and applied to the tasks. When students feel successful and confident in their learning, motivation is highly elicited towards the subject matter tasks. This can also be shown in the result of this study, where students' motivation towards learning physics was measured and determined. Students responded on a 5-point rating scale of temporal frequency, ranging from (1) never to (5) always in the SMQ-II physics version. The SMQ II: physics version contains 5 motivation components: IM, SD, SE, CM, and GM. GM (M=3.09, SD=0.766), IM (M=2.68, SD=0.761), and SD (M=2.62, SD=0.727), where the topmost motivational components why students learn physics. Students believed that getting good grades in physics and recognition from their parents and teachers were important to them. Another key factor is that students working in teams displayed a strong eagerness to succeed in the science competition, which motivated their participation and diligent effort in each activity of the Olympics. These findings support the notion that competition-based learning, as implemented in the science olympics, effectively enhances student motivation, aligning with previous research on the positive impacts of competitive environments on learning outcomes [26], [27]. Students also believed that learning physics is fun, interesting, and relevant. Using strategies and allotting a lot of time and effort in studying helps them to learn physics more. CM (M=2.44, SD=0.914) got the least mean rating among the 5 components of motivation. It can be implied that CM is not the main factor why students are motivated to learn physics. Studies have shown that one of the main problems today in physics education is the inability or failure of students to appreciate, recognize and process the subject [28]. Thus, this significantly affects how students perceive learning physics as beneficial and useful in the careers they will be choosing in the future. This distinction in motivation levels highlights a particular area of concern and underscores the need for targeted interventions and support in the realm of CM.

This study revealed students' level of motivation towards physics, at the same time, showed the effects of the science olympics as a school-wide and innovative platform of performance tasks to promote conceptual learning and motivation in physics. The motivation of the students in response to the science olympics was further presented and intertwined with students' perception and their subjective disposition towards the activ-ities. It was determined that students' interests were captured, their confidence to learn on their own were build-up, and the Science Olympics itself was rewarding for them especially when they received and got the highest point for the work they have done on finishing the tasks and allocating time, effort and perseverance for the sake of winning in the competition. Furthermore, it still upholds together the spirit of the Olympics, working as a team, social relationship, learning responsibility, sense of accomplishment and accountability of their own decisions and actions towards achieving the goal of the tasks.

3.2. Students' general perceptions towards science olympics

The students' perception of the science olympics was also determined through the activity perception questionnaire. The questionnaire assessed students' levels of interest/enjoyment, perceived competence, effort/importance, felt pressure and tension, perceived choice, value/usefulness, and relatedness while they were performing the activity. As presented in Table 3, the overall mean rating results revealed that students generally had positive experiences with science olympics. Relatedness (M=5.55, SD=1.00), effort, and importance (M=5.35, SD=1.27) followed closely by value and usefulness (M=5.30, SD=1.35), then interest and enjoyment (M=5.00, SD=1.17) and lastly, perceived competence (M=4.42, SD=1.20) and perceived choice (M=4.42, SD=1.34) was the sequence of the main themes emerging from students' responses in the activity perception questionnaire. This can be implied that students enjoyed doing the activity very well, mainly because it provides the opportunity to collaborate and interact with other learners, where they drew support and learn from each other in achieving common goals. Social engagement, teamwork, and cooperation were highly observed in the science olympics. Social interaction is crucial for effective collaboration [29]. Students were willing to do and participate in the science olympics again because they believed that it is valuable, important and personally beneficial. Students' interest and motivation to learn physics was captured, because activities were designed in a way that students can learn relevant scientific concepts while enjoying the fun-filled, interesting, and yet challenging tasks or activities, which is a unique way of providing a meaningful and contextualized learning experience. It was also found that students were competent and satisfied with their performance at the given tasks; they exerted a lot of effort, built a strong alliance and coordination with their team to complete the tasks at hand without complaining about how difficult and challenging the problem was during the conduct of the Olympics proper. They enjoyed the process of prototyping and implementing what they built and modeled, which demonstrates the transfer of knowledge, the formation of conceptual understanding, and the application of skills.

Table 3. Overall mean rating of students' perceptions towards science olympics

Constructs	M	Min	Max	SD
Interest/enjoyment	5.00	1	7	1.17
Perceived competence	4.42	1	7	1.2
Effort/importance	5.35	1	7	1.27
Pressure/tension	3.6	1	7	1.32
Perceived choice	4.42	1	7	1.34
Value/usefulness	5.3	1	7	1.35
Relatedness	5.54	2.6	7	1.00

Note: n=200, 1.00-2.71 (not at all true), 2.72-5.29 (somewhat true), and 5.30-7.00 (very true)

Moreover, the results of the thematic coding done can be deduced into 2 categories; positive features of the science olympics, and the drawbacks of the science olympics. Students' responses in the interview and reflective questions were analyzed and presented to describe and enumerate the positive features of the science olympics. The following statements were found to be repetitive and taken in the context of students' learning entry in their interview journal: i) develop students' skills and abilities both personal and interpersonal skills; ii) provide a vast variety of dynamic and thought-provoking activities that are engaging, fun and very interesting, provide an opportunity for just-in-time acquisition of knowledge and conceptual formation; iii) challenge students to solve multiple complex problems promptly and skillfully while being put under time pressure; iv) allow students to interact, meet new people and generate ideas collaboratively; v) take ownership of the outcome of their hard work; collaborative process and creation of end-product; and vi) foster students' and teachers' involvement and engagement. It is highly evident that science olympics has a positive impact on students towards the development of 21st-century skills, acquisition and application of knowledge and understanding, social interaction, engagement and participation, contextualization, and effective learning experience. Most of the students responded that they enjoyed the company of their group members in doing the tasks and achieving their team goals. Students got the opportunities to hone their skills in team dynamics, leadership, creativity, resourcefulness and time management through working in teams. To strengthen further students' learning experience in science olympics, there is a need to take into account fair class division and selection of students, who will work well together, for optimal group progress and learning-responsibility with active involvement, collaboration, and problem-solving through the task and process-related activities. Students should be given more time for discussion and specifications; rules, tasks, instructions, and background content to further maximize the quality of students' work and outcome.

The finding in this study that the manifestation of 21st-century skills is evident in science olympics aligns with the importance of collaborative learning and its relationship with the development of these skills. The observation of 21st-century skills in the science olympics underscores the initiative's capacity to cultivate essential abilities such as critical thinking, problem-solving, collaboration, and communication. For instance, collaborative learning involves students working together in groups, fostering teamwork, communication, critical thinking, and problem-solving abilities. These skills are considered essential for success in the 21st-century, where teamwork and adaptability are highly valued. In support of the findings, Dieu *et al.* [30] focuses on the development of a collaborative skill scale rooted in the 21st-century skills approach. This study underscores the importance of assessing and nurturing collaborative skills, which are closely related to the skills demonstrated in the science olympics. Laal *et al.* [31] highlights the benefits of collaborative learning and its shift from individual efforts to group work. Collaborative learning encourages students to engage with diverse perspectives and collectively find solutions to complex problems, which aligns with the dynamic and thought-provoking learning experiences offered by science olympics. Moreover, O'Sullivan and Dallas [32] discusses the need for high school students to acquire information literacy skills and problem-solving abilities through collaborative approaches. These skills are essential components of 21st-century skillsets and are integral to the success of students in science olympics and beyond. The current study's finding that the manifestation of 21st-century skills is evident in science olympics reinforces the idea that collaborative learning plays a pivotal role in developing these skills. Science olympics, with its competitive and collaborative activities, provides students with opportunities to apply and enhance teamwork, critical thinking, problem-solving, and communication skills all essential components of 21st-century skills.

4. CONCLUSION

In the review of the foregoing findings, the overall results clearly demonstrated significant student engagement and participation, conceptual understanding, and motivation in learning physics in the science olympics activities. Our findings provide conclusive evidence that this competition-based, interdisciplinary approach integrates design thinking and problem-based learning to enhance student motivation and showcases students' 21st-century skills through collaborative and multidisciplinary tasks involving subjects like general science, mathematics, arts, and technology. Teachers play a crucial role in fostering a positive learning environment that encourages student involvement and motivation. Additionally, the findings suggest that expanding the scope of the science olympics to include more subjects and extended, multi-school events could further enrich student experiences and outcomes, allowing for a richer, more competitive environment that could inspire greater interest and deeper learning in the sciences. The results advocate for incorporating collaborative learning experiences like the science olympics in educational curricula to better equip students with the skills needed for the 21st-century. This aligns with broader educational research emphasizing the development of collaborative and interdisciplinary skills critical for modern challenges.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

INFORMED CONSENT

Informed consent was obtained from all individuals who participated in this study.

ETHICAL APPROVAL

Ethical approval for this study was granted by the Ethics Review Committee of the Department of Science Education, Br. Andrew Gonzalez College of Education, De La Salle University, Manila, Philippines.

DATA AVAILABILITY

The datasets used in this study are not publicly available due to confidentiality and privacy agreements with participants. However, derived data supporting the findings may be provided by the corresponding author upon, [FILP], reasonable request, subject to ethical approval.

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