

# Design and Discovery | Overview and Benefits

## Bass Space

### Erika: Solving a Real-Life Problem

Erika, a middle school student with a talent for music, used the process she learned in *Design and Discovery* to solve a problem from her own life. A string bass player, she invented a training aid to help string musicians learn proper hand positioning. The design process also taught her about the value of teamwork and gave her insights into career fields she might never have considered otherwise.

### Getting Inspired

At the start of the *Design and Discovery* program, Erika was encouraged to look at everyday challenges that could be solved through engineering. That got her thinking about her music lessons. One of the biggest challenges in learning to play the bass is remembering to keep your fingers in the correct position. Music teachers have been known to tape students' fingers together or bind them with rubber bands to hold this proper hand positioning. During a music lesson, she talked with her teacher about the potential benefits of a product that would keep a bass player's hand in the correct position, yet feel comfortable.

Erika teamed up with a fellow *Design and Discovery* participant named Alicia. Soon, the two girls were brainstorming ideas, making sketches, and jotting down notes. They didn't know at first what the best design might look like or what material their product should be made of. But they knew they were on the right track: A search for patents showed them that nothing like what they had in mind was yet available.



Using a design process to guide their project development, they came up with product requirements. "Our design requirements for this product were that it needed to hold the hand correctly. It must be comfortable. It must be cost-efficient. It must be rigid yet slightly flexible so that it's comfortable while still holding the hand correctly," Erika says, consulting the design notebook that became a critical repository for their ideas, notes, and sketches.

To move from requirements to an actual product, the girls used the same process that engineers follow to develop prototypes and make improvements. They developed a series of prototypes before reaching a solution that fit their requirements. But then came a new challenge: What material would work best?

### Enter the Mentor

An engineer named Jill Barrett, recruited by *Design and Discovery* program facilitators, agreed to work with the girls as a mentor. Barrett is a materials engineer, trained and experienced in finding the right materials to meet design specifications. "I was excited about the girls' project immediately. They just have the coolest project!" recalls Barrett, who spent much of her own youth inventing projects to enter in science fairs. Barrett started by talking with the girls about material selection and then helped guide them through the testing process.

As Erika and Alicia worked through the testing process, the girls found that many materials did not fit their purposes. When certain materials failed, Barrett encouraged the girls not to be discouraged by setbacks. "Failures are sometimes more instructive than anything else," she says.



Similarly, Erika's mother was careful not to step in when she saw the girls struggling. "It's very easy for a parent to tell a child what to do. It's more challenging to stand back and let them explore on their own," she says.

Eventually, they determined that a material used to make mouth-guards did the best job of meeting their design

specifications. This was a critical accomplishment—on many levels. As Barrett explains, "Just watching the two of them having such a good time, making something tangible, was fantastic. It's been fascinating to watch them progress through the steps of engineering. They're driven and inspired. They've spent so much time making it work. Making it right."

### What's Next

With an eye toward marketing, Erika and Alicia have developed packaging materials to present their product to prospective buyers. They have applied for a patent for the product they call the Bass Space.

Already, their project has won praise. At a regional science fair affiliated with the Intel International Science and Engineering Fair (Intel ISEF), Erika and Alicia's project won first place in engineering. They also received the Discovery Young Scientists Challenge Nomination for middle school students. After the judging was completed, an engineer who was impressed by the thinking behind the Bass Space came back to talk with the girls about pursuing the field as a profession.



Erika is now considering a future career in engineering. Her mother credits Erika's experience with *Design and Discovery* as something that has "broadened her horizons, helped her understand what's out there for her. She hasn't really thought before about how what she's learning can have some future application. This experience offered her a chance to look into her future and find out she has lots of opportunities."

Both Erika and Alicia have returned to *Design and Discovery* as program aids, helping younger students get excited about the process of invention and engineering. Erika is researching possibilities with local manufacturers for getting the Bass Space into production.

