

Lemelson-MIT Program

The [Lemelson-MIT Program \(LMIT\)](#) continued its mission in 2019–2020 of celebrating outstanding inventors and inspiring youth through its awards, invention education, and communication activities. The Lemelson-MIT Program maintained implementation of the national awards program, invention education activities, and EurekaFest, but with noteworthy programmatic changes.

Noteworthy Outcomes

- The 25th and final \$500,000 Lemelson-MIT Prize was awarded to inventor of renewable energy technologies Cody Friesen, founder and CEO of Zero Mass Water.
- There were six winners in the national student prize competition for graduate and undergraduate students.
- Lemelson-MIT partnered with Beyond Benign, AVID (Advancement Via Individual Determination) Education, and MIT pK-12 Action Group and Open Learning to develop additional teaching resources and invention education packages in response to COVID-19.
- The program led the formation and ongoing development of invention education research with two additional research reports.
- LMIT collaborated with Biogen to launch Biogen-MIT Biotech in Action, a new virtual Learning Lab for students underrepresented in STEM.
- The first virtual EurekaFest was a success, with over 800 participants accessing the webcast site.
- Email marketing efforts continued to promote InvenTeam grant opportunities, Excite awards, and professional development offerings.
- The program also received continued recognition for InvenTeams from elected officials through community engagement efforts.
- There were three more InvenTeam patent grantees, two from pro-bono help brokered by Lemelson-MIT from the Microsoft #MakeWhatsNext patent program.
- LMIT developed two new JV InvenTeam activity guides on toy design and a companion activity guide on computational thinking.

Further detail, goals, and accomplishments are described below.

Recognizing Outstanding Inventors

Lemelson-MIT's activities to recognize outstanding inventors and inspire youth to lead creative lives through invention include two annual awards: the \$500,000 Lemelson-MIT Prize and the \$10,000–\$15,000 Lemelson-MIT Student Prize.

The Lemelson-MIT Prize has been awarded for 25 years. While the criteria for determining the winner has changed slightly over time, the program has been administered in accordance with Jerome Lemelson's original intent to "provide young Americans with inspirational role models" through a prize that would "capture the imagination, admiration, and respect of the world at large." The 25th Lemelson-MIT Prize was awarded to Cody Friesen in September 2019.

The Lemelson Foundation and the Lemelson-MIT Program decided to discontinue the \$500,000 Lemelson-MIT Prize as of 2019. The announcement was made on the LMIT website in December 2019, which explained that the Lemelson Foundation and LMIT's goal is to deepen its commitment to invention for K-12 and higher education and to expand the impactful work happening on college campuses and in K-12 schools across the US. The Lemelson-MIT Program and the Lemelson Foundation are working with Rand and History Associates to study, document, and communicate the societal and economic impact of individuals who have been awarded the Lemelson-MIT Prize. Up to six winners will be profiled through multiple forms of media (audio, video, print). The unveiling of this information to the public is scheduled for National Inventors Day on February 11, 2021.

Cody Friesen, PhD, inventor of renewable energy technologies and SOURCE hydropanels, received the highest amount of media coverage for a winner. His press announcement exceeded 333 million impressions. Impressions attributed solely to traditional media (online, print, broadcast) amounted to over 259 million impressions.

Lemelson-MIT Student Prize Competition

The national Lemelson-MIT Student Prize competition is open to graduate students and teams of undergraduate students who are selected based on their inventive work and its significance to the US economy. Non-monetary student prize incentives include prestige; communication and media training; networking opportunities with other inventive students, judges, past winners, and the Lemelson network overall; and a push for significant media coverage to bolster the winners' trajectory. The prize categories remained the same for 2020: "Cure it!" (healthcare) "Use it!" (consumer devices), "Eat it!" (food/water and agriculture), and "Move it!" (transportation and mobility).

Lemelson-MIT Student Prize recruiting efforts through email marketing resulted in 188 applications, an increase from last year's 116 applications. The application goal is 200 applicants per year. There was also a broader national representation, with applications from 88 colleges and universities across 32 states. As with prior years, the quality of applications remained high. The "Eat it!" category had a record number of applications, while numbers increased slightly for "Move it!", a category that struggles to find applications, especially among graduate students. Representation of female graduate student applicants increased from 20% to 26%. However, female undergraduate student team members decreased markedly since last year, from 34% to 26%. Underrepresented minorities as a percent of total applicants remained generally consistent with last year's numbers for both graduate and undergraduate students. Ten percent of graduate students and 16% of undergraduate team members indicated that they receive a federal student loan, which is a slight decrease from last year. Female, underrepresented

minority, and federal student loan status is self-reported, with only a selection of applicants providing this data.

Screening committees were formed to select finalists in the competition's four categories. These committees included experienced screeners from the Lemelson-MIT Prize and experts in health technology, consumer products, transportation, and food and agriculture. Finalists submitted videos of their inventive work along with letters of support. The same national jury that selected the winner of the \$500,000 Lemelson-MIT Prize reviewed and selected the winners of the \$15,000 graduate student prizes and \$10,000 undergraduate team prizes. Six prizes were awarded in April 2020, with awards going to three graduate students and three undergraduate student teams. No prizes were awarded in 2020 in the "Move it!" graduate category and the "Eat it!" undergraduate team category. Two of the six winners were from MIT. The six winners of the 2020 Lemelson-MIT Student Prize are:

- Shriya Srinivasan, "Cure it!" graduate winner, MIT, who developed the cutaneous mechanoneural interface (CMI), a new type of surgical process for amputations that would allow a person to sense what their prosthesis feels.
- Augeo: Siddharth Iyer, Jasmine Hu, Mathias Insley, Diane Lee, and Eric Lin, "Cure it!" undergraduate team winners, Johns Hopkins University, who developed a cryogel polymer-based embolization solution that can quickly expand to many times its size, resulting in an inexpensive and simple way to permanently stop a patient from bleeding internally.
- Tzu-Chieh Tang, "Eat it!" graduate winner, MIT, who developed Syn-SCOBY, a special kind of tea mushroom that can be grown at home and used to create a filter to detect and remove pollutants in water.
- Celestine Ananda, Bennett Bartel, Nicholas Bartel, Cassandra Bossong, and Taylor Peterson, "Move it!" undergraduate team winners, Carthage College, who invented the modal propellant gauging technology to properly gauge the amount of fuel left in a spacecraft or airplane tank.
- Daniela Blanco, "Use it!" graduate winner, New York University, who invented a greener chemical reactor, which is a machine that transforms a raw material into a useable product, and an optimized system for energy storage and hydrogen production.
- Neptune Plastics: Marx Acosta-Rubio, Grant Christensen, and Hal Jones, "Use it!" undergraduate team winners, Brigham Young University, who invented a biodegradable and compostable plastic bag that is safe for wildlife to eat.

Winners were announced through a press release on the Lemelson-MIT website and in coordination with their respective schools on April 27, 2020, and through the launch of MIT Full STEAM Ahead Week 6 package. Unfortunately, the Lemelson-MIT Student Prize media announcement was impacted by COVID-19, and the national media campaign will be delayed to late summer and fall.

LMIT also celebrated the winners at our first virtual EurekaFest held on June 17, 2020.

Inspiring Youth

LMIT's activities to inspire youth to lead creative lives through invention include invention education, InvenTeams, JV InvenTeams, community engagement, and EurekaFest.

Invention Education

LMIT's invention education activity consists of collaborations with organizations to promote inventive thinking and doing. This is also the arena in which LMIT pursues new research opportunities and engages with the MIT K–12 STEM community.

InvenTeams

InvenTeams, LMIT's premier hands-on invention experience for teams of high school students, educators, and mentors, continued as a national program. LMIT announced the selection of 14 2019–2020 InvenTeams, representing 12 US states, on October 23, 2019. InvenTeams' projects were under way by November, with teams completing research and outreach to beneficiaries/customers. Prototypes were built and iterated in December 2019 through late March 2020 before schools began to close due to COVID-19.

Recruitment for 2019–2020 InvenTeams resulted in 48% female student representation and 50% of members from schools with free or reduced-price lunch.

The Lemelson-MIT Program implemented one change to the InvenTeam initiative offerings. During the 2019–2020 grant year, all teams were required to submit their research protocol for institutional review board (IRB) approval. Recent changes to the government common rule and the desire for students to invent with, rather than for, their intended beneficiary precipitated this change. A new team role—research lead—was added to facilitate this. Teams will spend \$500 from their budget for an independent IntegReview IRB to approve their protocol.

Lemelson-MIT also made a change to the Excite Award. Previously, InvenTeam finalists were considered Excite Award recipients and received all-expenses paid professional development training during EurekaFest as their award. Starting in the 2020–2021 grant cycle, the Excite Award and InvenTeam application are separate. The Excite Award will be a stand-alone award for K-12 educators nationwide and recipients will attend summer professional development training at the end of July. The InvenTeam application will still be a two-stage application and finalists will be supported with synchronous and asynchronous webinars in the spring and summer to support the development of competitive final applications. This change will help build a stronger and more diverse base of invention educators within Lemelson-MIT's network, as well as local champions in each community.

LMIT continued programmatic InvenTeams activities, including the following:

- Conducting all 14 InvenTeams site visits prior to the end of 2019. Site visits early in the grant cycle offer guidance to teams for successful start up of the invention process
- Conducting InvenTeams informational webinar for the public during the recruiting season to raise educators' awareness of LMIT's InvenTeam grant opportunity and to answer questions

- Holding trainings with each team in communications/public relations and basic finance using Zoom video conferencing
- Supporting InvenTeam master teachers to attend site visits/mid-grant technical reviews for InvenTeams
- Requiring teams to hold mid-grant technical progress reviews open to their respective communities and to engage elected officials
- Recruiting via email marketing and selecting the 2020 Excite Award recipients, who will receive free summer professional development training

Junior Varsity InvenTeams

In-kind grants are no longer provided to schools, but we continue to develop our activity guides and use them as the foundation for invention education for both youth and educators. The guides continue to be offered for free on the LMIT website, where customized material kits may be purchased. Pricing on kits is continually optimized to make them as economical as possible. Currently, no kit costs more than \$400 for groups of 20 students. The new green chemistry activity guide developed with Beyond Benign was released on June 18. Since early in the year, LMIT has been posting about green chemistry and the guide on all social media channels, and cumulative impressions total almost 27,000. Additional email and/or direct marketing will take place in the fall once schools are again in session. In addition, a computational thinking companion guide and toy design guide were finished and will be designed and released in late August or early September 2020.

Community Engagement

Lemelson-MIT started a community engagement campaign in 2011 with the goal of creating awareness among political and community leaders about InvenTeam projects happening in their community and the support needed from the community to sustain such projects throughout the school year and beyond. Success of this campaign is dependent on consistent and ongoing outreach. LMIT sends a letter to political leaders at the start of the InvenTeam grant period. The schools receive a certificate of appreciation citation from political leaders in response to LMIT's letters. This recognition helps excite and encourage InvenTeams. The letter and email campaign for the InvenTeams was executed in late January in anticipation of the letters arriving on the desks of elected officials during National Inventors Day in February. Elected and school officials in each InvenTeam community received a letter from LMIT that encouraged recognition of the InvenTeam and/or attendance at their mid-grant technical review event. Emails were sent to school administrators and additional supporting local companies that were listed in the InvenTeam grantee's application. InvenTeams used social media to communicate with their local elected officials and STEM community. Online community engagement presence resulted in 613 total posts to social media. News sources at the local level wrote 31 articles about the InvenTeams, their invention ideas, and EurekaFest. The InvenTeams' community engagement presence resulted in over 7,972 likes and 477 shares and retweets on social media channels (Twitter, Facebook, and Instagram) as of June 30, 2020.

Cultivating a culture of invention in the community is imperative to building an ecosystem of invention. The following list highlights the impact of InvenTeams' community engagement for 2019–2020:

- The 2018 SOAR Early College High School InvenTeam from Lancaster, California, led by teacher Rachel Thibault, received their second patent on January 7, 2020. [Patent #10,529,216 B1](#) was awarded to the team for their invention of a personal safety system that can detect the presence of an individual who is nearby or even behind the user. Patent attorney Adam Stevenson of Tempe, Arizona, offered the team pro bono legal assistance.
- The predominately female InvenTeam from Stockbridge High School in Stockbridge, Michigan, was issued a US patent on June 23, 2020, which also happened to be International Women in Engineering Day. [Patent # 10,690,646 B2](#) was awarded to the team for their invention of an underwater camera and water quality monitoring system. The team, led by teacher Bob Richards, received pro bono legal assistance through Microsoft's #MakeWhatsNext patent program.
- The 2017 Poolesville High School InvenTeam in Poolesville, Maryland, was issued a US patent on June 2, 2020. [Patent # 10,672,213 B2](#) was awarded for their money sorter for the blind and visually impaired. The team, led by teacher John Williams Stansberry, also received pro bono legal assistance through Microsoft's #MakeWhatsNext patent program.
- The three patents bring the total to 11 InvenTeams being awarded US patents, with 128 students named on them (38% female).
- Tom Jenkins, a STEM educator from the Greenon High School InvenTeam from Ohio, was a 2020 recipient of the Excellence in Teaching Award from the Rotary Club of Springfield, Ohio, this past March. The award is given annually to outstanding teachers. Jenkins has been a teacher for 23 years. He has degrees in elementary education, science teaching, and engineering education.
- This spring and summer, several Lemelson-MIT educators nationwide have been working diligently to build personal protective equipment for health-care workers and first responders on the front lines of fighting COVID-19. They include Doug Scott of Hopkinton High School in Massachusetts and Mark Westlake of Saint Thomas Academy in Minnesota, who was featured on *Good Morning America*.

EurekaFest 2020

LMIT held its 14th annual EurekaFest event on June 17 virtually, due to the COVID-19 pandemic. The event had been scheduled for a special 25th anniversary celebration in Washington, D.C.

EurekaFest recognized and celebrated InvenTeams and the Lemelson-MIT Student Prize winners. The virtual event included special guest speaker Andrei Iancu, under secretary of commerce for intellectual property and director of the United States Patent and Trademark Office, and Carol Dahl, executive director of The Lemelson Foundation.

LMIT had over 800 people visit the EurekaFest webcast, with nearly 400 joining on the day of the event and an additional 125 viewing the event afterward, making it more accessible to people around the world.

Partnerships and New Invention Education Activities

Dewey Square Group

LMIT reengaged public relations firm Dewey Square Group for a national media awareness campaign for the Lemelson-MIT Student Prize winners and the retrospective study work for the Lemelson-MIT Prize.

New Initiative: InventionAdventures

In the last quarter of 2019, Lemelson-MIT identified six sites for middle school-level invention education camps throughout the US, to be led by InvenTeam educator alumni. Using JV InvenTeam activity guides and material kits, campers were to learn the concepts of invention and engage in additional creative activities that spur inventive thinking. The first quarter of 2020 was devoted to program planning and launching camp registrations, but efforts were halted because of COVID-19. This initiative will be revisited in summer 2021.

Full STEAM Ahead

As a rapid response to the COVID-19 pandemic, LMIT partnered with others at MIT to create online learning resources for teachers, students, and families. LMIT created two weekly invention education modules that helped students think like inventors by teaching them to identify problems and iterate solutions. Videos and activity guides provided in-depth guidance for parents and educators alike. Full STEAM Ahead had the highest engagement, with 35,000 page views and over 15,500 total sessions during our first week of invention education activities. Lemelson-MIT also collaborated with AVID (Achievement Via Individual Determination) to bring both Full STEAM educational packages to their teacher network and received 80,356 page views from their launch in May to June 30.

Biogen-MIT Biotech in Action: Virtual Summer Lab

Lemelson-MIT collaborated with Biogen to provide a free online summer program that taught students about biotechnology and the unique ways neuroscientists and inventors use STEM knowledge to solve problems. The program content centered around topics and methods regularly used by scientists to develop new biotechnology. Throughout the week, students learned about viable treatment and research for neurodegenerative diseases, with a focus on Parkinson's disease. Biotech in Action welcomed 80 students for each week-long program, with five sessions running throughout July and August 2020, reaching a total of 400 students. Utilizing a wealth of technologies, the students engaged in problem-solving exercises, interactive group projects, and lab simulations. Biogen also provided free laptops and WiFi hotspots to students who might not otherwise have the resources or technology to participate.

Online Offerings

LMIT is adapting existing resources used for in-person programs to online learning geared toward youth and K-12 educators. This includes creating a virtual InvenTeam experience that will allow teachers and students to learn critical skills in problem identification, design thinking, iteration, and prototyping. For the first time, LMIT teacher professional development will be offered online. Multiple technology platforms, integrated with funding from Biogen, are being utilized to provide as broad a range of learning as possible and allow for meaningful interaction between students and with instructors. Platforms that will be used include the learning management system Canvas, along with Labster, Flipgrid, and Zoom.

New Research

Lemelson-MIT continues to lead ongoing development of invention education research with two additional research reports. One report, “Policy Initiatives Needed to Foster Female Inventors’ Contributions to US Economic Growth,” written by Stephanie Couch and Leigh Estabrooks at the end of June, will be sent to a targeted list of nonprofits and corporations with similar missions, perspectives, and resources to help move forward the issue of lack of diversity in patenting. Another paper was also published in the National Academy of Inventor’s conference journal.

Administration

The four-year grant period with the Lemelson Foundation started January 1, 2018.

Finances and Funding

Funding to LMIT from the Lemelson Foundation runs on a calendar year cycle. The 2020 funding level is \$3,595,868.

Personnel Changes

At the end of 2019, Emily Meehan left as administrative assistant, and Zoe Vanderschmidt, the program assistant, left in early 2020. Three new hires were made in March to fill these and a longer vacant position: Alma Lundberg is the new administrative assistant, Sam Situ is the invention education program assistant, and Laura Lopez is the program assistant supporting the executive director, prize program, and communications.

Future Plans

The Lemelson-MIT Program plans to do the following:

- Continue to carry out the program initiatives in accordance with the four-year grant proposal with the Lemelson Foundation
- Conduct the Lemelson-MIT Prize retrospective data gathering, analysis, and report, and finalize dissemination plans
- Increase diversity in recruitment efforts for the Student Prize program

- Cultivate additional sources of funding and partnerships that support expansion of the program
- Launch a website redesign in fall 2020
- Offer ongoing professional development webinars and courses for invention education
- In partnership with Dewey Square Group, continue national media campaigns to bring awareness of inventors and Lemelson-MIT Student Prize winners
- Complete recruitment efforts for the 2021 student prize applicants and conduct a first round of reviews
- Select the 2020–2021 InvenTeams
- Promote new JV InvenTeams activity guides: “Green Chemistry,” “Toy Design,” and “Computational Thinking and Coding”
- Conduct research and write papers for publication

Stephanie Couch
Executive Director