Partners in Invention Education

LEMELSON·MIT

Catalogue

Create your pathway to invention education

Welcome from the Executive Director

The Lemelson-MIT Program (LMIT) is grateful to have the opportunity to work with you to provide learners with access to opportunities for learning ways inventors find and solve problems that matter. Our work throughout the past two decades has shown us that all people can learn to invent, protect their intellectual property, and bring their creations forward so that they can make a positive difference in the world.

Invention, and technological invention in particular, requires the application of knowledge and processes from many different disciplines. We often say that it is a "team-based sport." This means that educators with a wide variety of backgrounds can adopt this approach to teaching and learning. LMIT is ready to help!

Educators with whom we have worked often say that the work has transformed their teaching. Once they get past their first try, they also describe the work as fun and deeply meaningful as they see the transformation that happens with learners. We hope you have fun as we embark on this learning journey together.

Sincerely,

Stephanie Couch

Stephanie Couch, PhD
Executive Director, LMIT

For more information, please contact Cristina Saenz at saenzc@mit.edu

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What is the Partners in Invention Education Program?

Partners In Invention Education (PiE) is a member-based professional learning community—in partnership with the Lemelson-MIT Program (LMIT)—that focuses on building strong pathways to invention (pre-K through adult) and increasing the number of inventors from diverse backgrounds. PiE offers unique resources that schools, districts, and community colleges can selectively use to jump-start their Invention Education (IvE) offerings. Through the annual subscription-based PiE membership, LMIT collaborates with members to assess, design, and implement educational offerings that enable students to apply STEM knowledge to the invention of solutions to real-world problems.

This catalogue provides PiE members with a description and breakdown of the various resources and supports available within each grade band. Using this catalog, PiE members can customize their own PiE experience to meet the unique needs of their students and school communities.

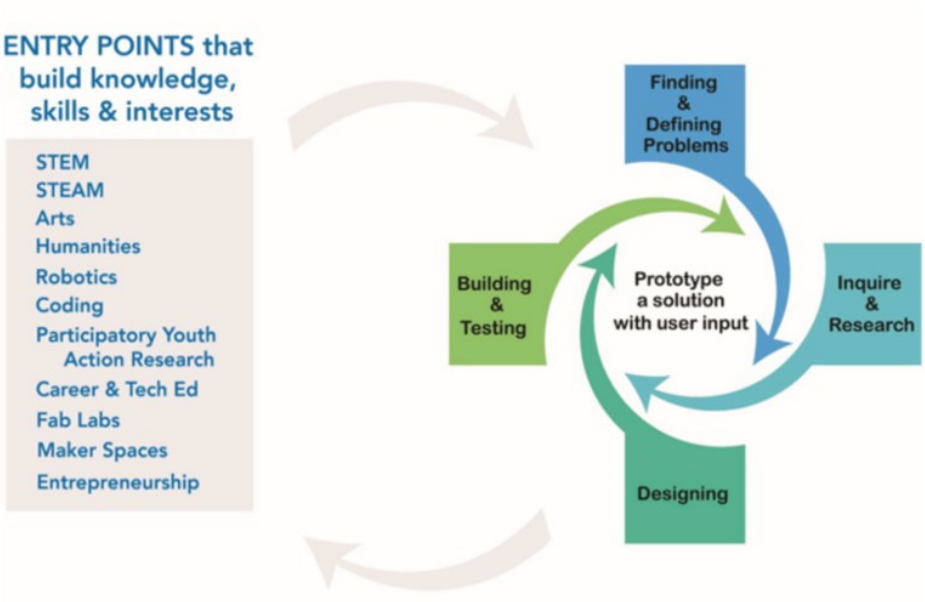
Invention Education

Invention Education educators serve as facilitators of learning, as opposed to owners of knowledge. Educators draw on the knowledge of community members and technological experts as they learn alongside their students to find and define problems and build useful and unique solutions that improve society.

Invention Education is an inquiry- and project-based approach to education that builds on the cultural knowledge and other assets students bring to their classrooms and learning experiences. A fundamental principle guiding the IvE movement is that inventiveness can be developed.

Students learn to find and define problems so they can build useful and unique technological solutions that improve lives.

The Invention Cycle



The transdisciplinary nature of IvE provides multiple entry points for students of all ages, from varied backgrounds, with diverse skill sets. Invention education is unique because of the emphasis we place on students learning to identify and solve problems within their own lives and communities. We believe problem identification, just like problem-solving, is a skill that must be practiced early and often. As students engage in the iterative and recursive processes of invention depicted in the diagram above, they also develop social-emotional skills and become more inclusive thinkers. Additionally, students who participate in invention education develop deep content-area and technical knowledge, along with teamwork and communication skills.

Invention Education Matters

Invention and innovation require new ideas and different ways of thinking. Currently, the invention ecosystem in the United States lacks diversity. Our research offers evidence that our creative, transdisciplinary problem-solving approach—known as invention education—helps students of all backgrounds develop interest, confidence, and capabilities in science, technology, engineering, and math (STEM), as well as invention and entrepreneurship. LMIT believes that all students need opportunities to apply knowledge from different subjects to invention projects at every grade level. Repeated exposure to the process and expertise developed over time will afford opportunities for students to be able to develop increasingly sophisticated solutions to real-world problems, as shown in the diagram below.

PiE Offerings

Through our PiE partnership, LMIT collaborates with members to determine effective and efficient ways of building pathways for students to continuously engage in the invention process. Our team brings in expertise from a variety of sectors to design, implement, and assess which strategies and programs will help invention education take root within your community!

Following, we outline the three major components of the PiE membership:
Professional Development, Working Groups, and **Individualized Support.**

Customize your PiE experience by selecting which components, services and/or supports your schools, teachers, and students need from the options within each component.

Professional Development

As a part of your membership, teachers have access to professional development that supports their work as facilitators of invention education.

- ☐ Invitation to attend EurekaFest 2023 presentations and exhibits
- ☐ Invitation to participate in the 3-day 2023 Professional Development Summit (Gold members receive an unlimited number of registrations, Silver members receive 3 free registrations)
- ☐ District/school introductory PD sessions
- ☐ District/school-specific curriculum sessions (if teaching specific curricula not covered in the general introductory PD)
- ☐ LMIT webinar series

Working Groups

As a part of your membership, educators within your school or district will be able to engage with a group of experts and educators across the country to achieve specified goals. Continuous engagement with like-minded STEM professionals willing to share information and expertise plays a central role in tethering our shared commitments to equity and social justice.

The groups can change on a yearly basis, depending on the identified areas of growth of our PiE members.

For the 2022–2023 school year, working groups are based on the following subject areas:

- ☐ Inventing in the early years (elementary/middle)
- ☐ Capstone participants (high school)
- ☐ i3 participants (community college)
- ☐ Problem finding and solving in transportation
- ☐ Problem finding and solving in agriculture
- ☐ Leadership

Invention education is a teaching strategy that engages educators as facilitators and students as inventors in problem identification and solution design for the betterment of society.

Individualized Support *Including curriculum review*
(Gold: 40 hours; Silver: 3 hours)

The bulk of our PIE offerings fall under the individualized support category. Below are the services we offer to support you as you implement invention education in your schools and districts. When support is combined with our wide array of curriculum and resources, partners can jump-start their invention education program quickly and efficiently.

Curricula Review/School Implementation
- ☐ District- or site-level curriculum review with plans to augment existing instructional offerings with invention education
- ☐ Access to teaching resources and curriculum available to PiE members only
- ☐ Co-teaching options (varies based on virtual vs. in-person and time required)
- ☐ JV InvenTeams with check-in meetings
- ☐ Patent research
- ☐ Proprietary curriculum design

Thought Partnership
- ☐ Professional connection to leaders in STEM, intellectual property, and entrepreneurship ecosystems across the nation
- ☐ Ongoing support from a team of researchers and experienced invention educators

Community Engagement
- ☐ Assistance with engaging your school, community, businesses, and elected officials to support invention education expansion efforts and advance diversity, equity, and inclusion in STEM, invention, and entrepreneurship
- ☐ Educating elected officials about your work
- ☐ Engaging IP attorneys to protect your students' intellectual property

Grant Writing
- ☐ Identifying funding opportunities to support your invention education expansion
- ☐ Grant-writing support
- ☐ In-house STEM and invention education researchers to document your progress and assist with augmentation of your goals
- ☐ Professional grant writer to assist in application efforts

Marketing and Communications
- ☐ Co-presenting at conferences
- ☐ MIT email addresses for participating school sites
- ☐ Banners for participating school sites
- ☐ Press releases (included in all memberships)

Research and School Design
- ☐ Support through early planning and design of a school or program with invention and innovation at its core
- ☐ Data collection: classroom observations, educator interviews, focus groups
- ☐ Documentation of the design process or educational approach
- ☐ Program design, including CTE pathways
- ☐ White paper collaboration

Event Coaching
- ☐ California Invention Convention
- ☐ Support for site entry to CAIC 2023
- ☐ Culminating site/district/region event planning guidance
- ☐ Event appearances (varies depending on in-person time)
- ☐ Kickoff event support
- ☐ Mentoring some inventors for event presentations
  (varies depending on in-person vs. virtual, number of inventors)
- ☐ Parent night support

LMIT Resources and Curricula

All LMIT resources and curricula align with the Next Generation Learning Standards from multiple subject areas.

PiE members have access to curricula, workshops, and professional development. We provide professional development for K–12 educators so that they can facilitate project-based invention education programs in their schools, classrooms, and after-school programs and camps. In addition to ongoing training, teachers and out-of-school educators can gain access to facilitators who support initial use of curricula. The activities embedded within the curricula are designed for learners within different age/grade bands so that students can continue to participate in invention education opportunities year after year. Many of the educators with whom we work begin with the goal of preparing students to submit the inventions developed through their program to local, regional, and/or state Invention Conventions.*

We also provide content resources and professional development for faculty and staff at two- and four-year colleges. We encourage K–12 schools and two- and four-year colleges to align offerings in local regions so that learners have access to a Pathway to Invention that begins in the early years and continues through college.

The following sections describe resources within each grade band.

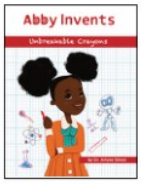
Grades K–5

Introducing Invention Through Children's Literature

InvenLit is a resource for teachers that allows them to use children's literature as the launching point to build empathy for others, identify problems within literature, and solve problems using STEM concepts, while igniting K–5 students' capacity for inventing. Through InventLit, teachers gain access to a repository of lessons tied to popular children's literature (examples include: The Very Hungry Caterpillar, Where the Wild Things Are, Abby Invents, El Deafo, and One Plastic Bag). InventLit was created by a group of educators who received a grant from the Lemelson Foundation. The educators who created InventLit are part of the larger invention education network and InventLit is a free resource for all teachers.

"Bee" the Inventor

"Bee" the Inventor is a 10-page STEAM activity book that teaches kids (ages 6–8) about invention through the role leafcutter bees play in our environment. In *"Bee" the Inventor*, students learn how to build a beehouse prototype for bees Shagun and Dwij.



Abby Invents

Abby Invents is an educational picture book written by Dr. Arlyne Simon that teaches the importance of perseverance as a young girl creates her first invention and earns a patent. Abby's crayons were constantly breaking. Fueled by her frustration, Abby invents the world's first unbreakable crayons. She even gets a patent to prove it! Through Abby's failures and eventual success, she playfully introduces young readers to STEM.

Inventing with Empathy

Using El Deafo as a launching text, students learn how empathy can drive the inventions we create. El Deafo is an autobiographical graphic novel written and illustrated by Cece Bell. In the book, the author shares the story of her own childhood and life with deafness. This resource guides educators on how to use details in the book to guide students to identify problems and design their own solution prototypes. Students will learn to create Scratch Story Cards to tell the stories of their inventions.

Cricket Media

LMIT collaborated with children's magazine publisher Cricket Media Inc., for their invention issues of *CLICK, ASK, DIG, COBBLESTONE,* and *MUSE*, which feature LMIT young inventors and staff members.

**Statewide Invention Conventions: California, Connecticut, Florida, Georgia, Idaho, Illinois, Iowa, Michigan, Missouri, New York, New Hampshire (Vermont & Northern MA included), North Carolina, Ohio, Pennsylvania, Wisconsin.*

Grades K–5, continued

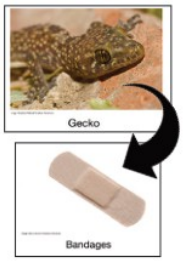
Howtoons

Howtoons are fun and creative cartoons that teach students how to build, create, and explore cool things. Aimed toward children ages 7–12, HowToons engages readers in activities like building a swing, zipline, and other playground equipment. Kids can even learn how to create patent drawings so that all their invention ideas can be put to paper.

Toy Design and Invention

This activity consists of 6 units that guide educators and students through understanding play and the toy design process. The goal of Toy Design and Invention is to cultivate new ways of thinking and to develop technical skills for students with limited access to hands-on STEM enrichment opportunities. Through prescribed activities, students will add to their own "toolkits" of minds-on knowledge and hands-on skills while having fun! Design thinking is explored, both unplugged and plugged. Ultimately, toys with computational components are prototyped with hardware, inputs, outputs, and software.

Biomimicry Lesson



Biomimicry is a practice used by scientists and engineers where they apply various structures and processes found in nature to current challenges like designing buildings and inventing new technologies. This lesson walks students through this process first with a brief slide presentation that introduces the concept of biomimicry. Students proceed with a matching activity that has them match the invention with the organism that inspired the design choices of the invention. Finally, students engage in the design process by making wings for the body of a balsa wood airplane that are inspired by an organism that is capable of flight.

Stand-Alone Activities

This section contains the stand-alone activities we offer at LMIT. These activities are meant to introduce students to inventing and do not require an abundant amount of time or expense to execute. PiE members can receive support in implementing these activities in their classrooms.
Any age group can benefit from these introductory invention activities.

Cell Phone Stand
Students build a prop for a cell phone out of cardboard.

Backscratcher Building
Kids build a backscratcher using simple materials.

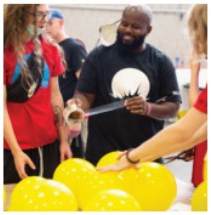
Problem Strips
Kids pick a "problem" from a hat and use everyday materials to solve it.

Grab Bag Inventing
Using a bag of pre-organized materials, students solve a specific problem-based scenario.

Designing for a Fairy or Wizard
This is a brainstorming exercise to help kids consider the needs of an end user when inventing.

Fun With Paper Airplanes
Kids build paper airplanes that must hit a specific target. The focus is on re-designing to get it right.

Jungle Survival Challenge
Kids build a model of a jungle shelter that has constrictions—it must be freestanding, six inches off the ground, and bear the weight of sleepers (i.e., marbles).



Balloon Tower Challenge
Students work in teams to build the tallest freestanding tower with balloons.

Treat on the Wall
Kids build a device using materials from the recycling bin to retrieve a "treat" taped up high on a wall or ceiling.

Bubble Challenge
Kids invent ways for a bubble to travel across a room without popping.

Paper Clip Challenge
Students re-envision the paper clip as a piece of wire with new purposes.

Trophy Tower
Kids make a strong structure out of straws to hold a trophy (i.e., tennis ball).

Hit the Target
Students invent a foot-activated ball launcher for a toy company.

Green Loungers
This is a two-session challenge where students first make a model of a chair using index cards and then build a full-scale chair out of cardboard, duct tape, and rope.

Rescue 911
Kids invent a tool to "rescue" a ball from a cardboard tube (i.e., kid stuck in a well).

Newspaper Clothes
Fashion show time! Kids design "green" outfits made entirely from newspaper.

FUN-Raising Games
Students invent a collection of games using materials from the recycling bin.

Light It Up
Kids learn basic circuitry and make their own flashlights to be more visible at night.

Grades 6–10

JV InvenTeam Projects

Ready-to-go guides and classroom kits* introduce students to the invention process

All activity guides are aligned with Next Generation Science Standards.

Through the PiE partnership, we support educators as they implement our JV InvenTeam guides in their schools. The goals of JV InvenTeams are to introduce students to the invention process, cultivate new ways of thinking, and develop technical skills for students with limited access to hands-on STEM enrichment opportunities.

Through prescribed activities, students will add to their own "toolkits" of minds-on knowledge and hands-on skills while having fun! Students will learn how to identify a need in their lives or in the world around them and develop their own invention after completing the main activity in each unit. They will pull from their expanding toolkit to come up with solutions.

The content is curated from the Massachusetts Institute of Technology (MIT) community and tested for quality and safety. Tools and materials lists are also available so educators can purchase what they need locally. Activities can be offered to students in many different contexts—as a supplement to coursework in the classroom setting, as enrichment activities in after-school programs, and as the core program offered in workshops or summer camps.

**Turnkey classroom kits of tools and materials for two teachers and up to 20 students are available for purchase. Contact us for details.*

Shoe Soles *(shoe design, biomechanics, biomimicry, drawing to scale, chemistry)*
Shoe Soles is a transdisciplinary guide that has applicable learning in biology (biomechanics, biomimicry), math (drawing to scale), art (clay models), and chemistry (mixing a polyurethane solution). Students are introduced to biomechanics and biomimicry with the purpose of giving them a foundation of knowledge to build a shoe sole prototype for a sport or activity of their choice. They learn how to draw to scale as they conceptualize their prototype, build a clay model, and then cast it in a polyurethane solution to create a rubber shoe sole.

Green Chemistry *(chemical science)*
This guide, developed in partnership with Beyond Benign, leads students through the creative application of green chemistry. Students will develop sustainable bioplastic prototypes made from benign materials in this Green Chemistry unit. They will learn about the life cycle of conventional petroleum-based plastics and consider how each stage of the life cycle could be improved to make the process more sustainable. Students will learn about the role that Green Chemistry plays in intentionally designing chemical products that are safer for humans and the environment. During their various trials, students will experimentally determine the role that the concentration and pH of a solution play in breaking down a starch into polymers and monomers. They will also learn how the type and size of starch granules influence the flexibility of their bioplastic. Students employ these chemistry principles to optimize their bioplastic formulation to create alternatives to plastics currently in use. They will consider improvements on the design as part of the prototyping process.

Electronic Textiles *(circuitry, fashion science)*
In this guide, students will activate their creativity to make wearable electronic textiles that light up and serve a specific purpose. Students first learn how batteries generate electricity and build their own battery cells using sanded pennies and a vinegar solution. Students also learn about conductors and insulators to guide them toward an understanding of open and closed circuits. They will build simple circuits in their design guides using conductive copper tape and will surface-mount LEDs. Students will learn how to hand sew for the purpose of using conductive thread in a textile design. Finally, they will create a wearable light-up textile using conductive thread and felt. Students will devise their own invention using electronics in the final meeting.

Chill Out *(heat transfer, circuitry)*
In Chill Out, the creative applications of heat and heat transfer are examined as students learn to build a lunchbox. Students will first learn about heat and heat transfer through readings and hands-on activities demonstrating convection, conduction, and radiation. They will also experiment with materials that have a variety of thermally conductive and insulating properties as they explore some of the coolers and lunch boxes they may already be familiar with. Students will learn about methods for removing heat from systems and will build a Peltier cooling unit using a Peltier tile and two heat sink fans. Finally, they will build a prototype of a lunchbox that uses a Peltier cooling unit to keep one side cool and the other side warm.

Pump it Up *(human energy, hydraulics, power)*
In this guide, students will discover that human power and energy have many creative applications. Students will learn about different types of pumps and their uses. They will have the opportunity to build a simple Archimedes screw pump and a prototype of a hydraulic pump while learning about hydraulics and Pascal's principle. Students will learn about check valves and pistons after they take apart a bicycle pump. They will use materials like PVC pipes to build and test check valves for their pump. Ultimately, they will assemble a water pump powered by human energy and customize it for their proposed use.

U Control *(simple machines, mechanical systems, circuitry)*
Students will create a mechanical door opener in U Control. They will learn about simple machines and how engineers integrate them into mechanical systems in new, inventive ways. Students will think about existing mechanical and automatic door opener designs and consider new users and new designs to fit those users' needs. Students will cut and assemble a door out of foam insulation board. They will then learn about motors and motor control while exploring how to create a circuit using a breadboard to control a motor's motion. Finally, they will construct their mechanical door opener by attaching the motor, the breadboard, and the control arms to the door.

Noise Makers *(sound, speakers, electromagnetism, musical instruments)*
Students will explore sound, speakers, instruments, and electric pickups in this unit. Through readings and hands-on experimentation, students will understand the basics of sound waves, electromagnetism, and how a speaker functions. Students will have the opportunity to dissect earbuds, build an electromagnet, and create paper-plate speakers in their exploration of sound production. Students will also explore ideas of motion by building and exploring a musical instrument made from everyday materials. Students will have the opportunity in the final meetings of the unit to design and build their own electric instruments.

Super Lens *(optics, physics, mathematics)*
The Super Lens guide will lead educators and students through the science of light. Students will build a lens and create a camera prototype. Students will learn how to control light through hands-on activities, testing various lenses, and optical concepts. Students will also explore scientific, health care, and entrepreneurial trends in phone camera lenses currently in development. They will design prototypes of a working smart-phone lens using glass lenses and cardboard. Students will be able to focus an image on a vellum paper screen, change the optical properties, and capture an image. Principally, they will learn two things: how a lens's shape and material affect focal length and how focal length affects angle of view and zoom.

Grades 6–10, continued

JV InvenTeam Advanced Guides – Exclusive for PiE Members

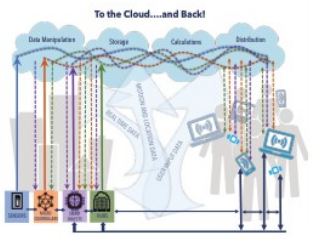
All activity guides are aligned with Next Generation Science Standards.

Stepping Into Coding and Inventing Through Toy Design

This exclusive JV InvenTeam guides educators and students through understanding play and the toy design process. Design thinking is explored, both unplugged and plugged. Ultimately, toys with computational components are prototyped with hardware, inputs, outputs, and software.

Stepping Into Mobile App Design

Creating mobile apps for smartphones and tablets is a way to do powerful things in the world. Through the Stepping Into Mobile App Design activity guide, you have the opportunity to open up the world of mobile app creation to your students. This activity guide is designed for teachers who are novices in app development. Students will be introduced to the basics of app development.



Stepping Into Coding *(computational thinking)*

This is an activity guide for teachers who are novices in coding. Students are introduced to computational thinking, and they step into coding with TurtleArt and Scratch. Ultimately, they explore physical computing with micro:bit using MakeCode.

"With invention education, the students' motivation comes from within."

Jordan Estock
InvenTeam Teacher whose team received a U.S. Patent for their invention

Grades 9–12

Capstone Course – Curriculum and Support Exclusively for PiE Members

Inventing Smart Solutions: Connecting Computer Science and Sustainable Design

Our *Inventing Smart Solutions* capstone-level course provides training for educators along with a project-based curriculum that allows students to discover and carry out authentic, independent research in their area of interest. Students will work on projects that create human-centered solutions designed to improve their communities and the world around them. Students will learn how to integrate computational thinking and action with physical computing techniques in their projects. Their work will be informed by environmentally sustainable design practices throughout the iterative process of invention.

Students, educators, and mentors will create a learning and research community of practice for scientific and technological growth throughout the exploration of challenge and solution spaces. The community of practice will offer support and constructive feedback, and more fully develop students' growth mindsets. This course will prepare students to use human-centered, sustainable, and iterative design to invent and integrate their useful and unique solutions into real-world community applications. Intellectual property will be explored with instruction and encouragement to consider patent protection of their work. Additional skill development may include 21st Century/New World of Work Skills such as adaptability, self-awareness, resilience, social-diversity awareness, collaboration, and communication.

By the end of this course, students will have taken a project from the recognition of a real-world challenge to the execution of iterative technological prototypes with user testing. In the first half of the course, students will acquire experience by observing challenges in their community, selecting and pitching a challenge and possible solutions, planning and managing a project with budget and timeline constraints, and researching potential physical and computer science solutions. The second half of the class will focus on implementing these physical and computer science

solutions into a prototype, performing user testing, and iterating on their prototype design based on user and community input. The final products of the course will include a functional prototype that has gone through at least two rounds of iteration/refinement, an individual digital portfolio, and a team poster that details the process the students used to build their prototype. Students will present their final work in a community forum so that community members, mentors, teachers, and their design beneficiaries can participate and provide feedback to the students.

This course has been approved as a "D" lab science and a "G" general elective course in California.

Two- and Four-Year Colleges

Invention and Inclusive Innovation

Invention and Inclusive Innovation (i3) is a unique initiative that provides community colleges with a framework and support in designing and implementing invention and entrepreneurship offerings at their schools. Our i3 program consists of professional development for faculty and an online content library. Universities participating in i3 may also work with local high schools to establish capstone courses at feeder schools, for which students can receive dual credit.
i3 is made up of three distinct phases:

Phase 1

Faculty as Learners

This phase is dedicated to professional development for faculty to further develop their own creative and inventive mindsets, ensuring they have the capacity to facilitate students' experiences with the process of inventing.

Phase 2

Faculty as Designers

Phase 2 provides the opportunity for faculty to apply the knowledge gained in Phase 1 as they design and implement summer workshops for students. All PiE members receive support from LMIT during the design period. In addition, all members have access to an LMIT-designed content library that contains the resources used during Phase I. The content library is divided into four modules that take learners through a process of working as an inventor and innovator. The four content modules include:

1. Introduction to i3/Envisioning i3 Ecosystems
2. Discovering the Problem Space
3. Exploring the Solution Space
4. Modeling your Business

These modules address the curricular aspects of the learners' paths to Invention and Inclusive Innovation. The content supports an open-ended, inquiry-based approach to teaching and learning in which learners discover the ways of thinking and processes used by inventors and innovators as they find and solve problems that matter. Competencies are developed through experiences that include activities, dialogues with key stakeholders, challenges, hands-on projects, and community engagement. The mindset and disposition of inventors and innovators are also developed through the experiences, including ways of thinking and working that activate empathy, creativity, curiosity, resilience, calculated risk-taking, passion, resourcefulness, and tolerance for ambiguity and complexity. These ways of thinking and working align with many of the New World of Work Essential 21st Century Skills embraced by the California community college system.

Phase 3

Faculty as Facilitators/Learners Alongside Students

Phase 3 is the implementation stage of i3, titled Faculty as Facilitators/Learners Alongside Students. Phase 3 offers a learning experience for students and a learn-by-doing experience for the faculty. These i3 facilitating experiences further the faculty's development of self-efficacy and their beliefs in their own ability to affect student learning.

Resources for All Grades

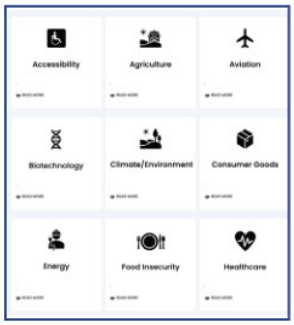
Some content resources are appropriate for multiple grade spans. Resources in this category are:

Inventor Archive

The Inventor Archive allows educators to make social studies/history connections by introducing students to past inventions and inventors. The information shared about prominent inventors is also used to jump-start discussions around students developing their own inventions.

Student Prize and Lemelson-MIT Prize Winner Archives

Searchable database and information about LMIT prize winners and their inventions. Video resources on YouTube.



Possibility Bank

We have created a library of videos from an assortment of our brightest minds, highlighting their invention processes from conception to solution. Some may call these problems—we like to think of them as possibilities!

Full Steam Ahead Curriculum

MIT Full STEAM Ahead is a collection of resources that MIT has compiled for teaching and learning online. These were meant as a rapid response to the need for online resources during the COVID-19 pandemic. We will curate existing resources for K–12, higher education, and workforce learners, as well as provide a weekly package of relevant materials for K–12 students and teachers.

Invention Adventures

This series of lessons prepares students to have a product that can be submitted to invention conventions, science or math fairs, or other events.

Case Studies: Invention Education in Action!

Our library of case studies shows the power and possibilities of Invention Education.

Middle School

- Discover how the JV InvenTeam initiative built a foundation for a teacher's STEM curriculum. Read here

High School

Impact of the High School InvenTeam Grant Experience

- Read how one school uses Invention Education to enhance its mission of service. Read here
- SOAR High School InvenTeam helps improve safety and accomplishes something that few teens do: become U.S. patent holders. Read here
- Garey High School InvenTeam: How invention uplifted and changed the course of the future for students and their community. Read here

Continued on next page

Case Studies: Invention Education in Action!

High School, *continued*

- The Natick High School InvenTeam and teacher Doug Scott took their invention all the way to a U.S. patent. Read here
- This student turned to STEM to build a foundation for invention and foster hometown pride. Read here

Engaging Young Women in Invention Education and STEM

- Katelyn Sweeney had no interest in science, technology, engineering, and math (STEM) until by accident she was placed in a technology class with an inspiring teacher who helped transform her into an InvenTeam leader, presenter at the 2014 White House Science Fair, and a U.S. patent holder. Read here

Students with Special Needs

- InvenTeam teacher's secret to success: "No excuses!" and "High expectations!" Read here

Importance of the Local Invention/Innovation Ecosystem and Community Support:

- SOAR High School InvenTeam helps improve safety and accomplishes something that few teens do: become U.S. patent holders. Read here
- Support from Microsoft's #MakeWhatsNext patent program inspires young female inventors to persevere. Read here

Building Pathways to Invention in Local Communities

- From InvenTeam to innovation center: one school's Invention Education journey. Read here
- Discover how a career technical educator built an invention pathway for his students. Read here
- Inspired by the InvenTeam experience, this teacher built a pathway of invention at Tustin Unified School District. Read here

Transforming Rural Schools

- Invention and STEM education transform a rural school in Michigan. Read here

Collegiate Level

Female Inventors and Their Pathways to Invention

This young inventor is dedicated to building more pathways for girls in STEM. Read here

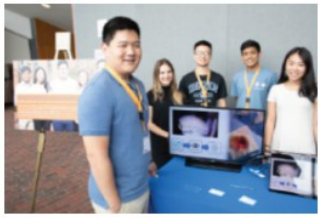
Impactful Invention Education Learning Opportunities at the Collegiate Level

Five biomedical students at Johns Hopkins University recognized the importance of cultivating inventors through undergraduate programs. Read here

Teacher Preparation and the Advancement of Professional Practices

Changing how Teachers "Teach"

This teacher recognized that when you teach students how to build something you engage their hands and minds. If you let them choose the project, you engage their hearts. Read here



The Impact of PD Opportunities

After attending a summer PD, this teacher took her class's invention education project all the way to publication in a respected journal. Read here

To see all of our case studies, click here.

Additional Resources

United States Intellectual Property Alliance (USIPA)

USIPA works with educators to bring awareness to what IP is, why it is important, and how everyone can play a role with it for the betterment of American lives. USIPA teamed up with the United States Patent and Trademark Office to offer resources for students, parents and educators Learn more here

Research and Reports

Our programs are informed by extensive research conducted by experts in the field of education. Below is a sample of the resources available. To access all reports, click here.

Addressing the Gender Gap Among Patent Holders Through Invention Education Policies
Read here

Biogen-MIT BioTech in Action Summary 2020
Read here

Comments Submitted by LMIT Leadership to USPTO Re: National Strategy for Expanding American Innovation
Read here

Enhancing Inventiveness for Quality of Life, Competitiveness, and Sustainability
Read here

Failure as an Active Agent in the Development of Creative and Inventive Mindsets
Read here

Invention Education: Technology & Innovation Journal
Read here

Measuring the Value of Invention
Read here

Peer-reviewed practitioner article in The Science Teacher: Let's Invent!
Read here

Policy Initiatives Needed to Foster Female Inventors' Contributions to U.S. Economic Growth
Read Here

Researching Invention Education: White Paper
Read here

Testimony for USPTO SUCCESS Act Hearing
Read here

The Lifecycle of Inventors
Read here

Understanding Factors Impacting the Development of Inventors from Diverse Backgrounds
Read here

Where's the Computer Science in Invention?
Read here

Meet the Partners in Invention Education Team

LMIT has become a national leader in efforts to prepare the next generation of inventors and entrepreneurs. Our team focuses on the expansion of opportunities for young people to learn ways inventors find and solve problems that matter. We are devoted to bringing Invention Education opportunities to all students, while prioritizing work with young women and Black, indigenous, Latinx populations and other people of color. Our commitment to diversity, equity, and inclusion aims to remedy historic inequities among those who develop inventions, protect their intellectual property, and commercialize their creations.

Stephanie Couch, *Executive Director*

Expertise:

- K–12 and higher education policy
- Invention education research
- Advancing equity within the field of invention education and in STEM learning opportunities
- Ethnographic research in education
- School finance
- Grant writing

Education:

- AA, Modesto Junior College
- BA, Political Science: University of California, Davis
- MA/PhD, Education: University of California, Santa Barbara

Cristina Sáenz, *Invention Education Manager*

Expertise:

- Engaging underrepresented minority students in invention and STEM through an assets-based approach
- Specialization in understanding the experiences and cultural capital of young Latina inventors
- Narrative research in education
- Implementing invention education in K-5 classrooms
- University instruction
- Developing solutions to remedy historic inequities in the invention ecosystem

Education:

- BA, Political Science: Rollins College
- MA,Teaching: Northeastern University
- PhD, Education: University of Central Florida

Evelyn Gomez, *Invention Education Administrator*

Expertise:

- Administrating K-12 invention education programs
- Invention conventions
- Local outreach with underrepresented populations to remedy historic inequities among those who develop inventions, protect their intellectual property, and commercialize their creations
- Education equity prioritizing working with young women, Black, Indigenous, Latinx populations and other people of color throughout
- Community college instruction

Education:

- BS, Aerospace Engineering: Massachusetts Institute of Technology
- MA, Education: Teaching and Curriculum: Harvard University
- MS, Aerospace Engineering: University of California, Los Angeles

Brenda Payne, *Invention Education Administrator*

Expertise:

- 30 years of delivering invention education to K–12 students
- Training educators, program leaders, and administrators in invention education
- Developing district-level engineering curriculum
- Leads California Invention Convention
- Teacher of professional development
- Leading after-school programs
- Develop teacher-training modules
- Former Superintendent

Education:

- BA, English/Teaching Credential: University of California, Berkeley
- MA, Administrative Education and Educational Leadership: University of San Francisco

Liza Goldstein, *Invention Education Administrator*

Expertise:

- Developing JV InvenTeams curricula
- STEM programming at WGBH (Boston's PBS station)
- Introducing K–12 educators and administrators to invention education
- Delivering professional development
- Classroom instruction

Education:

- BA, *magna cum laude*, Sociology: Cornell University's College of Arts and Sciences
- MA, Education, Learning, and Teaching: Harvard University Graduate School of Education

Christine Lawlor-King, *Invention Education Administrator*

Expertise:

- Administrating K-12 STEM programs
- National and international invention education curriculum
- Invention Convention Worldwide
- Recognized with STEM Connector's Community Trailblazer Award

Education:

- Teacher's Certification: Saint Joseph College
- BS, Clinical Laboratory Science/Medical Technology: University of Connecticut

Monica Storss, *Learning Management Specialist*

Expertise:

- Program development and management
- Adult learning theory
- E-learning/curriculum design
- Technology training
- Instructional design
- Pedagogy
- Experiential engagement/reporting
- Micro-learning
- LMS administration

Education:

- BA, *magna cum laude*, English: Portland State University, Portland, Oregon
- MA, English & Creative Writing: University of Califonia, Davis

LEMELSON-MIT
222 Third Street, Suite 0300
Cambridge, MA 02142
lemelson.mit.edu