Science Olympiad
A Hands-on Science Experience for Students Nationwide
Sports is where it's at in America. Whether it's Pop Warner football, Little League baseball, or AYSO soccer, from an early age kids are primed to dream of making it to the Super Bowl, World Series, or World Cup. But what about kids who are more academically inclined? Fortunately, 32 years ago, a group of science teachers began a grassroots movement that led to the creation of the Science Olympiad for students who compete using brainpower over muscle power. In the 1970s and early 1980s, Olympic-style science competitions were being held for students in Pennsylvania, North Carolina, and Delaware. The Delaware program caught the attention of Dr. Gerard Putz, a science director and consultant for a school district in Michigan.
He invited Jack Cairns to come and share the Delaware program with science teachers and educators in his county. After holding two successful regional competitions in Michigan, Dr. Putz convinced Mr. Cairns to team with him and take the program nationwide.

An appeal was made at the annual convention of the National Science Teachers Association in 1984, and with the sponsorship of the U.S. Army (which was in need of increasingly high-tech recruits), Michigan State University hosted the first Science Olympiad National Tournament on its campus in 1985 with student teams representing 17 states.

From that humble beginning, the program now has more than 7,000 middle school and high school teams participating from all 50 states, each team striving to make it to the national competition. A further 10,000 elementary schools hold local Science Olympiad tournaments and/or host hands-on science events. In all, as many as 400 tournaments take place each school year, culminating with the annual National Tournament. And it's not just in the United States any longer. Although they participated as unranked guests, Global Ambassador Teams from Japan have been welcomed at recent National Tournaments—teams that won similar competitions in their home country and were awarded this trip to America.

**A Program on a Mission**

The Science Olympiad is a national nonprofit organization on a mission. Per its Web site, it seeks to "improve the quality of K-12 science education, increase student interest in science, create a technologically literate workforce and provide recognition for outstanding achievement by both students and teachers." The group pursues this mission via a number of means: working to improve and incorporate basic Science, Technology, Engineering, and Mathematics (STEM) concepts and practices into school curricula; hosting professional development workshops and institutes for teachers; and sponsoring tournaments for teams of students.

To help students see connections between basic concepts and their applications, topics covered within the program fall within three broad rubrics: Science Concepts & Knowledge, Science Processes & Inquiry Skills, and Science Applications & Technology. The hope is not just to increase national test scores, but to create a passion for science by changing the ways it is perceived by students and taught by instructors. Rather than rote memorization and regurgitation of facts and figures, the emphasis shifts to the processes of science, problem solving, and practical hands-on learning involving real-life applicability. Science isn't just the stuff of dry textbooks, but a means of tackling real-world problems.

In addition to its stated mission, Science Olympiad has proved to be a real boost for girls. Within STEM fields, a gender gap
opens early. One study has shown that by eighth grade, boys are more than twice as likely as girls to even aspire to be a scientist or an engineer. Other studies have shown that although women comprise nearly half the U.S. workforce, less than a quarter of the workers in scientific fields have been women. The numbers in engineering are even more disparate, with only one out of seven practicing engineers being female. The only exceptions to these trends are in the social and life sciences.

But while girls and women are underrepresented in STEM courses and careers, in general, fully half of the Science Olympiad participants are girls. Thus, the program is helping open the door to science in an equitable way for both boys and girls. A parallel goal is to open that same door for minority students, who are also traditionally underrepresented in STEM fields.

**Encouraging Kids K-12**

The nature and complexity of Science Olympiad is adjusted to grade level. It begins with Division A, the Elementary Science Olympiad (ESO) program for kids in Kindergarten through sixth grade. For this younger cohort, ESO encourages “Fun Days” or “Fun Nights” built around science themes and focused on hands-on activities as well as competitive tournaments.

Things get more serious for students in middle school (Division B, grades 6-9) and high school (Division C, grades 9-12). Schools form teams of 15 students who then train like athletes, getting coached and attending practices throughout the year with full-on commitment. Teams are sometimes larger than the 15 core students, with younger students attending practice sessions as apprentices and experienced students who have been through the process serving as mentors. The teams work not only with fellow students and teachers, but with school principals, parents, and even local business and industry leaders.

The program has as many as 23 events for Divisions B and C incorporated within the full spectrum of STEM disciplines. Those disciplines are: Life, Personal & Social Sciences; Earth & Space Science; Physical Science & Chemistry; Technology & Engineering; and Inquiry & Nature of Science. Four or five events are covered within each of these five disciplines, with events differing slightly between Divisions B and C. For instance, within the discipline of Earth & Space Science, Division B events for middle schoolers in 2016 include Dynamic Planet, Fossils, Meteorology, Reach for the Stars, and Road Scholar, whereas Division C events for high schoolers include Astronomy, Dynamic Planet, Fossils, and Geologic Mapping.

For descriptions of the disciplines and
Students working in pairs rotate through stations to answer questions about classification, habitat, ecologic relationships, and behaviors in the Fossils event.

their respective events, go to soinc.org/short_event_descriptions. The brief description of the Fossils event, for example, reads: “Teams will demonstrate their knowledge of ancient life by identifying fossils and answering questions about classification, habitat, ecologic relationships, behaviors, environmental adaptations and the use of fossils to date and correlate rock units.”

Building Teams

Building a team begins on the local level, usually with a science, math, computer technology, or industrial arts teacher who steps forward to serve as a coach at the beginning of a school year. Unfortunately, money is always scarce in our American educational system, especially for extracurricular activities. So just as with football, drama, or band, funding is needed, and it is essential to gain the support of the principal, PTA and parents. Local technology-related companies might help contribute to the cause. Science Olympiad has promo-
tional DVDs that can be shown to help the coach’s efforts. And as with any after-school activity, participants can expect to take part in bake sales, car washes, and similar fundraisers to bring in the necessary nickels and dimes. Coaches also need to register with their state’s Science Olympiad organization (www.soinc.org/state_websites) and pay a fee to become an affiliated team and obtain the Science Olympiad manual.

Concurrently, coaches need to recruit students to form a team. They list and explain the Science Olympiad events to engage students with the variety of abilities and interests necessary to cover the 23 event topics. Rather than simply soliciting volunteers and seeing who steps forward, some schools host a science contest in which students compete for a place on the team. Once a full roster of 15 students is in place, preparations begin with a practice schedule that may involve meeting once a week or more, including weekends, throughout the school year.

Because the 23 events cover the entire spectrum of science, technology, engineering and mathematics, it is vital that the coach engage and involve other teachers, as well as outside experts (for instance, a practicing engineer, a doctor or nurse practitioner, etc.) and parents. These adults should serve as mentors and advisors and should not run the whole show. Instead, coaches are encouraged to transfer as much responsibility as possible to student hands when assigning events to team members, scheduling practice sessions, and so forth.

A big goal is to teach individual initiative and responsibility along with teamwork and collaboration among participants. Most scientific careers involve working in teams, so Science Olympiad fosters teamwork and cooperative group learning that joins kids with different talents and skills to tackle a common problem. They cite an Elevated Bridge event wherein "an engineering whiz and a kid from wood shop can become gold medalists".
Competing in Tournaments

In addition to teamwork, emphasis is placed on fostering excitement and a sense of fun in a supportive environment, similar to the school spirit encouraged in the football or basketball program, putting what one school calls their “intelletes” on par with athletes. Much of that excitement comes from competing in tournaments held at regional, state and national levels, often with members wearing team hats or T-shirts and waving team banners. States or private groups sometimes sponsor “invitational” tournaments that serve as practice rounds for regional and state competitions. Just as with sports, teams need to excel at the regional tournaments before advancing to state and, finally, national levels. The most successful schools maintain a long-term, multi-year commitment. It would be unusual for a team to advance to the national level in just one year. More often, a new team participates in a regional tournament in its first year and, with that experience under its belt, moves to state competition in a subsequent year.

To cover all 23 events, team members
divide up responsibility. Usually, two (sometimes three) members from the team participate together on a particular event, so an individual student is likely to be involved in at least three, and sometimes more, events. Knowledge-based events may see participants taking a test—for instance, “answer questions relating to physical and geological oceanography”. Hands-on events often require performing experiments to solve a problem (“perform chemical and physical tests and analyses to solve a crime”). Engineering events require constructing devices and testing them against those constructed by competing teams (“construct elastic launched gliders designed to achieve maximum air time”).

As you can see, this variety of events calls upon teams to be built around students with varying intellectual and practical skill sets. Events change and/or are updated every year, so experienced teams don’t enter competitions with an unfair advantage. The winning team is determined by adding up an overall score from performances in all 23 events.

Teams that are successful at state levels look forward to late May. That is when the annual Science Olympiad National Tournament is held on a college campus. Upcoming tournaments will be held at the University of Wisconsin-Stout (2016), Wright State University (2017), and Colorado State University (2018). Usually, 120 teams participate (60 in Division B; 60 in Division C).

Just as the Olympics open with a parade of athletes from each participating country, so Science Olympiad National Tournaments open with the Parade of States on Friday night, followed by a swap meet, where students can meet one another and exchange gifts. There is also a welcoming address—sometimes delivered by a Nobel Laureate! Most of the event competitions are done on a single day in overlapping 60-minute blocks, and a formal Awards Ceremony is held Saturday night. Awards include ribbons, medals, trophies, and plaques, but hosting universities also sometimes provide tuition waivers and cash scholarships. In addition to the tournament, the university may host booths with representatives from science and technology companies and/
Lab skills, as well as engineering, building, communication, and problem-solving talents, are put on display at Science Olympiad tournaments.

or provide career counseling sessions with professors, scientists and professionals who give students insights into jobs that might lie ahead for them.

A Continuing Endeavor & Commitment

The Olympics is not a one-time event for athletes, but rather the culmination of a journey. It demands long and constant training and preparation. So, too, the Science Olympiad is not just a one-shot deal. The national organization encourages teachers to incorporate their ideas and projects into classroom curricula on a daily basis, and offers professional development workshops.

After the National Tournament concludes, enrichment opportunities continue for both teachers and students. The organization offers a Science Olympiad Summer Institute for teachers and summer camps across the country for students. The National Competition is merely the icing on the cake. The true pleasure comes from baking that cake—and then continually playing with the ingredients.