

# BUILD. CODE.

# CREATE. DISCOVER.



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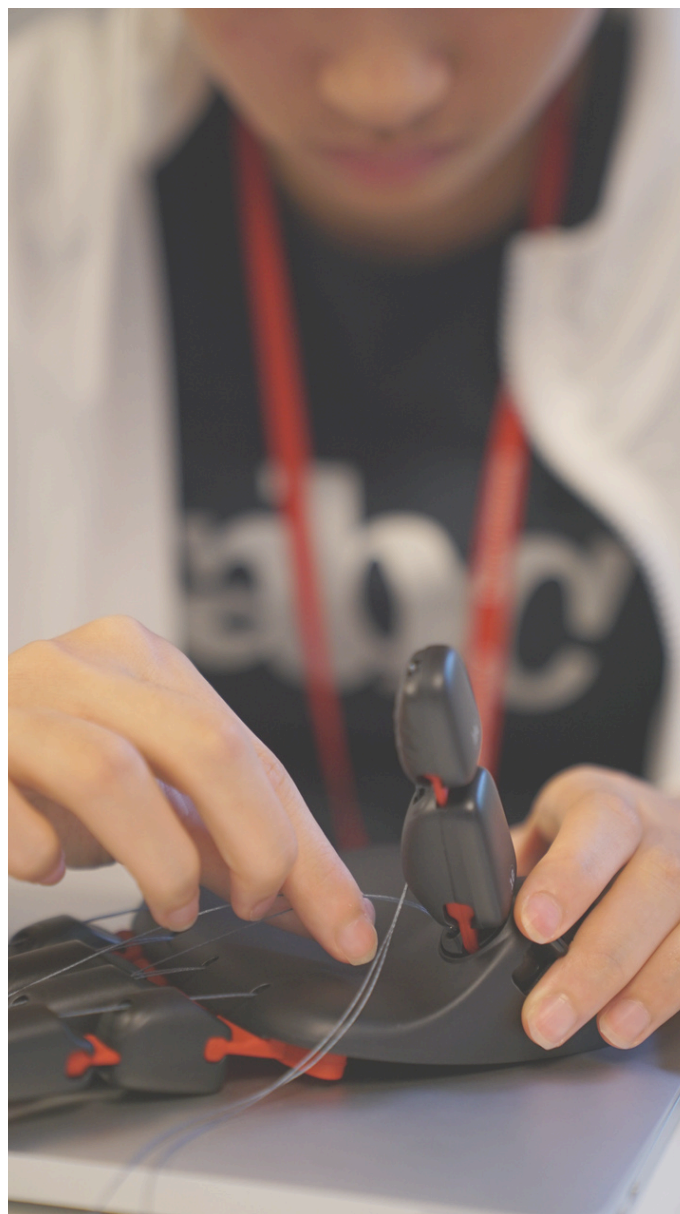
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# Who We Are

NeuroMaker works with schools, universities, and programs around the globe to provide students the opportunity to explore artificial intelligence, brain - computer interface technology, coding, biomedical engineering, neuroscience, engineering design, and many other practical and transferrable skills with industry-level technologies and minimal effort to implement.

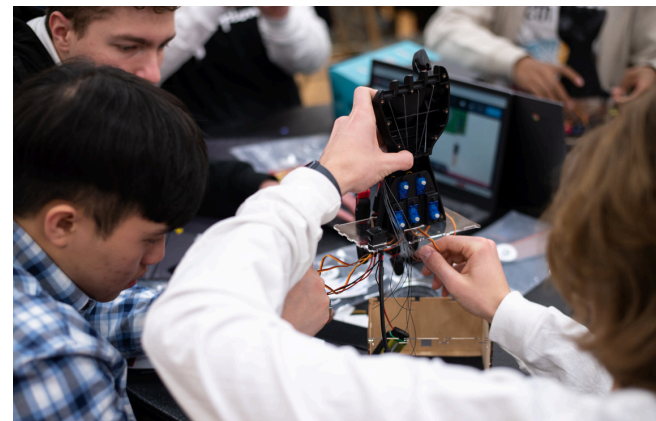
NeuroMaker is the education arm of the three divisions underneath the BrainCo umbrella. BrainCo is a brain-computer interface (BCI) company that explores how the brain interacts with the world. BrainRobotics, our prosthetics sister division, aims to bring a cost-effective myoelectric prosthetic to the limb-different community. FocusCalm, our mental and workplace wellness division, has made leaps and bounds in workplace wellness and athletic performance through working with professional and Olympic sports professionals in our mental conditioning platform. With NeuroMaker, we've taken all of those experiences and brought the best of them to the classroom. We have global reach with our products and have now been implemented in hundreds of school districts across the United States.

We pride ourselves on

- crafting unique interdisciplinary experiences through open-ended and inquiry-based learning.
- placing students in the shoes of modern industry professionals looking to solve social dilemmas to build empathy, content knowledge, and 21st Century Skills all at the same time.
- implementing a variety of cutting-edge technologies, including artificial intelligence and brain-computer interface technology, that students interact with to better understand the world in which they live and their own brains.



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Support: [support@x-cal.us](mailto:support@x-cal.us)

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# Student Experiences

In a recent NeuroMaker pilot program sponsored by PepsiCo R&D, **junior and senior students explored interdisciplinary subjects such as biomedical engineering, manufacturing, artificial intelligence, and more.** Students were asked to report on their experience, whether or not they saw themselves pursuing a career that related to the skills they developed, and how they perceived the importance of STEM in their career considerations post-high school.

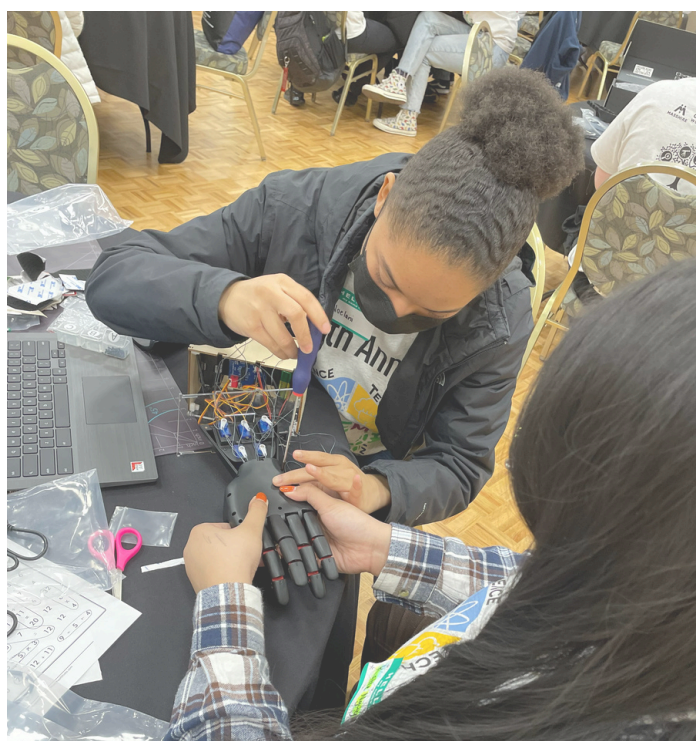


**All students** who participated in the exit survey identified that STEM mattered strongly or somewhat strongly in a career they were considering post-high school.



## 100%

of students rated their experience **at or above average with NeuroMaker hardware and curriculum.**



## 75%

of students said they **saw themselves pursuing a career with STEM skills related to NeuroMaker activities.**



# The NeuroMaker Programs

## What's Included?



### NeuroMaker HAND 2.0

The NeuroMaker HAND and curriculum were derived directly from real-world prosthetic products to foster industry-specific skills while delivering a truly immersive experience. Students are introduced to biomedical innovations, programming, artificial intelligence, mechanical and electrical engineering, and additive manufacturing.



### NeuroMaker BioSensor Kit

AI-powered BioSensors from real prosthetic hands, now accessible for students to build, code, and learn. These plug-and-play sensors easily integrate with the NeuroMaker Hand, enabling the measurement of EMG (muscle signals), tracking hand motion, and detecting colors, temperature, magnetic field, and more.



### NeuroMaker BCI

NeuroMaker BCI combines a comfortable cutting-edge EEG headband with dozens of activities that introduce students to neuroscience, machine learning, signal processing, as well as the ethical implications and impact of brain-computer interface.



### Curriculum & Projects

En ambos inglés y español!

100+ hours of interdisciplinary content spanning Biomedical Engineering, Programming, Brain-Computer Interface Technology, and more! With student-oriented projects, they can progress from setup and assembly to advanced projects and final competitions, learning together with interactive content and teacher support.



### Professional Development and e-learning

We believe in providing options to best meet each school's unique needs. To best achieve that end, we offer hundreds of hours of content on the e-learning platform, live support with our product engineer, easily accessible product documentations and FQA pages curated from years of educator feedback. Our goal is to provide PD that is easy, flexible, efficient, and engaging from beginning to end.



### NeuroMaker Creative Challenge (Capstone)

The NeuroMaker Challenge, our complimentary and inclusive capstone project, is a culminating experience that tasks students with identifying a societal need, collaborating with their peers to develop a solution, and presenting their project to be evaluated by a panel of industry experts.

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# NeuroMaker Hand 2.0

Build. Code. Create. Discover.

## Need a hand with STEAM learning?

Get hands-on learning and create impactful STEM projects to solve real-world problems with this programmable prosthetic hand kit with industry-level BioSensors capturing brainwaves, muscle signals, hand motions, and beyond.



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- Reusable and Customizable
- Plug-and-Play BioSensor Integration
- Block-Based Programming
- Arduino C SDK
- 100+ hrs of Curriculum Included
- 3rd Party Sensors and Microcontrollers



Learn More

\*NeuroMaker Hand 2.0 with optional NeuroMaker BioSensor Kit shown.

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# Using the NeuroMaker Hand



Learn More

Our programs are designed to foster both technical acumen and deep sense of social responsibility. Created by our actual prosthetic hand and knee engineers, these industry-derived education products and project-based curriculums immerse students in the real-world challenges faced by amputees and engage them in reimagining solutions. With their transferrable skills, students will foster a more inclusive and compassionate world.

## Build

Modular design and packaging lets you build your NeuroMaker HAND from the ground up, offering an immersive hands-on experience with every component. Organized packaging enables easy disassembly, storage and reusability.



## Code

Ideal for introductory programming courses, **block-based programming** allow you to visualize, design, and enhance your control programs effortlessly, even if you're a novice.

Also fully browser-based, our **Arduino C** library is designed to maximize the capabilities of the HAND, BioSensors, and compatible third-party accessories.

## Create Real World Solutions

With BioSensors, students can explore endless combinations to reimagine, design, and engineer a more intuitive prosthesis that can truly transform amputees' life by addressing real-world challenges. Participate in a competition focused on making a meaningful impact on others' lives.





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# NeuroMaker BioSensor Kit

AI-Powered BioSensors from Real Prosthetic Hands, Now Available for Students to Build, Code and Learn.

## EMG Muscle Signal Sensor



When integrated into prosthetic hands, these sensors translate the user's muscular movements into signals that control the prosthetic's movements, allowing for more natural and intuitive hand functions, and achieve remarkable levels of dexterity and responsiveness.

We're bringing this technology from our real prosthesis straight into the classroom. Now, students have the unparalleled opportunity to engage with, code, and recreate using the exact industry-grade electrodes that make these life-changing prosthetics possible.



Learn More

## Flex BioSensor



Flex sensors can be strategically attached to gloves or clothing to capture the intricate movements of fingers, wrists, elbows, and other joints. When a joint bends, the attached flex sensor bends as well, generating data that can be analyzed to understand the motion's characteristics.

This technology has widespread applications, from creating more interactive and responsive virtual reality environments to developing advanced prosthetics that mimic natural movements more accurately.

## Other Sensors and Modules



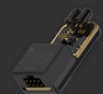
Hall Sensor

Detects Magnetic Field



Ultrasonic Sensor

Detects Distance to Object



IR Obstacle Sensor

Detects Obstacle in Range



Push Button

Returns HIGH when pushed



Rotary Encoder

Returns Dial Position



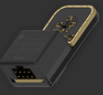
RGB LED

Displays Colors



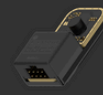
Temperature Sensor

Detects Ambient Temperature



RGB Color Sensor

Detects color and returns RGB Value



Sound Sensor

Detects Sudden Volume Change



5 Channel Flex Sensor Adapter

Up to 5 Flex Sensors



Single Channel Flex Sensor Adapter

1 Flex Sensor



# NeuroMaker BCI



Learn More

NeuroMaker BCI is the most accessible Brain-Computer Interface hardware for education. It only needs Chrome browser on a laptop or Chromebook, and no login required. The hardware is designed for minimal maintenance.



## What is NeuroMaker BCI?

NeuroMaker BCI combines a comfortable cutting-edge, AI-powered EEG headband with activities and games that introduce students to neuroscience, machine learning, signal processing, as well as the ethical implications and impact of brain-computer interface. It can also be integrated with most microcontrollers for coding.



## What does the BCI Curriculum/ Activity Look Like?

- Visualize brainwaves, focus level, relaxation and learn fundamentals of neuroscience.
- Record, process and analyze EEG data.
- Play games controlled by brainwave.
- Connect and control the NeuroMaker Hand using brainwave.
- Control anything with it- integrate BCI into other microcontrollers and coding platforms!
- With NeuroRacing, control the race car using BCI.



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# NeuroRacing



Learn More



Unlock your brain's potential and control the speed of a car with your brain! NeuroRacing is the perfect addition to any STEM Makerspace room. In this high-stakes, brainwave-driven competition, NeuroMaker BCI's EEG headband **measures students' ability to focus to determine the speed of their car going around the slot car track.** Setting up is easy- you only need a Windows laptop and a TV/monitor.



With advanced focus training software guiding them, **students learn powerful techniques to enhance and sustain their mental endurance,** essential for controlling their car's speed. Racing head-to-head on the Carrera Digital 132 track, they experience the ultimate tech-driven makerspace adventure, navigating sharp turns and straightaways with sheer mental focus.



## What's included?

- 2 or 4 BCI Headbands
- NeuroRacing Control Box, Lap Counter and Accessories
- NeuroRacing Software
- A complete set of Carrera® Digital 132 2-lane or 4-lane track
- Wireless Router
- Instructions and Training Materials



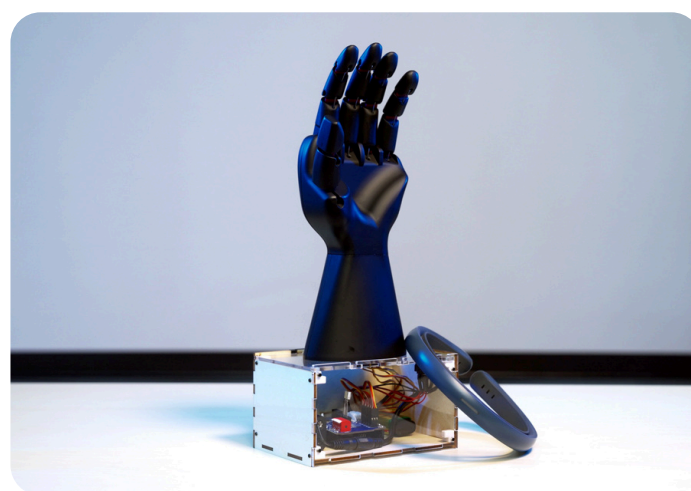


# Additional NeuroMaker Equipment

Our programs are designed to foster both technical acumen and deep sense of social responsibility. Created by our actual prosthetic hand and knee engineers, these industry-derived education products and project-based curriculums immerse students in the real-world challenges faced by amputees and engage them in reimagining solutions. With their transferrable skills, students will foster a more inclusive and compassionate world.

## NeuroMaker Hand- Maker Edition

Our Legacy Edition, a versatile open-source prototype reflecting our initial prosthetic design. Gain complete access to CAD files, source codes, and adaptable microcontrollers for unparalleled customization and recreation. **Fully compatible with 100% of our curriculums, PD resources, and newest hardwares.**



## NeuroMaker Repair Kit

The NeuroMaker Repair Kit is stocked with additional consumables and spare parts frequently used or missing. This kit is thoughtfully curated to prolong the utility of your NeuroMaker Hand, saving you both time and expenses involved in separate purchases. Each kit is designed to support 3 to 4 Hands. Supports the Maker Edition Only.



# Curriculum and Projects

## En ambos inglés y español!



100+ hours of interdisciplinary content spanning Biomedical Engineering, Programming, Brain-Computer Interface Technology, and more! With student-oriented projects, they can progress from setup and assembly to advanced projects and final competitions, learning together with interactive content and teacher support.

Scan here to view a complete gesture glove project in Spanish!



Sample project  
Proyecto de muestra



### Student Oriented Projects

More than 40 hours of interactive, hands-on project series designed to engage students in collaborative learning environments. Teams work together through a series of progressive stages—from assembly and coding to creative problem-solving and a final capstone design challenge. With minimal direct instruction, educators serve only as facilitators, while students explore, experiment, and evolve their ideas into tangible, helpful tools for those in need.



### Comprehensive Lesson Plans

Our Comprehensive Lesson Plans are exhaustive lesson maps that include resources and teaching scaffolds designed to support all educators from interns to seasoned veteran STEM instructors.



### One Page Lesson Plans

Our One Page Lesson Plans serve as helpful outlines of the critical features of the lesson while still delivering all of the foundational components that educators need to feel supported.



### Assessment Menus

Deviating from the traditional exit ticket or evaluation, our Assessment Menus provide students with choice around how they can best demonstrate what they've learned. Students can choose to write, speak aloud, draw, and more!



### Background Documents

Educator Background Documents remove a step of the preparation process for educators - time intensive research! We have articles that precede NeuroMaker lessons to ensure educators feel confident and prepared.



### Student Lab Notes

Our lesson plans are anchored around student experience - as can be seen in our Student Lab Notes. Students use Lab Notes to brainstorm, design, and project plan independently and in groups to ensure they retain and incorporate knowledge.



### Presentation Decks

To scaffold class discussion and help solidify NeuroMaker routines, Presentation Decks are chock full of information, discussion prompts, and project directions, that both help educators teach and students learn in a variety of modalities.



# Hand Curriculum Modules

## En ambos inglés y español!



### Module 1: NeuroMaker Hand Guided Assembly

Total 6 hours 30 minutes

Students discover the processes for assembling a real-life prototype while working in small groups. They are introduced to mechanical and electrical engineering concepts and skills while engaging in self-direction, information literacy, and demonstrating perseverance. This Module exposes students to a variety of Career Technical Education (CTE) Pathways, such as Manufacturing Production Process Development, and allows students to develop foundational skills and potential interest in career fields such as Manufacturing Engineering.



### Module 2: Biotech and Biomedical Exploration

Total 10 hours 0 minutes

Students explore Biotechnology and Biomedical concepts while collaborating with others to brainstorm solutions to real world problems. They are introduced to neuroscientific, biomedical, and prosthetic design concepts and skills while engaging in problem solving and demonstrating creativity and social responsibility. This Module exposes students to Biotechnology Research and Development, and allows students to develop foundational skills and potential interest in career fields such as Bioengineering and Biomedical Engineering.



### Module 3: Engineering Design

Total 10 hours 50 minutes

Students explore the engineering design process to discover the different phases of development while collaboratively engineering their own prosthetic hand prototype. Students learn introductory computer science concepts and engage in critical evaluation and innovation skills while demonstrating technology skills and digital literacy. This Module exposes students to Engineering and Technology, and allows students to develop foundational skills and potential interest in career fields such as Orthotics and Prosthetics.



### Module 4: Life and Physical Sciences Exploration

Total 3 hours 0 minutes

Students use their completed NeuroMaker HAND to explore physics, energy, and the human body. They are introduced to critical scientific hypothesis testing and experience the affect physical forces have on objects while engaging in critical thinking and problem solving. This Module exposes students to a variety of Career Technical Education (CTE) Pathways, and allows students to develop foundational skills and potential interest in career fields such as Materials Science.



### Module 5: Introduction to Programming

Total 12 hours 50 minutes

In Module 5: Introduction to Programming, students use block-based coding and/or text-based coding to connect and test the capability of their completed NeuroMaker Hand. They are introduced to foundational coding skills and computing logic, and a deep understanding of how programs interact with devices and improve the user experience with prosthetic technology.



### Module 6: Applied Artificial Intelligence Exploration

Total 16 hours 0 minutes

Students explore and apply concepts of artificial intelligence through the lenses of global citizenship and privacy. They are introduced to Neuroethics and logical processes while discussing cutting-edge use cases and models within the emerging field of Applied Artificial Intelligence. This Module exposes students to a variety of Career Technical Education (CTE) Pathways, such as Information Support and Services, and allows students to develop foundational skills and potential interest in career fields such as Data Science.



# The BCI Curriculum

## With the NeuroMaker BCI Headband

	CTE Pathway Exposure	21st Century Skills
<p><b>Module 1: Neuroscience Fundamentals</b></p> <p><b>Students:</b></p> <ul style="list-style-type: none"> <li>acquire critical background knowledge surrounding EEG technology, brain waves, and how to use their NeuroMaker BCI device.</li> <li>are introduced to neuroscientific concepts and skills.</li> </ul>	<ul style="list-style-type: none"> <li>Biotechnology Research &amp; Development</li> <li>Engineering &amp; Technology</li> <li>Therapeutic Services</li> </ul>	<ul style="list-style-type: none"> <li>self-direction</li> <li>critical thinking</li> <li>technology literacy skills</li> </ul>
<p><b>Module 2: Neurofeedback Exploration</b></p> <p><b>Students:</b></p> <ul style="list-style-type: none"> <li>undergo a series of self-guided experiments to improve self-regulation.</li> <li>discover how to relax and engage with neurotechnology.</li> <li>introduced to experiment design and modern neurotechnology applications.</li> </ul>	<ul style="list-style-type: none"> <li>Therapeutic Services</li> <li>Biotechnology Research &amp; Development</li> <li>Engineering &amp; Technology</li> <li>Counseling &amp; Mental Health Services</li> </ul>	<ul style="list-style-type: none"> <li>communication</li> <li>creativity</li> <li>problem solving</li> <li>perseverance</li> <li>collaboration</li> <li>self-direction</li> <li>social responsibility</li> </ul>
<p><b>Module 3: Brain-Powered Device Control</b></p> <p><b>Students:</b></p> <ul style="list-style-type: none"> <li>build a variety of devices and then control those devices using their BCI.</li> <li>are introduced to C++ programming, serial communication protocols, and different forms of hardware.</li> </ul>	<ul style="list-style-type: none"> <li>Programming &amp; Software Development</li> <li>Quality Assurance</li> <li>Engineering &amp; Technology</li> </ul>	<ul style="list-style-type: none"> <li>critical thinking</li> <li>communication</li> <li>self-direction</li> <li>collaboration</li> <li>innovation</li> <li>creativity</li> <li>technology literacy skills</li> </ul>
<p><b>Module 4: Impact and Ethics of BCI</b></p> <p><b>Students:</b></p> <ul style="list-style-type: none"> <li>use their NeuroMaker HAND to learn about physics, energy, and the human body.</li> <li>are introduced to scientific hypothesis testing and are able to recognize the affect physical forces have on items.</li> </ul>	<ul style="list-style-type: none"> <li>Engineering &amp; Technology</li> <li>Manufacturing Production Process Development</li> <li>Production</li> </ul>	<ul style="list-style-type: none"> <li>critical thinking</li> <li>communication</li> <li>problem-solving</li> <li>collaboration</li> <li>innovation</li> <li>self-direction</li> </ul>



# Student-Oriented Projects

En ambos inglés y español!

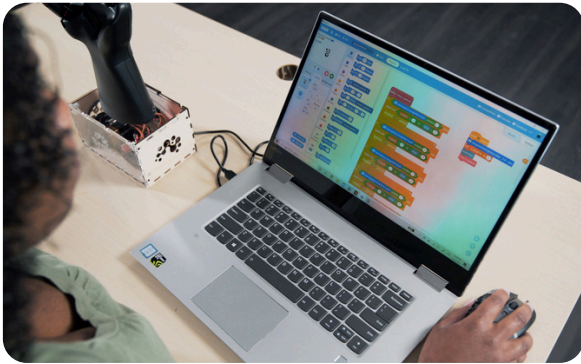


More than 40 hours of interactive, hands-on project series designed to engage students in collaborative learning environments. Teams work together through a series of progressive stages—from assembly and coding to creative problem-solving and a final capstone design challenge. With minimal direct instruction, educators serve only as facilitators, while students explore, experiment, and evolve their ideas into tangible, helpful tools for those in need.



Scan here to view a complete gesture glove project in Spanish!

Sample project  
Proyecto de muestra



### Intro to Hand & Sensor Projects

Explore the HAND and BioSensors through fun, hands-on projects that cover everything from assembly to programming. Students learn independently, crafting innovative solutions and harnessing creativity to make a real-world impact.

### Advanced Creative Projects

Engaging, self-guided projects that maximize the potential of BioSensors and AI, empowering students to design and program cutting-edge prosthetics, games, art, and more. Prepares students fully for the capstone competition.

### Level 2 Capstone Competition

In Level 2, students face real-world challenges to enhance lives. In a simulated grocery store, they'll design and program a prosthetic hand using learned skills, aiming to help amputees navigate shopping with ease, improving their quality of life.





# Professional Development

e-learning Suite, Core, Live Support, Online Docs & FAQ

We believe in providing options to best meet each school's unique needs. To best achieve that end, we offer hundreds of hours of content on the e-learning platform, live support with our product engineer, easily accessible product documentations and FQA pages curated from years of educator feedback. Our goal is to provide PD that is easy, flexible, efficient, and engaging from beginning to end.



Scan here to view a complete sample PD lesson!

Sample PD Lesson



## Suite NeuroMaker e-learning

NeuroMaker e-learning Suite is our comprehensive library of asynchronous course work. It covers a variety of topics including, but not limited to, product onboarding, cognitive development of the brain, and introduction to artificial intelligence. Receive a printable certificate of completion for each course mastered and share with your network to identify yourself as a NeuroMaker subject expert!



## Core NeuroMaker e-learning

NeuroMaker e-learning Core is our compact, asynchronous offering and covers all of the essential product onboarding materials for those looking to get started on a budget. This valuable alternative to the e-learning Suite empowers educators with comprehensive guidance on hardware utilization, coding functions, and how to access and make the most of all available content and activities.



## NeuroMaker Live Technical Support

FREE

Implementing new programs can often be a challenging task. In instances where a support query cannot be effectively resolved through support email, we prioritize a more personalized approach by arranging video or voice conferences, during which our dedicated team of developers and engineers directly engage to offer comprehensive assistance.



## Online Docs, FAQ and Embedded Resources

FREE

In our curriculum portal, you'll find extensive product documentation, encompassing detailed instructions, informative videos, SDK, demo codes, and sample projects. Additionally, our FAQ section, enriched with years of feedback from educators, addresses the most common questions encountered during use.

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# References

## Middle School

### Los Angeles Unified School District, CA

Integrated **HAND** and **BCI** as part of **Makerspace and Coding & Robotics Core Class**

- **Kate Dehbashi** - STEAM Magnet Coordinator
  - kate.dehbashi@lausd.net
  - 818-313-7463

### Worcester Public Schools, MA

Integrated **HAND** and **BCI** as part of **STEM Enrichment Program**

- **Christine Lloyd** - Science and Engineering Director K-8
  - lloydc@worcesterschools.net
  - 508-799-3470

### St. Vrain Valley School District, CO

Integrated **BCI** as part of **Neuroscience Program**

- **Anna Mills** - Innovation Coordinator & Teacher
  - mills\_anna@svvdsd.org
  - 303-702-8020
- **Cyrus Weinberger** - Principal
  - weinberger\_cyrus@svvdsd.org
  - 303-702-8020

## High School

### Boston Public Schools, MA

Integrated **HAND** and **BCI** as part of **STEM Program**

- **Elizabeth Milewski** - Executive Director of STEM
  - ekenney2@bostonpublicschools.org
  - 857-302-9002

### Elyria City Schools, OH

Integrated **HAND** and **BCI** as part of **STEM Program**

- **Kathy Koep** - Director of Professional Development, Science, and STEAM
  - koepkathy@elyriaschools.org
  - 440-284-8222

### Colorado Springs District 1, CO

Integrated **HAND** as part of **CTE Program**

- **Duane Roberson** - CTE Director
  - duane.roberson@d11.org
  - 709-328-2041

### STEMWorks Hawaii, HI

Integrated **HAND** and **BCI** as an **afterschool Enrichment Program for the State of Hawaii**

- **Katie Taladay** - Director of Education and Workforce Development
  - katie@medb.org
  - 808-429-5745

STEM Program

Core Curriculum Supplement

CTE Program

Afterschool Enrichment

“NeuroMaker has done more than just engage the students.

It has helped the high school kids from the robotics club bond with the upper elementary students through building the NeuroMaker HAND prototype. This does more than build relationships; it allows the older students the opportunity to teach and lead.”

-Tom Barnhart  
Sydney Public Schools

## Next Steps

NeuroMaker is committed to our current and future partners and values feedback from the educators and students that inspire what we do every day:

“It’s [NeuroMaker Curriculum and Hardware] **all hands on**. That’s what I love about it. It’s hands on. **Students are able to see the results of their work** in the project. So it’s not just theory. They read about it, they’ve learned the scientific facts, and then they do the project and then they **see the results of what they learn**.”

-Kate Dehbashi

Hale Charter Academy Educator and NeuroMaker Partner since Fall 2021



### 1 Explore the Remarkable Projects Created by Students

This packet is all yours! We've included the most fundamental things we think you might need to get a sense of who we are and why NeuroMaker is right for you.

More information is available at [neuromakerstem.com](http://neuromakerstem.com), where you'll find product details, images and videos, and **amazing projects submitted by our students**.



### 2 Connect with Us Today!

#### ALL SALES INQUIRIES:

**X-CAL Sales**  
[sales@x-cal.us](mailto:sales@x-cal.us)

#### Technical or any other questions:

**X-CAL Support**  
[support@x-cal.us](mailto:support@x-cal.us)

#### Curriculum and student projects:

**Official Website**  
[neuromakerstem.com](http://neuromakerstem.com)