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International Science Olympiads: The Israeli Teams

Judith GAL-EZER, Doron ZOHAR, Anat ROLNIK
The Open University of Israel, Mathematics and Computer Science Dpt. Ra'anana, Israel
e-mail: galezer@openu.ac.il, doron.zohar@openu.ac.il, anatrolnik@gmail.com

Abstract. The International Olympiads (IOs) caters to exceptional students worldwide. Israel, for example, in 2023, competed in nine out of 14 IOs, including five in the sciences. Students participating in the Olympiads must possess a high level of knowledge and a broad understanding of their subject area, along with the ability to tackle complex problems, synthesize knowledge, and develop creative solutions.

Ministries of Education as well as academic institutions and policy makers see the Olympiads as a vehicle of developing the social conditions and economics of their country, consequently, they encourage talented students by providing financial support for training programs, travel, and accommodation.

In this paper, we provide an overview of the science IOs: the International Mathematical Olympiad (IMO), the International Physics Olympiad (IPhO), the International Chemistry Olympiad (IChO), and the International Biology Olympiad (IBO), with a particular focus on the International Olympiad in Informatics (IOI). We describe the organizational structure, student training process, and ranking system, while highlighting the participation and achievements of Israeli delegations.

Keywords: International Olympiads; International Science Olympiads; Israeli National Teams.

1. The International Olympiads

The International Olympiads (IOs) are social-educational events that bring together outstanding students from around the world who share a common interest in science, and a team of expert coaches with aligned goals and interests. The official aims of each Olympiad are specified in the competition regulations (for example (IBO, 2025; IChO, 2023; IMO, 2023; IOI, 2023; IPhO, 2023)). In addition, unofficial goals arising from the nature of the event itself include:

- Encouraging scientific excellence among teens.
- Increasing interest in the sciences.
- Encouraging students to choose scientific subjects in schools and in the future.
- Enabling international relations between educators, scientists, and future scientists.

Lim *et al.* (Lim *et al.*, 2014) highlight the impact of Science Olympiad programs on students' education in science, technology, engineering, and mathematics (STEM), enhancing their skills and shaping their career aspirations. These programs provide students with a perspective on science beyond their high school experience, offering close contact with university faculty and researchers, and insight into potential science careers: "Science Olympiads are important vehicles for science communication, especially between scientists, educators, and students. When students participate in these Olympiads, they gain exposure to a different view of science from that which they experience at the high school level. Close contact with university faculty and science researchers will provide students with a glimpse of what careers in science can offer. For those who will not pursue science any further than high school, at least they will hopefully have a higher level of scientific literacy". In a later research, Jovanov and Stankov (Jovanov and Stankov, 2020) mention an additional aspect of the Olympiads: "Science Olympiads are not just a science competition but a means to care for talent in the particular scientific field. International Olympiad in Informatics (IOI) is one of the first five Olympiads that arose, after Mathematics, Physics and Chemistry, and before Biology Olympiad. Being the "summit" of the brightest students, at all Olympiads contestants are generously awarded with recognitions in the form of gold, silver and bronze medals, and additionally, the so-called 'Honorable Mention' award".

STEM competitions significantly contribute to student development, fostering creativity and critical thinking among emerging professionals as presented in (Campbell *et al.*, 2017). Campbell and Welberg observed that many students who participated in these programs later chose to pursue science-related academic programs and technical careers that contribute to national development (Campbell and Welberg, 2010). Years later, Smith *et al.* also reached the conclusion that participation in such rigorous competitions, along with the preparatory training involved, bolsters students' motivation and promotes sustained academic growth. Science Olympiad experiences influenced both academic and career decisions, especially in college and major selection (Smith *et al.*, 2021).

There are many international competitions designed for talented youth in the fields of science; any competition may be called an "Olympiad". Some examples are: The Asian Physics Olympiad (APhO) (APhO, 2024), the Romanian Master in Mathematics (RMM) (RMM, 2024), the International Mendeleev Chemistry Olympiad (IMChO) (IMChO, 2024), computer science competitions, such as the Asia-Pacific Informatics Olympiad (APIO) (APIO, 2024), Central European Olympiad in Informatics (CEOI) (CEOI, 2024), the European Girls' Mathematical Olympiad (EGMO) (EGMO, 2024), the European Girls' Olympiad in Informatics (EGOI) (EGOI, 2024), and the Baltic Olympiad in Informatics (BOI) (BOI, 2025). These competitions are similar in nature and structure to the IOs, but participation is conditional and often based on factors such as continent (or region), gender, or the country's ranking in the IOs.

In contrast to these and many other competitions, IOs are accessible to any country interested in participating, without restrictions based on location, gender, or prior achievements. IOs are regarded as the world's largest and most challenging competitions for youth in the sciences and humanities.

Table 1
The International Olympiads

Foundation	Scientific Field	Name	Acronyms
1959	Math	International Mathematical Olympiad (IMO, 2023)*	IMO
1967	Physics	International Physics Olympiad (IPhO, 2023)*	IPhO
1968	Chemistry	International Chemistry Olympiad (IChO, 2023)*	IChO
1989	Computer Science/Informatics	International Olympiad in Informatics (IOI, 2023)*	IOI
1990	Biology	International Biology Olympiad (IBO, 2025)*	IBO
1993	Philosophy	International Philosophy Olympiad (IPO, 2023)*	IPO
1996	Astronomy	International Astronomy Olympiad (IAO, 2024)	IAO
1996	Geography	International Geography Olympiad (iGeo, 2024)	iGeo
2003	Linguistics	International Linguistics Olympiad (IOL, 2023)*	IOL
2004	Sciences (Chemistry, Biology, and Physics)	International Junior Science Olympiad (IJSO, 2023)*	IJSO
2007	Earth Sciences	International Earth Science Olympiad (IESO, 2024)*	IESO
2007	Astronomy	International Olympiad on Astronomy and Astrophysics (IOAA, 2024)	IOAA
2015	History	International History Olympiad (IHO, 2024)	IHO
2018	Economy	International Economics Olympiad (IEO, 2024)	IEO
2024	Artificial Intelligence	International Olympiad in AI (IOAI, 2024)	IOAI

*Israeli participation

Fifteen Olympiads (listed in Table 1) fall under the umbrella of the IOs, which include participants from dozens of countries worldwide.

In Section 2, we will describe the International Science Olympiads IMO, IPhO, IChO, and IBO; with more details on IOI; In Section 3, we highlight the case of Israel, including the efforts made to ensure inclusiveness by providing opportunities to all populations, and we explain the crucial role of teachers, and Section 4 presents a brief summary.

2. International Science Olympiads

In the following we provide detailed descriptions of the organizational structure, regulations, delegations, procedure and finally, ranking and medals of the International Science Olympiads (ISOs).

2.1. *Organizational Structure and Regulations*

The organizational structure of the ISOs is generally as follows: The General Assembly (GA) is the main authority. It elects or appoints the Executive Committee. The Executive Committee (EC sometimes called Executive Board) oversees overall operations and helps the next Host Country Organizing Committee. The Host Country Organizing Com-

mittee sets up the Scientific Committees for the competition. The Scientific/Academic committees are composed of experts from various disciplines. Some Olympiads have a small Permanent Secretariat for long-term support. Each year, a new country organizes the Olympiad, but the basic structure remains.

The GA composed of official country representatives. The EC is a smaller elected group managing operations between Olympiads. The Host Country Organizing Committee is a temporary committee responsible for running a specific year's Olympiad.

The rules and regulations for ISOs are generally established and decided upon by the GA. The committees are responsible for coordinating the event, setting the rules and standards, and ensuring that the competition runs smoothly. They also work to maintain consistency and fairness across different countries and regions. In some cases, an Olympiad will be organized by the president of one of the committees, to whom the other committees and bodies report. The international committee of each ISO includes representatives from the participating countries. These committees have several key roles, for example, approving competition regulations, electing a president, and determining future decisions, such as the order of host countries or whether to hold the competition online (for instance, during the COVID-19 pandemic). In addition to their general duties, committees are responsible for overseeing the competition itself. This includes maintaining the quality of competition questions and tasks, managing the scoring process, addressing any issues that arise, and establishing the score cutoffs for medal allocation and criteria for special awards. They also play a vital role in upholding the professional standards and integrity of the ISOs.

Each ISO can establish additional committees, based on the regulations and specific needs of the competition. The mission of these committees is always to support the effective organization, management, and execution of each Olympiad.

The regulations of each ISO may change from time to time, as responses to requests from the representatives of the participating countries or the international committee of the Olympiad. These changes aim to produce an efficient, fair, and ethical competition. The representatives from the participating countries vote on any proposed changes; majority consent is required for their implementation.

Although each Olympiad has its own specific regulations, there are some basic rules common to all. For example, the host country is obliged to invite all the countries that participated in the previous year's Olympiad, without discrimination on political or religious grounds. Regardless of nationality, gender identity, physical ability, religion, or sexual preference, the host country must treat all delegations equally.

The official language of competitions is English. Olympiad questions are translated by coaches and trainers into the native language of participating students. The students' answers are typically written in English although, in some cases, they may also provide answers in their native language as a backup, in the event of an appeal. In natural sciences and exact sciences Olympiads, some of the students' answers may be in the form of formulas or computer code. However, English language proficiency is still important, as some answers require an explanation of the approach and essence of the solution.

2.2. *The Delegations*

Each Olympiad delegation includes the student team and the coaches, trainers, and observers, all led by the chair of the delegation. The students chosen to represent their country are selected through a national competition open to all eligible youth in that country. The trainers and observers are experts in the specific field of knowledge and must be fluent in English. Each year, a different participating country hosts the Olympiad.

Each delegation consists of between four and six students (IMO – up to six students, IPhO – up to five students, IChO, IBO, and IOI – up to four students). Middle school and upper school students up to the age of twenty may participate. Some ISOs, such as the IMO and the IOI, allow home-schooled students to take part, as long as they have not yet completed high school.

Coaches, who are responsible for training the students and accompanying them to the competitions, are integral members of each delegation. The coaches are subject-matter experts with professional backgrounds, some of whom may have even participated in a previous ISO. At the head of the delegation are the leaders, one of whom is designated Head of the delegation, and next in line are the observers who assist the leaders. The coaches serve as mentors to the students in the training process and during the competition itself. This professional team is mandated by the rules and regulations of the ISOs.

Unlike sports competitions, in which coaches have no influence on the judges' evaluation, during ISOs, these mentors play a decisive role and have a significant influence on the final results, in the following realms:

1. **Translation:** The mentors are responsible for translating the exam questions from English into the competitors' native languages. Precise translation in scientific fields is critical for students' understanding of the questions which, in turn, can impact their performance.
2. **Evaluation:** After the competition, judges (appointed by the host country) check and grade the solutions. Mentors evaluate their students' solutions and compare their assessment with the judges' grades.
3. **Appeal process:** If there is a discrepancy between the mentors' and judges' evaluations, a structured appeal process takes place. The mentors conduct scientific-professional negotiations with the competition judges on a dedicated day during the program. This appeal process requires negotiation skills and extensive academic knowledge, as it can affect the final grades and overall results.

The mentors' involvement in translation, evaluation of solutions, and the appeal process (if necessary) can significantly impact the team's achievements in the ISOs.

2.3. *Competition Program*

Each ISO features an organized program that is announced to all participating countries in advance, both directly and through the competition website. The syllabus is published

several months before the event so that all participants may organize accordingly. The Olympiad website, published by the host country, includes comprehensive information about the competition, including the registration process and fees. The site is updated before and after the competition with Olympiad questions, solutions, various statistics, such as the participants' scores, the scores of the leading countries, and the distribution of medals.

Usually, ISOs take place for a week to ten days; a period of time that allows for both the exam days and social activities that reflect the dual goals of the Olympiad: forging friendships between students and professionals from around the world.

Usually, each ISO begins with a solemn opening ceremony, during which all participating countries and delegation members are presented. Some also feature a group ceremony in which students pledge to uphold exam integrity and human dignity. Each event includes two exam days, social activities, and cultural tours. In the IOI, the two exam days are experimental. In the other ISOs the first day is usually devoted to a theoretical and the second day to an experimental. The Olympiad concludes with a closing ceremony during which medals and prizes are awarded.

To preserve exam integrity, competitors are typically isolated from accompanying coaching staff who have had prior access to competition questions. In some ISOs, students are also separated from devices with Internet connections in order to maintain this goal.

2.4. *Medals and Ranking of Countries*

In sport competitions, gold, silver, and bronze medals are awarded to the three athletes with the highest achievements. At ISOs, the distribution of medals is done in order to encourage outstanding youth to engage in, and deepen their study of scientific subjects. Therefore, at each ISO, a large number of medals of every kind, as well as certificates of appreciation and marks of honor are given. Each country's ranking is determined by weighing the results of its delegation.

The distribution of medals is carried out in accordance with the rules established by the International Olympiad Committee and stipulated in the regulations. For example, IMO regulations state that the number of medal winners will not exceed half the number of participants and the ratio between them will be approximately 1 : 2 : 3. For example, if 100 students participate, 50 may receive medals: eight students will receive a gold medal (one-sixth of fifty), 16 will receive a silver medal (two-sixths of 50) and the rest will receive a bronze medal. According to IPhO regulations, gold medals are to be awarded to the 8% with the highest results, silver medals to the following 25% in the order of the results, and bronze medals to 50% of the remaining students. A commendation is awarded to 67% of the participants with the highest scores. For example, if 100 students participated, eight will receive gold, 17 silver, 25 bronze, and 17 students will receive a commendation.

In addition to the distribution of medals, some ISOs add additional categories and special prizes. For example, at the International Biology Olympiad, a prize is given to a

"Social Delegation" (IBO, 2025) for promoting friendships between young people from around the world, and for sharing and exchanging ideas for studying biology education. In the International Physics Olympiad, the award "Absolute Winner" (IPhO, 2023) is given to the student who achieved the highest combined score in both the theoretical and experimental sections of the competition. In the International Math Olympiad, "The Most Outstanding and Creative Solution" (IMO, 2023) prize was awarded.

In addition, some regulations include a section that allows the host country to determine categories for additional prizes as long as they preserve the goals of the competition and the rights of the participants. Some of these categories have become traditional and are included annually. For this reason, during the awards distribution portion of the closing ceremonies, different categories are added. These include "Honorable Mention", "Perfect Score", and "The Best Solution" in the International Math Olympiad; and the "Best Theoretical Score", "Best Experimental Score", and "The Most Creative Solution" in the International Physics Olympiad. The "Absolute Gold" prize is awarded to the student with the heights score in all ISOs.

Despite the Olympiads are individual competitions, with medals and prizes awarded to students who achieve the best results, reference is also made to the ranking of participating countries. Each country's ranking is calculated by weighing the results of the delegation's members. In the ranking process, the points earned by all delegation members are added up, and based on this sum, the country's ranking is determined. According to this system, the countries that stand out for their excellence are China, Russia, and the United States (IMO, 2023; IOI, 2023; IPhO, 2023).

As an example of a specific Olympiad we elaborate in the next section, on the International Informatics Olympiad.

2.5. *The International Informatics Olympiads (IOI)*

The official Website of the IOI (IOI, 2023) provides useful information about the goals, the organization, the participating countries and statistics.

According to the history of the IOI by Mārtiņš Opmanis (IOI, 2023) the concept of organizing an IOI for school students was first proposed at the 24th General Conference of the United Nations Educational, Scientific and Cultural Organization (UNESCO) in Paris by Bulgarian delegate Professor Blagovest Sendov in October 1987. In May 1989, UNESCO launched and sponsored the first IOI, which took place in Bulgaria that same year.

As described above, each year, a different country hosts the event. The competition is supervised by the International Committee and follows the UNESCO-endorsed structure. Teams are officially selected by their national organizations through national contests. Each country can send up to 4 participants, along with team leaders.

The contest consists of two days of algorithmic programming challenges, where students solve problems using programming languages like C++ first, for a few years Java was also supported. The solutions are submitted as files of C++ code which are then compiled and executed on a set of test cases for grading.

Many former IOI participants have gone on to become startup founders and tech leaders: Adam D'Angelo co-founder of Quora received a silver medal in the 2002 competition (IOI, 2023). Nikolai Durov, a four-time medalist at the IOI (1995–1998), co-founded VKontakte (VK, 2023), Russia's largest social network, and later Telegram Messenger, focusing on secure communication (IOI, 2023; Maréchal, 2018). These individuals exemplify how the skills and experiences gained from participating in the IOI can serve as a strong foundation for entrepreneurial success in the technology sector.

In 2007 the IOI community in cooperation with the Institute of Mathematics and Informatics (now Vilnius University Institute of Data Science and Digital Technologies) initiated the journal Olympiads in informatics, an international open access journal (IOI, 2023).

In the following section, we explore Israel's participation in the International Science Olympiads, highlighting its involvement and achievements.

3. The Case of Israel

Israel began competing at ISOs in 1994. In its first year, Israel sent only one delegation to the IPhO (IPhO, 2023). Since then, Israel has expanded its involvement. In 1997, two delegations participated in two additional ISOs: the IMO (IMO, 2023) and the IOI (IOI, 2023). Israel joined the IChO (IChO, 2023) in 2005. A year later, a delegation participated in the IPO (IPO, 2023) for the first time, and in 2012, the first delegation took part in the IESO (IESO, 2024). Over the next ten years, delegations continued to represent Israel at the Olympiads. In 2022, the Israeli delegation took part for the first time in the IBO (IBO, 2025) and in 2023, Israel participated for the first time in the IJSO (IJSO, 2023). In 2012, Israel also participated in the IOL (IOL, 2023). As of 2023, Israel has taken part in nine of the 14 existing IOs.

Israel's participation in ISOs serves several objectives, including enhancing the country's standing in the global science education community, fostering role models for Israeli youth, particularly young women, pursue science studies in middle and high school and encouraging minority groups, such as the Arab population. The Israeli education system has embraced this approach as a means of effectively addressing the needs of gifted students with a strong interest in science. Engaging in these programs allows students to build connections with peers and exceptional students from around the world.

To achieve a high rank in the Olympiads, the most outstanding students must be selected and properly prepared according to the competition's syllabus. Five high school Israeli Science National Teams (ISNTs) have been established for this purpose. Each focuses on a specific field: mathematics (The Israeli Ministry of Education, 2024d), chemistry (The Israeli Ministry of Education, 2024b), physics (The Israeli Ministry of Education, 2024e), biology (The Israeli Ministry of Education, 2024a), and computer science (The Israeli Ministry of Education, 2024c). An additional team, the Israeli Science Young Team (ISYT), serves middle school students and acts as a feeder for the high school ISNTs (IYST, 2024). The teams train throughout the school year and the outstanding students compete at the end of the year to join the delegation representing Israel.

3.1. *Paving the Way to the Olympiads*

In this section we describe the process leading to participation in five science Olympiads of the ISNTs and the ISYT.

3.1.1. *The Israeli National Science Teams (ISNTs)*

Candidates for the teams undergo a structured recruitment and selection process consisting of three stages. In Phase A, students take a 90-minute online exam via the Israel National Teams Website (The Israeli Ministry of Education, 2024f). Any student in the education system is eligible to participate, with the exam available in both Hebrew and Arabic. Some disciplines emphasize creative and scientific thinking without requiring prior knowledge in the sciences, while others demand extensive background knowledge in a specific field and advanced familiarity with the science curriculum. The exam is offered in two sittings, and students may attempt both. The highest score is considered for advancing candidates to the next phase.

Phase B takes place at a number of nationwide centers. The participants chosen in Phase A (with the exception of ISYT) must attend in person. Students who pass this stage will continue to the final phase.

Phase C is a one-day program conducted at an academic host institution for the ISNT. It includes a lecture, an exam, a personal interview, and an overview of the preparation process leading up to the Olympiad.

The transition between Phases B and C differs from field to field. The study materials required for preparing for each stage are published on the Israel National Teams Website (The Israeli Ministry of Education, 2024f) and sent directly to students who have passed Phases A and B. Students who successfully complete Phase C are assigned to the ISNTs based on their area of expertise.

After having been accepted to an ISNT, students undergo a training period during which they learn different areas of knowledge related to their field while emphasizing various study skills. These include independent learning and group collaboration, organization of study materials, time management, strategic development for diverse solutions, perseverance, working under pressure, and quick recovery from failure. In addition, students engage in self-reflection on their activities, draw conclusions, and practice critical, scientific, and creative thinking.

During this stage of the training, emphasis is placed on experimental and playful learning, which helps all team members reach higher achievement.

For examples from the Israeli National Informatics Olympiad, see Appendix A.

3.1.2. *The Israeli Science Young Team (ISYT)*

As mentioned above, the ISYT is a feeder team for the ISNTs. The ISYT is comprised of about 200 students from grades 8 and 9 who undergo a two-year training process. During the 7th grade they take exams, during the 8th grade, students study mathematics, physics,

chemistry, and computer science. In the 9th grade, they specialize in two of the four fields, in coordination with the academic staff and based on their preferences. At the end of the 9th grade, the four most outstanding students are chosen to represent Israel in the International Junior Science Olympiad (IJSO) (IJSO, 2023). In this competition, the students are tested together in the fields of physics, chemistry, and biology. As part of the preparations for this Olympiad, students complete the biology studies which were not covered during their ISYT training.

Like the ISNTs, the ISYT also has three selection phases, with the first two available online (IYST, 2024). In Phase A, the exam consists of math questions that require a numerical answer or a multiple-choice response. Phase B requires students to present the solution process. Phase C takes place at the academic institution hosting the team, in the format of a study day that includes a personal interview, lecture, and a number of exams. These exams test abilities such as mathematical thinking, listening comprehension, reading comprehension, and include questions based on the lecture content.

The ISNTs participants gain significant benefits, the most important for all students is the acquisition of a deep understanding of academic subjects, the development of thinking skills, and the tools gained during the training and coaching process. These include independent learning, dealing with heavy workloads, teamwork, scientific creative thinking, strategies for solving complex and challenging problems, study habits, time management, perseverance, and learning from failure. These tools will become integral to the students and will serve them, not only in the Olympiads, but also throughout their lives.

In addition, ISNT members who have completed a full year of training are entitled to exemption from the Ministry of Education matriculation exam which would normally take place at the end of the training year.

Academic institutions offer benefits to the ISNTs, especially to members of the delegations. These benefits are primarily reflected in tuition fees.

Many ISYT graduates successfully advance to the ISNT selection process. Some even integrate into the ISNTs while still members of the ISYT, depending on their skills and level of emotional readiness for academic challenges.

Israel's performance has improved steadily over the years. For instance, at the 2015 IOI, three of the four Israeli contestants earned bronze medals, placing between 116th and 163rd. By 2022, all four contestants received medals – one gold, two silver, and one bronze – placing between 27th and 92nd (IOI, 2023). At the IMO, Israel was ranked 40th in 2015 and 10th in 2022 (IMO, 2023).

3.2. *Inclusion of all Populations*

In order to give every student an equal opportunity to participate in the ISNTs or the ISYT, the Ministry of Education's unit in charge of the ISOI decided to increase the number of students participating in the program. To this end, the data of students who had participated over the years were examined, and their level of success in the exams

leading up to the ISNTs and acceptance to the Israeli delegations were analyzed[1]. The data were examined with reference to area of residence, socioeconomic status, gender, and identification with specific sectors that make up Israel's population. Based on the analysis, it was decided to operate through several different channels. Changes were implemented to encourage participation by underrepresented groups, including those from the geographic periphery, female students, pupils attending religious state education (HEMED) schools (HEMED, 2024), and the Arab sector.

3.2.1. *Peripheral Communities*

To encourage the participation of students from the geographic and/or socioeconomic periphery, meetings were held with educators and decision makers responsible for these areas. During the meetings, which were attended by inspectors from the Ministry of Education, heads of education departments in local authorities, school administrators, and teachers, the selection process was explained and benefits for team members were highlighted. The meetings also emphasized the image benefits for schools and municipalities, as well as for the country as a whole. These meetings led to the development of a preparatory system for the exams, including classes for the placement tests, study groups for students who had already gone through Phase A, monitoring of student needs, and providing emotional support during the next screening stages. One of the challenges was providing financial support for travel costs to exams. The Ministry of Education and the municipalities had to assist with this support. The students who were accepted to the national team were given recognition and appreciation by heads of municipalities, as well as by teachers and school principals.

3.2.2. *Female Students*

In order to encourage female students to participate, emphasis was placed on marketing and advertising directed to a female audience. This was accomplished by pointing out the achievements of female students and by using written and visual cues in marketing (capitalizing on the grammatical difference between addressing males and females in Hebrew) and by using photos of female students.

Since the advanced selection stages of the recruitment process and the teams themselves are overwhelmingly male-dominated, an effort was made to group several female students from the same school or residential area together during the transition between the phases, in order to provide support and encourage them to reach advanced screening stages.

In addition, it was decided that Israel would participate in two additional Olympiads in which only female students compete: the European Girls' Mathematical Olympiad (EGMO) (EGMO, 2024) and the European Girls' Olympiad in Informatics (EGOI) (EGOI, 2024). The goals of these are to promote excellence among women in mathematics and computer science, to increase the number of female students studying these subjects, and to provide them with an international platform in which to excel.

[1] This was carried out by moderator from the Ministry of Education.

For example, in 2022, the number of female students on the computer science team tripled. In EGMO, Israel was ranked ninth, with students winning four medals (one gold and three bronze) (EGMO, 2024). In the IPhO, a female student from the Israeli delegation won the gold medal (IPhO, 2023). In the IMO, a female student from the Israeli delegation won a silver medal **(**IMO, 2023) and was first place champion of the Asian continent.

3.2.3. *The Jewish Religious Community*

In the Israeli education system, an educational stream called HEMED (Religious State Education) (HEMED, 2024) provides a response to the unique academic needs of religiously observant students. HEMED schools provide gender-separate classrooms in upper grades, and the curriculum provides religious as well as secular studies while ensuring that students can observe religious rituals such as praying, keeping kosher, observing Shabbat, and celebrating Jewish holidays.

In the current setup of the ISNTs and the ISYT, certain situations may conflict with modes of religious lifestyles. Issues may arise with gender-mixed learning, social activities, and training camps that include mixed-gender accommodations.

It was found that school stakeholders sometimes refrained from sending their students to participate in the Olympiads due to concerns that the activities might conflict with their students' religious lifestyle. They feared criticism from parents, and as a result, over the years, fewer students were sent from religious schools.

In a dialogue with the management of HEMED, and with the assistance of administrators and teachers, the rules of conduct of the ISNTs and the ISYT were modified in order to allow religiously observant students to participate. Sabbath observance, keeping kosher, etc. were offered and were also made possible for delegations traveling abroad. It was also suggested that Phase A of the selection process be held at their own HEMED schools (HEMED, 2024). In any case, the decision of whether to participate was left up to each individual and their parents, allowing them to decide according to their religious beliefs.

The possibility of observing religious precepts is also given to members of other religions participating on the national teams.

3.2.4. *The Arab Community*

During the team training period, studies are conducted entirely in Hebrew. In the past, this prevented native Arabic speakers who lacked proficiency in Hebrew from participating in the selection tests and later, from joining the ISNTs or the ISYT. Over the years, it has become evident that the Arab community in Israel has improved its command of the Hebrew language, and students whose mother tongue is Arabic are now better equipped to cope with studies in Hebrew.

However, the timed placement tests remain an obstacle for acceptance to the team. In the past, these screening tests were only given in Hebrew. To overcome this barrier, starting in 2020, the test for Phase A has been translated into Arabic for both test dates.

Additionally, during the exams, a telephone support center was opened to provide answers to questions in Arabic.

For the ISYT, the exams for Phases B and C were also translated. Students who passed Phase C but struggled with Hebrew were provided language improvement lessons. During the selection process, an Arabic-Hebrew dictionary can be used during the exam for students who require assistance.

These efforts will hopefully lead to an increase in participation of Arabic-speaking students, ensuring equal opportunities for all students, regardless of their native language.

3.2.5. *Intervention Impact*

Following the implementation of these interventions, the total number of participants from schools countrywide has increased, especially the number of female students in the ISNTs and the ISYT. Today, many students from the religious education stream have joined the national teams and an increasing number of students from the Arab sector are also joining, especially in the ISYT, which paves the way to the ISNTs.

At the same time, to maintain the growth trend and in order for the screening tests to become part of a school's routine, these processes require continued work and constant effort in order to establish awareness among school stakeholders.

3.3. *The Role of Teachers*

Teachers are the cornerstone of every process in the education system (Gal-Ezer *et al.*, 1995). Armoni and Gal-Ezer in their paper (Armoni and Gal-Ezer, 2023) demonstrate, among other findings, that high-school teachers influence students' later decisions to pursue computing disciplines in higher education. Teachers also play a key role in encouraging student participation, their guidance contributes to students passing the exams required to join these teams and support students in staying committed, which helps maintain a steady flow of qualified participants in national teams over time. Teachers who express enthusiasm, interest, involvement, and care for the subject will influence their students, leading them to participate in the national exams, motivating them to continue the process from throughout all the phases of the selection process.

As key educational influencers, teachers, especially science teachers, play a vital role in raising awareness about the ISNTs and ISYT. This includes explaining the challenges and benefits that students may experience from participating, both during high school and beyond.

In order to effectively prepare students for initial challenges, science teachers can direct all students in their classes to questions from the ISNT's question bank and even solve such questions in class, thereby introducing their pupils to different thinking skills, which are often more challenging than what is needed for the official curriculum.

Upon receiving the results of the Phase A exam, which are also sent to the teachers by the Ministry of Education, teachers share the outcome with their students. If the result

is positive, they can turn the good news into a pivotal moment. Conversely, if the result is negative, teachers can offer emotional support and encourage students to continue participating in other excellence programs. Support and encouragement from teachers is valuable at every stage throughout the process and during team training. Instructors play a vital role, both by showing interest and providing motivation to continue, and on an organizational level, by granting permission for absences or helping students catch up on material missed due to team commitments.

The schools, with the assistance of the teachers, can create a supportive social environment for students who are progressing towards, or are already part of, national teams, turning them into role models. This can be done, for instance, by sharing their stories on school websites and on social networks, highlighting their efforts and the significant investment required to secure a place on the Israeli national teams.

The path to success begins with the first phase of training and testing at a student's school, and continues to worthy achievements with the help of supportive teachers all along the way.

4. Summary

The International Olympiads are the highlight of international school students' competitions. They are the main goal that Ministries of Education or their equivalents worldwide aim for, and the driving factor behind national teams training programs. Each national team member aspires to be part of the delegation representing his or her country in these international competitions.

The IOs serve as a quality incubator for youth with high intellectual abilities who have a passion for science, technology, mathematics, and other disciplines. This enables the development of human capital that will be at the forefront of progress in science, industry, technology, security, health, and the economy.

Israel views human capital as its most important resource. The country's academic and economic strength is based on exporting scientific and technological knowledge. Therefore, developing these academic strengths and fostering excellence in these fields is of utmost importance.

The essence of Israel's efforts goes beyond just preparing for the international competitions. It focuses on creating expert human resources in science, Informatics and mathematics through education for scientific distinction, creative thinking, and complex problem solving.

Within the scope of this paper, we focused on the general structure of five science Olympiads in which Israel participates, with a focus on the informatics Olympiad. The paper offers an overview without delving into the structure of each competition. Despite the local point of view, same as (Cohen *et al.*, 2022; Zohar and Gal-Ezer, 2023), it can serve worldwide populations, who will benefit by following the guidelines and practices described, replicating them, and emphasizing inclusiveness in their own countries.

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J. Gal-Ezer is Professor Emerita of Computer Science (CS) at the Open University of Israel (OUI), where she played a pivotal role in developing Math and CS courses, and designing the undergraduate and master's programs in CS. She has held significant positions, including Head of the Math and CS Department and Vice President for Academic Affairs. Her research focuses on CS education. She holds key roles in various prestigious committees, including the ACM Education Board, the I4All Coalition, chairs the ACM Europe Education Committee and is member of the EU expert group for teaching Informatics in school. She is ACM Fellow. And the recipient of the ACM SIGCSE Award, the IEEE Taylor L. Booth Education Award, and the ACM Karl V. Karlstrom Outstanding Educator Award.

D. Zohar is an educator specializing in science and technology, with over 30 years of experience in higher education, educational policy, and secondary-school instruction in Israel. At the OUI, he teaches computer science courses, coordinates curriculum development, and develops multimedia instructional materials. He also supports pedagogical initiatives aimed at encouraging STEM careers across the national education system. From 2018 to 2019, Dr. Zohar served as Acting Chief Inspector for Computer Science at Israel's Ministry of Education, overseeing the K7-12 curriculum and managing the 5-unit matriculation exams. Since 1996, Dr. Zohar has taught computer science at Ohel Shem High School, preparing students for advanced-level matriculation exams in CS. He coordinates the "Academia in High School" initiative, a collaborative effort between the Ministry of Education and the Open University of Israel. Throughout his career, Dr. Zohar has focused on enhancing excellence, equity, and accessibility in computer science education.

A. Rolnik, an educator and jurist, has been a prominent figure in science and technology education in Israel for four decades. In recent years, her work has focused on advancing scientific and technological excellence within the national education system. Among her notable achievements, Anat was one of the founders of the Scientific-Technological Cadet Program, which transformed the national approach to science and technology education and led to a significant increase in the number of students earning high-quality matriculation certificates. She also led Israel's national science teams for six years, founded both the Israeli Biology Team and the Young Israeli Team, and helped expand opportunities for excellence among students nationwide. Most recently, Anat directed the Israeli High-Tech Program at the Ministry of Education, working in close cooperation with the public sector, high-tech companies, NGOs, and philanthropic foundations to promote excellence and strengthen the connection between education and the high-tech industry.

Appendix A: Examples from the Informatics Olympiads

The core of the IOI competitions is algorithmic problem solving. Today online preparation sessions are offered, these sessions help students develop skills in writing pseudocode (between Phases A and B) and basic programming (between Phases B and C).

Such algorithmic problems can be found in David Ginat's column in the *ACM InRoads* Magazine, for example: "Given the points 1 .. N in the X-axis and the points 1 .. N in Y-axis of a Cartesian coordinates system, where N is even; each point i on each axis is connected, with two lines, to two points on the other axis – the points i and N-i + 1; devise a recursive solution for computing the number of line intersections. For example, for N = 2, the answer is 1; for N = 4 the answer is 10. (If two lines meet on one of the axes, we do not consider it intersection.) The challenge may be solved directly, with suitable counting. It may also be solved recursively in some cumbersome ways. We are asking for an elegant, illuminating, recursive solution." (Ginat, 13) The emphasis on simple and elegant solutions makes these problems even more challenging.

In (Ginat, 14) the problem presented involves optimizations task, which was designed to exercise induction and abstraction. Through these and other algorithmic challenges, students refine their abstraction and creativity, deepening their understanding of algorithmic problem-solving – the core of computer science.