

Project Invent

Unleashing 21st century mindsets through design thinking, engineering, and real world problem-solving

PRESENTED BY

Siegel Family Endowment

We are a foundation focused on understanding and shaping the impact of technology on society.

About Siegel

Siegel Family Endowment employs an inquiry-driven approach to grant making that is informed by the scientific method and predicated on the belief that philanthropy is uniquely positioned to address some of the most pressing and complex issues facing society today. Our grant making strategy positions us to be society's risk capital. We support high quality work that will help us derive insights to timely questions and has high potential for future scale. Our focus is on organizations doing work at the intersection of learning, workforce, and infrastructure. We aim to help build a world in which all people have the tools, skills, and context necessary to engage meaningfully in a rapidly changing society. Siegel Family Endowment was founded in 2011 by David M. Siegel, co-founder and co-chairman of financial sciences company Two Sigma.

Our Focus on Learning

We strive to understand how we can better equip individuals with the knowledge they need to contribute to and engage with a rapidly changing society. Yet, we also recognize that every factor in a learner's education – from broadband access to safe and affordable housing to the development of social-emotional skills – can widen inequality and impact success. Our work supports and shapes programs and solutions that build lifelong learning opportunities and envision an education system that works for everyone, by addressing long standing social and economic inequities.

Enduring and Frontier Skills

Siegel Family Endowment is committed to supporting organizations that are on the frontlines of building an equitable future by helping to nurture **enduring skills** and **frontier skills**. We seek to foster “**enduring skills**,” or the competencies and mindsets needed to thrive both in the present and in a changing world. These include both technical capabilities, as well as a variety of attitudes and mindsets. Examples of enduring skills include computational thinking, problem solving, collaboration, creativity, resilience, and the ability to learn, to name a few. At the same time, we want to ensure that emergent fields, such as biotechnology and generative AI, are equitable for all. Thus, we also support the development of “**frontier skills**,” that is the abilities, literacies, and pathways necessary to participate in and drive emergent industries - acknowledging that these skills also apply across many areas of life today.





About Grantee

Through invention, students can both make a difference and become fearless, compassionate problem solvers. That's the philosophy of Project Invent, a nonprofit educational program that operates nationally. Project Invent offers design thinking, engineering, and entrepreneurship professional development opportunities to middle and high school educators across subject areas. With this training, educators lead their students to identify a real problem in their community and invent a technology solution. That process places the student as the leader and is grounded in partnership with community stakeholders. Through its work with educators and through its free, downloadable curriculum, Project Invent empowers students with 21st-century skills to succeed individually and impact globally, through invention.

KEY TAKEAWAYS

- Adults are most effective in facilitating student learning around invention when they've experienced the same process themselves.** Professional development programs that provide educators with opportunity to experience the same processes and activities as their students can inspire empathy and reinvigorate learning, and allow educators to empower students to take ownership of their own learning.
- Empathy and a commitment to and understanding of community partnership are core elements of the future-resilient skills that will allow students to thrive.** Through real-world learning opportunities and design-thinking processes, STEAM (Science, Technology, Engineering, Art, and Mathematics) educational programs can help students to develop relationships *with* the larger community and to design *with* communities, rather than *for* communities. Students develop agency as they learn how they can create real, viable community solutions today rather than years into the future. Communities gain tangible solutions for all.
- It's important for learners themselves to be involved in developing definitions for success and evaluating their own progress toward those goals.** The act of learner self-reflection can be a powerful tool for building skills as well as for evaluating programs. Program leaders should make an active effort to adjust their approaches to respond to the definitions of success generated by students and other stakeholders.

Executive Summary

The skills that students need to succeed in the society and economy of the 21st century aren't just technical in nature. Students will also have to rely on a host of mindsets and values that are not always taught explicitly in schools: agency, resilience, creative confidence, curiosity, ambition, and empathy, among them. Project Invent is a nonprofit organization that seeks to help students develop these skills through its design thinking and invention programs and resources. Along the way, students also learn the technical skills inherent in design thinking, engineering, and entrepreneurship.

Project Invent focuses on serving middle and high school educators from a myriad of formal and informal learning environments. The program offers a yearlong fellowship for educators to learn pedagogical skills that place both student and educator as co-learners and collaborators, and that empower students to learn from the

community and to invent technological prototypes to address community needs and challenges. Along with curricula and other resources, the fellowship program gives educators the tools they need to run Project Invent programs in their own learning settings, and to form robust communities of practice.

Project Invent is also changing the way that we think about and measure educational impact. It aims to measure students' and educators' growth on a variety of mindsets, beliefs, and attitudes through pre- and post-program survey reflections. The ultimate goal of the program is not to receive a positive evaluation or score on a final project, but rather to learn across the invention process, to make failure okay, and to develop resiliency, and empathy among students. As one student explained, "the most important thing is the journey." It's a lesson that will serve students well in their future careers and lives.

Programs and Examples

“Invention” is not a standard school subject, but the principles, mindsets, and skills necessary for invention are essential for students’ future success. That’s the thinking behind Project Invent. Project Invent provides professional development, curricula, and other resources to middle and high school educators who, in turn, provide opportunities for students to invent solutions to address challenges in their communities. Through the program, students and educators develop design thinking, engineering, and entrepreneurship skills and build partnerships with the community.

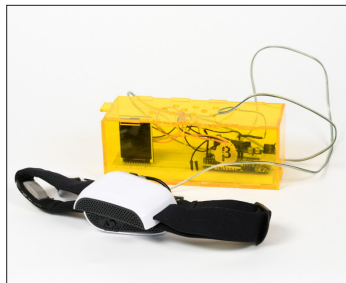
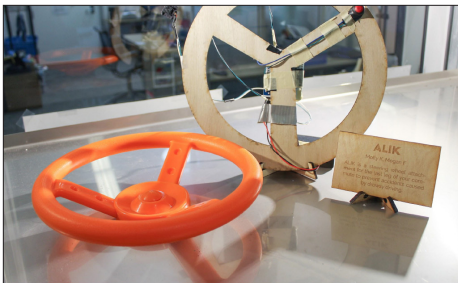
Project Invent empowers educators to help students drive the process. Students meet with community stakeholders and design physical technology products that serve their needs. Along the way, they ideate, prototype, test, and iterate to refine a responsive product. As part of this human-centered approach, students have the opportunity to share their inventions with stakeholders, and to receive mentorship and guidance from community members. Examples of past projects include a device to combat drowsy driving; a tool to reduce pollution created by the local bus system; and a concussion assessment device to determine if high school football players should seek immediate medical attention after suffering a hit.

Project Invent’s results can’t just be measured by the number or quality of inventions; Project Invent also seeks to understand whether students have developed greater empathy, agency, resilience, creative confidence, curiosity, ambition, and creative-



Two middle school students at Bostonia Global in El Cajon, CA work with Micro:Bit starter kit to develop the prototypes for their inventions

problem solving abilities, along with an expanded STEM identity and their ability to impact the world around them among other future-resilient mindsets. In the process, Project Invent is not only creating a new generation of inventors, but also creating community and responding to need in new, transformative, and human-centered ways.



FROM LEFT TO RIGHT: Device that combats drowsy driving; Betaband, a football field kit to detect early signs of concussion; Adaptplay, an adaptive gaming controller for individuals with limited mobility.

The ultimate goal of the program is not to receive a positive evaluation or score on a final project, but rather to learn across the journey, to normalize failure, and to develop resiliency, and empathy among students. As one student explained, “the most important thing is the journey.” It’s a lesson that will serve students well in their future careers and lives.

Core Elements: What Makes the Program Work?

1

Focusing on the Educator to Drive Student Ownership

“Our belief is that we start with the adults in the room,” says Jax Chaudhry, Project Invent’s Executive Director. Those adults are educators in all the spaces where students learn: the high school STEAM teacher, the middle school English teacher, the afterschool coordinator, and many others. Project Invent is built on the premise that adults are most effective in facilitating student learning around invention when they’ve experienced the same process themselves.

Through Project Invent’s [Educator Fellowship](#), adults

participate in a yearlong exploration of design thinking, engineering, entrepreneurship, and the other elements of the Project Invent curriculum. Just like their students, educators must work through challenges and respond to failures. Chaudhry reflects that the experience “requires educators to become comfortable with being a co-learner and with making failure okay.” They bring this outlook back to their students, with a renewed commitment to granting students’ ownership over their own learning.

2

Working with the Community to Address Community Need

Project Invent’s model empowers student inventors to work with [Community Partners](#) and [volunteers](#) in order to better understand community needs and design physical technological products that respond to those needs. Past technologies include an adaptive video game controller for gamers with limited mobility ; a wearable device that alerts individuals with hearing impairments to emergency situations ; a handheld pod designed to appeal to multiple senses to reduce anxiety; and a smart belt for blind users to avoid dangerous veering.

There are three ways that these partners are identified: by Educator Fellows; by students who are interested in tackling a particular issue; and through Project Invent’s network. For example, partners have ranged from a national group of firefighters to local migrant farming communities. Community Partners are active participants in the process and advise students on whether and how their invention ideas and prototypes respond to their needs.



An all girls Project Invent student inventor team from e3 Civic High in San Diego, CA invented Guard D-rink. A device that provides safety to college students who are susceptible to drink spiking. It is an electronic device that helps both detect when a drink has been spiked as well as alerts the users’ emergency contacts with their location and time of positive test. The product is disguised as a watch with a GPS feature and has 12 sections for the test area. This team presented about their invention journey on a live stage in front of 150+ Project Invent community members (engineers, investors, donors & sponsors, tech executives, community partners, and their families) during our 2023 FutureFest in June.

3

Embracing Failure and Aligning Metrics with Values

One of Project Invent’s [core values](#) is “Make failure OK.” That means creating an environment where success doesn’t consist of only a single evaluation of the final inventio, but also as an ongoing reflection on the process as a whole. Students in the program learn to track progress over time, not performance on a single day.

Failure is a necessary part of the process of invention and that failure results in better and more responsive devices. In the design thinking process, students refine their ideas and test their prototypes with the audiences for which they were designed. They don’t immediately work in the best possible way or meet the specifications of the person they’re designing for. It’s only by

learning more about the partner and their needs that students are able to create a promising solution.

The experience of failure also offers a different vantage point on how to track success. Project Invent looks at student and educator resilience, confidence in their creative problem-solving ability, and a range of other mindsets. The goal is not to reach a particular score or marker, but instead to grow and progress over the course of the program. In invention, there is always a way to do things better and the task is never done. Project Invent’s impact metrics and focus on progress and the journey itself reflect that approach.

Students in the program learn to track progress over time, not performance on a single day.

Impact and Next Steps

Impact

Project Invent is designed to teach skills that aren't typically evaluated through standard measures of academic performance. As such, Project Invent, with the partnership with Stanford's d.school and Project Evident, is proposing new measurements that align with the aims that they want to achieve for educators and students who take part in the program. "We like to think that we're making the intangible tangible," reflects Project Invent Executive Director Jax Chaudhry.

The program administers a pre- and post-survey to student and educator participants that are designed to measure mindsets such as resilience, confidence in creative problem solving abilities, and comfort with failure. Project Invent aligns its questions with academic literature that suggests ways that individuals can demonstrate competence on different mindsets necessary for success in the future. Many of these questions are reflection questions in which students and educators have an opportunity to examine their prior and current beliefs, values, and attitudes, and their experience of the program as a whole. That act of reflection and recognition of growth can also be a powerful learning opportunity. After their experience with Project Invent:

- Educators observe over 9-in-10 student participants are more confident in their ability to make a difference in the world.
- Students commonly reflect that "The most important piece is the journey," which demonstrates a comfort with failure, and an understanding that resilience is necessary to engage in this work.
- Students feel greater confidence in understanding the skills to pursue STEM careers, having commented that "design thinking and creating technical solutions through invention is hard," and yet persisting through the process.

Project Invent is actively concerned with centering its programming around [equity](#) and tracks and responds to a variety of equity measures, such as educator and student recruitment, and ensuring the make-up of its internal staff and Board match the diversity of the people it serves.



Project Invent recruits industry professionals from corporations such as Google, Adobe, PayPal, KLA, Atlassian, IBM, and Toyota Research Institute who volunteer to mentor our students along their invention journeys. Through this, students meet diverse role models that help them move into STEM careers.

Next Steps

Project Invent is built on community and there are numerous ways that stakeholders can get involved.

- 1 Interested middle and high school [educators](#) can participate in Project Invent's yearlong Educator Fellowship, or access Project Invent's free curriculum and resource library.
- 2 Project Invent welcomes inquiries from potential [Community Partners](#) who would like to help student inventors uncover impactful solutions to local challenges. Community Partners come from many different backgrounds and do not need to have experience in technology, STEAM, or entrepreneurship.
- 3 Industry [volunteers](#) help power Project Invent teams locally or virtually. There are numerous ways to get involved, including reviewing ideas, providing prototype support, coaching students on pitching, or serving as a speaker or judge on Demo Days.
- 4 Reach out to [Project Invent](#) to learn more about the program and to see other ways to get involved.

To learn more and contact Siegel Family Endowment, visit www.siegelendowment.org