

STEM Scale-Up Program

Menu for 2018-2019

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STEMS
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GOVERNOR'S STEM ADVISORY COUNCIL

2018-2019 STEM Scale-Up Program Menu

Curriculum for Agricultural Science Education (CASE) – Animal Plant Biotech.....4

Description: Experience industry appropriate applications of biotechnology-related plant and animal agriculture through hands-on activities, projects and problems in biotechnology. Research and experimental design will be highlighted in industry-appropriate investigations that involve micropipetting, bacterial cultures and transformations, electrophoresis, and the polymerase chain.

Grade Level: 9-12

Contact: Joshua Remington, Iowa FFA Foundation, joshua.remington@iowaffafoundation.org and Becky McCullough, Iowa FFA Foundation, becky.mccoullough@iowaffafoundation.org

For more information: <http://www.case4learning.org/>

Curriculum for Agricultural Science Education (CASE) – Environmental Sci Issues.....5

Description: Description: Investigate areas that include ecosystem management, sustainable agriculture, energy choices, and pollution. Students will research, investigate, experiment, and document a project, and communicate solutions to peers and members of the professional community.

Grade Level: 9-12

Contact: Joshua Remington, Iowa FFA Foundation, joshua.remington@iowaffafoundation.org and Becky McCullough, Iowa FFA Foundation, becky.mccoullough@iowaffafoundation.org

For more information: <http://www.case4learning.org/>

Computer Science Principles.....6

Description: A year-long Code.org course that aligns with CSTA standards and 21st Century Learning Skills. It can be delivered as an Advanced Placement course. Teachers need no prior computer technology experience to qualify for training.

Grade Level: 9-12

Contact: Samantha Dahlby, NewBoCo, Samantha@newbo.co

For more information: www.code.org/educate/csp

Engineering Everywhere.....7

Description: Helps students think creatively and solve globally relevant engineering challenges during out-of-school programs. Each unit has an introduction to the engineering process, culminating design challenge, science and mathematics standards, and 21st Century Learning Skills.

Grade Level: 6-8

Contact: Nia Keith, Director of Professional Development, nkeith@mos.org

For more information: www.eie.org/engineering-everywhere

Making STEM Connections.....8

Description: Activities that help students connect STEM to their daily lives and develop competencies essential to Iowa's future workforce. Grounded in making, safety, upcycling, creative constraints, art, and reinventing technologies. Lessons build on NGSS standards, reflect Iowa Common Core, and include National CORE Art Standards.

Grade Level: K-8

Contact: Jolie Pelds, Science Center of Iowa, jolie.pelds@sciowa.org

For more information: www.sciowa.org/makingstemconnections

Pint Size Science.....9

Description: Four hands-on modules: one introductory unit and three chosen by the educator. Features Iowa Early Learning Standards/GOLD Objectives, NGSS, Iowa Common Core math and literacy and 21st Century Learning Skills. Includes kit materials, curriculum guides, website and webinar support.

Grade Level: PreK-2

Contact: Jolie Pelds, Science Center of Iowa, jolie.pelds@sciowa.org

For more information: www.sciowa.org/scaleup

PowerTeaching Math.....10

Description: Includes active instruction, team practice, formative and formal assessments, feedback and motivation,

and a designated PowerTeaching coach. Contains Iowa Common Core Mathematics Standards and 21st Century Learning Skills.

Grade Level: 6-8

Contact: Cecelia Daniels, cdaniels@successforall.org and Kris Misage, kmisage@successforall.org and Amanda Nappier, anappier@successforall.org

For more information: www.successforall.org

Project Lead The Way (PLTW): Computer Science for Innovators and Makers.....11

Description: Using real-world scenarios, students use the design process, which includes defining the problem, generating concepts, and designing and presenting a solution. Aligns to NGSS, Iowa Common Core for Mathematics and ELA, and CSTA Standards.

Grade Level: 6-8

Contact: Terry Ausman, Director of School Engagement, tausman@pltw.org

For more information: <http://www.pltw.org>

Ramps and Pathways.....12

Description: Explore the engineering process and mathematics of spatial thinking and geometry through construction of marble runs; mathematics and literacy skills through data collection; physics of force and motion through conversations and retesting; and 21st Century Learning Skills related to creation and innovation.

Grade Level: PreK-2

Contact: Beth VanMeeteren, Director of the Regents' Center for Early Development, UNI, regents.center@uni.edu

For more information: www.rampsandpathways.org

STEM in Action.....13

Description: With options in Life, Earth and Physical Sciences, each educator-chosen kit (5 for PreK, 9 for K-2, 9 for 3-5) is formatted into small, manageable bits of time with limited consumable items. Available in English and Spanish.

Grade Level: PreK-5

Contact: Julie Law, jlaw@hand2mind.com

For more information: www.hand2mind.com/steminaction

**Curriculum for Agricultural Science Education
(CASE) – Animal and Plant Biotechnology**
2018-2019 STEM Scale-Up Program

CASE utilizes science inquiry for lesson foundation and concepts are taught using activity-, project- and problem-base instructional strategies. In addition to the curriculum aspect of CASE, the project ensures quality teaching by providing extensive professional development for teachers that leads to certification.

<p>Grade Levels: 9-12</p> <p>Program Provisions:</p> <ul style="list-style-type: none"> • CASE Curriculum – 172 rigorous lessons that have been cross-walked to national content standards for math, science, English and agriculture with built-in pedagogical, instructional strategies for differentiated instruction. • Professional Development Training Institute: two-week training held during the summer, lodging, most meals, all institute material expenses. • Materials/equipment to implement CASE. • Workshops at NAAE Conference. • Access to NAAE Communities of Practice (Professional Learning Communities) on the state and regional level. • Teacher services including purchasing lists, technology support, and professional development. • Purposeful assessment of the concepts taught. 	<p>Program Summary</p> <p>Animal and Plant Biotechnology, a specialization course in the CASE Program of Study, provides students with experiences in industry appropriate applications of biotechnology related to plant and animal agriculture. Students will complete hands-on activities, projects, and problems designed to build content knowledge and technical skills in the field of biotechnology. Students are expected to become proficient at biotechnological skills involving micropipetting, bacterial cultures and transformations, electrophoresis, and polymerase chain reaction.</p> <p>Program Objectives and Description</p> <p>Students will maintain a research level Laboratory Notebook throughout the course documenting their experiences in the laboratory. Research and experimental design will be highlighted as students develop and conduct industry appropriate investigations. Students will develop and conduct a research project following the National FFA Agriscience Fair guidelines. From background research through data collection and analysis, students will investigate a problem of their choice and conclude the project by reporting their results in the forms of a research paper and a research poster. In addition, students will complete all of the laboratory experiments for Advanced Placement Biology – in addition to several others – all in an agricultural context.</p> <p>What is required by the educator in order to implement this program?</p> <ul style="list-style-type: none"> • Attend two weeks of CASE Curriculum Institute (Institute dates and locations will vary). • Travel expenses to and from the Curriculum Institute which are outside the award. • Secure equipment and supplies to teach CASE course above the award allocation. • Commit to adopt and teach CASE curriculum upon return from institute (2019-2020 school year). <p>Links</p> <p>Website: http://www.case4learning.com/index.php/curriculum/case-courses/aap-biotechnology</p> <p>Standards: http://www.case4learning.org/images/documents/2017Documents/APB_CASE_Brochure_2017_nocropsmlr.pdf</p> <p>Video: https://www.youtube.com/watch?v=YNGvaj_fztA</p>
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**Curriculum for Agricultural Science Education
(CASE) – Environmental Science Issues**
2018-2019 STEM Scale-Up Program

CASE utilizes science inquiry for lesson foundation and concepts are taught using activity-, project- and problem-base instructional strategies. In addition to the curriculum aspect of CASE, the project ensures quality teaching by providing extensive professional development for teachers that leads to certification.

<p>Grade Levels: 9-12</p> <p>Program Provisions:</p> <ul style="list-style-type: none"> • CASE Curriculum – 172 rigorous lessons that have been cross-walked to national content standards for math, science, English and agriculture with built-in pedagogical, instructional strategies for differentiated instruction. • Professional Development Training Institute: two-week training held during the summer, lodging, most meals, all institute material expenses. • Materials/equipment to implement CASE. • Workshops at NAAE Conference. • Access to NAAE Communities of Practice (Professional Learning Communities) on the state and regional level. • Teacher services including purchasing lists, technology support, and professional development. • Purposeful assessment of the concepts taught. 	<p>Program Summary</p> <p>Environmental Science Issues is a specialization course in the CASE Program of Study. Students will complete hands-on activities, projects, and problems that simulate actual concepts and situations found in the environmental science field, allowing students to build content knowledge and technical skills. Students will investigate areas of environmental science including ecosystem management, sustainable agriculture, energy choices, and pollution.</p> <p>Program Objectives and Description</p> <p>Students will maintain a research level Laboratory Notebook throughout the course documenting their research and laboratory experiences. Issue analysis and experimental design will be highlighted as students develop and conduct environmental investigations. Students will investigate, experiment, and learn about documenting a project, solving problems, and communicating solutions to their peers and members of the professional community.</p> <p>What is required by the educator in order to implement this program?</p> <ul style="list-style-type: none"> • Attend two weeks of CASE Curriculum Institute (Institute dates and locations will vary). • Travel expenses to and from the Curriculum Institute. • Secure equipment and supplies to teach CASE course above the award allocation. • Commit to adopt and teach CASE curriculum upon return from institute (2019-2020 school year). <p>Links</p> <p>Website: http://www.case4learning.com/index.php/curriculum/case-courses/environmental-science-issues</p> <p>Standards: http://www.case4learning.com/images/documents/2017Documents/ESI_CASE_Brochure_2017_nocropsmlr.pdf</p> <p>Video: https://www.youtube.com/watch?v=YNGvaj_fztA</p>
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Computer Science Principles
2018-2019 STEM Scale-Up Program

As Iowa's Code.org Regional Partner, NewBoCo provides free training and support for Code.org's computer science curricula. Computer science is a field to which every student in every school should have access no matter their future careers. [Computer Science Principles](#) introduces the many aspects of computer science in an engaging and approachable way.

Grade Levels: 9-12

Program Provisions:

- Curriculum by Code.org, recognized by the College Board as an endorsed provider.
- Five-day summer workshop held at the University of Northern Iowa from July 16-20.
- Four one-day Saturday workshops held during the academic year.
- Breakfast and lunch at all workshops.
- Travel stipend of \$50 per workshop day.
- Per diem stipend of \$60 per workshop day for teachers' time.
- \$100 to cover classroom supplies.
- Connections with other Iowa computer science teachers to build an in-state support network.
- Opportunity to earn licensure renewal or graduate credit through Keystone AEA.
- Ongoing support during implementation from NewBoCo staff, facilitators, and online forums.

Program Summary

This year-long course can be taught as an AP or non-AP course—no prerequisites required for students or for teachers new to computer science! Students will explore topics like the Internet and how it works; how and why digital information is encoded, represented and manipulated; privacy; and programming. In addition, the curriculum is available online at no cost for anyone, anywhere to teach. For more information about Code.org's goals and approach to their courses, please visit the website for curriculum values and professional learning values.

Program Objectives and Description

Computer Science Principles introduces students to the foundational concepts of computer science and challenges them to explore how computing and technology can impact the world. More than a traditional introduction to programming, it is a rigorous, engaging, and approachable course that explores many of the foundational ideas of computing so all students understand how these concepts are transforming the world we live in.

Our year-long Professional Learning Program provides ongoing support for teachers, requiring no prior computer science experience to get started. The curriculum and workshops are also designed to foster equity and diversity in the classroom, breaking down barriers and stereotypes around computer science.

What is required by the educator in order to implement this program?

- Participate in all nine workshop days throughout the year.
- Implement the class during 2018-19.
- Submit a Code.org application (5-10 minutes) at <https://newbo.co/code-org-partnership/#apply>
- Costs for licensure renewal or graduate credit (optional).

Links

Website: <https://newbo.co/code-org-partnership/>

Standards: <https://newbo.co/code-org-partnership/#standards>

Video: <https://youtu.be/jQm0z894CG0>

Social Media:

- NewBoBo Twitter: <https://twitter.com/newboco>
- NewBoCo Facebook: <https://www.facebook.com/NewBoCo>
- Code.org Twitter: <https://twitter.com/codeorg>
- Code.org Facebook: <https://www.facebook.com/Code.org>

Engineering Everywhere
2018-2019 STEM Scale-Up Program

Engineering Everywhere (EE) is a rigorously researched, youth-tested curriculum that integrates engineering and technology concepts and skills with science topics. EE is designed to empower middle school-aged youth in afterschool and camp programs tackle real-world engineering problems using the engineering design process, creativity, and collaboration.

Grade Levels: 6-8

Program

Provisions:

- Educator Guides: include background content, detailed activity plans, and material kit content lists.
- Engineering Notebook for youth.
- Online resources for educators and learners including articles and videos.
- Professional development, led by a master teacher, focused application and pedagogy.
- Online professional development.

Program Summary

The EE curriculum has been expressly designed to address the critical need of increasing children’s STEM literacy. Inquiry-based and standards-driven, EE provides youth with personally meaningful and globally relevant engineering challenges that empower them to problem solve, think creatively, and learn from each other. EE teaches engineering content and skills while helping youth develop positive associations with engineering and science—to see them not only as integral to modern life, but also as potential career paths. EE builds a strong foundation of problem solving and critical thinking for all youth while helping them to become lifelong STEM learners.

Program Objectives and Description

Engineering Everywhere (EE) curriculum units are designed for out-of-school-time programs and a supplemental guide does provide NGSS alignment for classroom teacher’s use. EE units help youth build enthusiasm for engineering careers and understand the prevalence of engineering and technology in their everyday lives. EE units are developed to explore real-world challenges. The curriculum is flexible and can be adapted to fit local circumstances. EE Professional Development workshops help educators better understand engineering concepts, skills, and pedagogy. Sessions support professional learning communities, enabling educators to collaborate, share best practices, and integrate 21st century skills. EE PD workshops provide an in-depth understanding of a specific unit while also familiarizing the participants with the structures and pedagogy of the curriculum. The workshops are focused on preparing educators to teach engineering and technology using hands-on, activating learning techniques. Participants practice working with the Engineering Design Process and developing questioning strategies to use with youth.

What is required by the educator in order to implement this program?

Educators awarded EE will participate in a full day of professional development. This experience includes an overview of materials, experience with the skills and content from the program and a walk through of a complete unit. Educators will also benefit from follow up webinars offered for continued support and education about engineering and science. Each educator will chose, based on their allocation, educator guides and materials with which to do the engineering challenges. Access to the internet is required for participating youth to view the Special Report videos that set the context for the unit. A list of the specific materials that are needed for each unit can be found online or at the beginning of each educator guide.

Links

Website: <https://eie.org/engineering-everywhere>

Video: <https://eie.org/engineering-everywhere/resources/listing?resourceType=255>

Social Media:

- Twitter: [@EiE_org](https://twitter.com/EiE_org)
- Facebook: <https://www.facebook.com/eiemos/>

Making STEM Connections
2018-2019 STEM Scale-Up Program

The Science Center of Iowa's *Making STEM Connections* program provides a kit including tools, teacher resources and lessons to inspire the maker mentality in youth ages 5-14 through highly engaging, interactive and safe experiences. Building upon the natural inclination to tinker, this program empowers participants to explore STEM principles and 21st Century Skills as they design, create and make.

<p>Grade Levels: K-8</p> <p>Program Provisions:</p> <ul style="list-style-type: none"> • Educational materials including lesson prompts, teacher resources, as well as books for teacher instruction and inspiration. • Maker toolbox with a variety of materials to support a classroom of 30 such as a GoPro camera, robotics components, MaKey MaKey, circuit materials, DC Motors, hand tools, soldering iron, sewing machine, safety goggles and first aid kit. • Literature for student engagement and understanding. • Professional development led by a master teacher and maker, focused on the making process and research behind its success. 	<p>Program Summary</p> <p>The <i>Making STEM Connections</i> program is designed to empower teachers to cultivate engaging, purposeful and successful extensions of their already developed curriculum. The making philosophy directs students to use their hands in conjunction with their minds to produce meaningful learning outcomes. Educating teachers on the process of making as well as familiarizing them with the tools and materials to be used will be the cornerstone of the <i>Making STEM Connections</i> professional development. A classroom using the <i>Making STEM Connections</i> kit might have students learning how to fuse plastics to create textiles or assembling an art-bot using a DC motor and batteries. Teachers are provided with a curricular framework to develop STEM principles and enhance those already existing in their classroom using maker materials, both high tech and low tech, as well as skills.</p> <p>This curriculum framework is focused around the idea that making and tinkering are ways to engage student's minds and build conceptual understanding around academic content. <i>Making STEM Connections</i> is structurally supported by cross-curricular experiences and opportunities, including literacy and math, to reinforce the maker foundation of active learning and problem solving.</p> <p>The purpose of making as a learning technique is summed up by Dale Dougherty, Chairman of Maker Education Initiative, "It is the difference between a child who is directed to perform a task and one who is self-directed to figure out what to do."</p> <p>Program Objectives and Description</p> <ul style="list-style-type: none"> • Ignite student interest in STEM by helping them discover science in the world around them through interactive, hands-on activities. • Provide teachers with foundational tools to develop a maker space in their classroom. • Support teacher implementation through professional development, technical manuals, reference materials and curricula. <p>What is required by the educator in order to implement this program?</p> <p>LEAs participate in a full day of professional development. This experience includes an overview of making, strategies for inspiring the maker mentality, training for tool use and safety as well as a walkthrough of each lesson prompt. LEA's will also benefit from four regional webinars offered as continued support and education about making and use of their kits.</p> <p>Links</p> <p>Website: http://www.sciowa.org/makingstemconnections</p> <p>Video: https://www.youtube.com/watch?v=sRLWF332Dpg</p> <p>Social Media:</p> <ul style="list-style-type: none"> • Twitter: @sciowamakers • Facebook: SCI Making STEM Connections
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Pint Size Science 2018-2019 STEM Scale-Up Program

The Science Center of Iowa's Pint Size Science program provides a platform for young children ages 3 to 8 to explore science in a highly-engaging, interactive, and safe manner.

Grade Levels: PreK-2

Program Provisions:

- A kit for four curriculum modules which includes lesson plans with opportunities for adaptations to the needs of local audiences.
- All necessary supplies and materials to conduct each program module.
- Professional development training to create deeper connections and instructional techniques to implement a STEM rich environment with a focus on inquiry, project-based learning, questioning and evaluation of student learning.
- Access to the Pint Size Science website which contains additional resources, including a variety of videos and assessments.
- Multiple webinar sessions throughout the year to allow for continued professional development and collaboration amongst implementers.

Program Summary

The newly revised Pint Size Science introduces children to STEM topics through discovery learning. Using a hands-on approach that engages and inspires young minds to explore scientific phenomena, the program works to not only build science understanding but also respond to the ever-changing interests and abilities of children. Additionally, each Pint Size Science kit includes a literacy component that pulls together the most important ideas of the STEM topic being discussed. Fundamental mathematical skills are also reinforced through activities, including counting, numbering, and graphing.

The new Pint Size Science kit includes four modules for each implementer. The foundation of the program is the introduction module titled, "Science Sprouts". All participants will receive this module. "Science Sprouts" serves as an introduction to the STEM fields and scientific investigation. Recognizing the need to be flexible to existing school curriculum materials and needs of organizations, schools and students, Pint Size Science allows LEA's to pick the remaining three modules to complete their set of instructional materials. Implementers chose one module from each of the following groups:

Group 1	Group 2	Group 3
Bits and Bots will provide a beginning step for students in learning programming and coding.	Classifying Creatures develops math skills in sorting and classifying as children observe and compare features of various animals and insects.	Exploring Engineering continues children's natural curiosity in to how things work.
Colorful Chemistry introduces young learners to the three phases of matter found on earth; solids, liquids and gases.	Mini Meteorologist inspires students to measure and understand the weather happening around us.	Push and Pull investigates the forces that cause motion.
Tiny Tinkerers brings the Maker Movement to the early childhood learning environment.	Homes and Habitats challenges students to think about where different animals live based on their environments.	Fascinating Farmers brings the world of agriculture to young children.

Program Objectives and Description

- Ignite child interest in STEM by helping them discover science in the world around them through interactive, hands-on activities.
- Expand the toolkit of instructional methods available to early childhood educators in Iowa.
- Provide for "out-of-the-box" implementation by supplying educational organizations with a complete set of curricula, activities, and program supplies.
- Build a support system for Iowa educators as they integrate STEM for Iowa's children.

What is required by the educator in order to implement this program?

LEAs participate in a full day of professional development that includes a walk-through of each classroom curriculum module.

Links

Website: www.sciowa.org/scaleup

Video: https://www.youtube.com/watch?v=QP_sOIH8nMY&t=5s

Facebook: [SCI Pint Size Science for Educators](#)

Twitter: [@sciowapintsize](#)

PowerTeaching Math
2018-2019 STEM Scale-Up Program

Developed by Johns Hopkins Researchers, PowerTeaching Math is the leader in cooperative learning math instruction helping teachers transform their classrooms environments to engage ALL students.

<p>Grade Levels: 6-8</p> <p>Program Provisions:</p> <ul style="list-style-type: none"> • A set of teacher materials for grades 6-8 and Algebra 1 with student blackline master. (Teacher materials include scope and sequence.) • Ongoing student assessment for each cycle. • Access to online resources. • Flash drive that includes all lessons for each grade level and award-winning media clips for concept learning. • One registration per school with travel stipend for our national conference: Experienced Sites Conference held in New York City, March 18-20, 2019. Additional registrations may be purchased at a cost of \$750 per person. Travel stipend is an additional cost. 	<p>Program Summary</p> <p>Developed by Johns Hopkins Researchers, PowerTeaching Math is the leader in cooperative learning math instruction helping teachers transform their classrooms environments to engage ALL students. PowerTeaching Math provides teachers with the tools necessary to enhance their math instruction and to grow professionally. It prepares students for the rigorous demands of high school so they will continue to succeed and feel confident in their math abilities.</p> <p>Program Objectives and Description</p> <p>PTM uses a research-proven cooperative structure to help teachers create a learning environment in which students support each other's learning through discussion of challenges and errors, on-the-spot explanations, and motivation to contribute to the success of the team. In several independent studies, students participating in the program gained a full year more than students in a randomized comparison group and had a greater liking of math and higher self-concept in math. PTM's cooperative learning structure teaches students to think critically and problem solve, communicate efficiently, and collaborate effectively with their peers. Well-implemented cooperative learning environments provide teachers with the freedom to observe, interact, and assess where the students are and allows them to adapt lessons and add targeted instruction as needed in real time.</p> <p>Through PTM, middle school teachers will provide their students with a "toolbox" of resources they can apply to any challenge they face in high school and beyond. These skills are not only critical for success in math but for success in all STEM fields. No student gets left behind, everyone stays on task, and each student is held accountable for his or her own learning. PTM provides teachers the means to prepare tomorrow's leaders.</p> <p>What is required by the educator in order to implement this program?</p> <ul style="list-style-type: none"> • Apply for STEM Scale-Up Program award by March 1, 2018. • Attend Regional Program Introduction prior to the start of school. • On-site support visits throughout the school year.
	<p>Links</p> <p>Website: www.successforall.org/our-approach/schoolwide-programs/powerteaching-math/</p> <p>Standards: http://www.successforall.org/wp-content/uploads/2018/01/PTM_IowaCCAlignment.pdf</p> <p>Video: https://www.youtube.com/watch?v=6NrmOgTAoJQ</p>

PLTW Computer Science for Innovators and Makers 2018-2019 STEM Scale-Up Program

[Project Lead The Way \(PLTW\)](#) is a nonprofit organization that provides a transformative learning experience for K-12 students and teachers across the U.S. PLTW creates an engaging, hands-on classroom environment and empowers students to develop in-demand knowledge and skills they need to thrive. PLTW also provides teachers with the training, resources, and support they need to engage students in real-world learning.

Grade Levels: 6-8

Program Provisions:

- Participation fee (PLTW grant of \$750 per school): The participation fee includes access to all program features for which a school has a trained teacher, including, but not limited to, access to curriculum through Courses – PLTW’s curriculum delivery tool; Community – a tool that allows teachers to connect with one another, share ideas, and learn from their peers; assessments; unlimited required software licenses; teacher resources and learning opportunities; student opportunities; reporting tools; and the PLTW Solution Center.
- Schools will receive a \$2,500 STEM Scale-Up award to support unit implementation. Allowable expenses include any required equipment and supplies, as well as professional development.
- Regional training.

Program Summary

Middle school is a time of exploration, a time when students are figuring out what they’re passionate about today and how that relates to who they’ll become tomorrow. [PLTW Gateway](#) sparks a joy of discovery and illuminates the range of paths and possibilities they can look forward to in high school and beyond. With PLTW Gateway CS unit [Computer Science for Innovators and Makers](#), students learn about programming for the physical world by blending hardware design and software development. Using microcontrollers with inputs and outputs, they develop code that brings their physical designs to life.

Program Objectives and Description

Computer Science for Innovators and Makers teaches students that programming goes beyond the virtual world into the physical world. Students discover CS concepts and industry-relevant skills by creating personally relevant, tangible, and shareable projects. Throughout the unit, students are challenged to use sensors and actuators creatively to develop systems that interact with their environment. Designing algorithms and using computational thinking practices, they code and upload programs to microcontrollers that perform a variety of authentic tasks. The unit broadens students’ understanding of computer science concepts through meaningful applications. Teams select and solve a personally relevant problem related to wearable technology, interactive art, or mechanical devices. Furthermore, PLTW integrates in-demand, transportable skills – problem solving, critical and creative thinking, communication, and collaboration – into the classroom experience.

This unit aligns to Next Generation Science Standards (NGSS), as well as Common Core State Standards (CCSS) for Mathematics and ELA. The unit also aligns to The Computer Science Teachers Association (CSTA) Standards, which map to CCSS.

What is required by the educator in order to implement this program?

- Plan for your program. Get familiar with the [PLTW Gateway](#) program, review the [Computer Science for Innovators and Makers](#) unit, determine your [PLTW investment](#), and get familiar with [technology requirements](#).
- Register your school with PLTW. Once you have been selected to receive a STEM Scale-Up award, visit [PLTW’s Get Started page](#) and follow the steps to register your school.
- Identify your PLTW Computer Science for Innovators and Makers Teacher. Each awardee is required to train a teacher in order to implement the program and receive the Scale-Up award.
- Register your Teacher to complete Computer Science for Innovators and Makers Core Training. PLTW will share the registration process in the spring and will offer trainings at Iowa State University (July 9-13, 2018) and at the Kirkwood Regional Center (July 23–27, 2018).

Links

Website: <https://www.pltw.org/our-programs/pltw-gateway-curriculum#curriculum-4>

Videos: <https://www.youtube.com/watch?v=ZEokiqFCWXI&feature=youtu.be> and <https://www.youtube.com/watch?v=rZWWINW6K1w>

Twitter: <https://twitter.com/PLTWorg>

Facebook: <https://www.facebook.com/projectleadtheway/>

Ramps and Pathways
2018-2019 STEM Scale-Up Program

Ramps & Pathways (R&P) is an NSF-funded, developmentally-appropriate and classroom-tested approach to integrative STEM that engages young children. R&P is designed to nurture engineering habits of mind as children build their own technology of marble runs; a type of Rube Goldberg machine. In the process, children grapple with the laws of physics, properties of objects, how those properties affect motion and engage in spatial thinking.

<p>Grade Levels: PreK-2</p> <p>Program Provisions:</p> <ul style="list-style-type: none"> • A classroom Ramps and Pathways Kit of non-consumable materials including unit blocks, ramps, spheres, and other manipulatives worth more than \$2,000. • Two days of professional development with one hour of University of Northern Iowa graduate credit. • \$120 for each day (sub pay or stipend). 	<p>Program Summary</p> <p>The R&P curriculum was designed through a collaboration of experts in child development, teachers of young children, science educators, and young children. R&P addresses the critical need to increase children’s STEM literacy, cultivate STEM identities, and develop executive function skills (working memory, cognitive flexibility, and inhibitory control). R&P is inquiry based and addresses the NGSS and early learning standards. Place-based social studies and literacy are naturally embedded.</p> <p>Program Objectives and Description</p> <p>R&P is designed to provide children access to a fully integrative STEM activity that:</p> <ul style="list-style-type: none"> • Develops a working understanding of physics • Offers opportunities to design and engineer their own technology of marble runs • Engages children in challenges in spatial thinking • Inspires children to learn the tools of literacy to document and communicate what they are learning and figuring out <p>R&P is not designed as a sequence of daily prescribed lessons in STEM. Instead, it is a framework that assists the teacher in facilitating the physical and social environment of the classroom to allow children to investigate the macro question of, “How can I get this object to move in an interesting way?” over time.</p> <p>What is required by the educator in order to implement this program?</p> <p>The applicant will attend two non-consecutive days of Ramps and Pathways professional development, preparing them to integrate STEM within other academic disciplines and arrange their classroom setting to be conducive for inquiry in STEM as well as literacy and social studies. Participants or the school must provide transportation to site of PD and participants are on their own for lunch.</p>
	<p>Links</p> <p>Website: rampsandpathways.org</p> <p>Standards:</p> <ul style="list-style-type: none"> • Iowa Early Learning Standards: https://regentsctr.uni.edu/ramps-pathways/meeting-early-learning-standards • Head Start Performance Standards: https://regentsctr.uni.edu/ramps-pathways/meeting-head-start-educational-standards • Next Generation Science Standards: https://regentsctr.uni.edu/ramps-pathways/meeting-next-generation-science-standards <p>Video: http://www.uni.edu/rampsandpathways/media-center/ramps-and-pathways-integrated-stem</p>

STEM in Action
2018-2019 STEM Scale-Up Program

STEM in ACTION[®] is a supplemental, module-based curriculum that harnesses the power of hands-on learning to inspire curiosity and nurture critical thinking and problem solving. Easy-to-implement modules integrate science, math, literacy, and engineering skills into real-world problems.

Grade Levels: PreK-5

Program Provisions:

- \$50 mileage/travel stipend, half day professional development, district receives \$50 sub pay, and one classroom kit of your choice
- Choice of two classroom kits with a set of all the materials needed to do all lessons/activities. Enough for six engineering teams (30 students total).
- All the consumable and non-consumable items needed.
- Six student activity books (one per team).
- Teacher guide.
- Access to online resources consisting of: editable blackline-master student recording sheets; set-up and facilitation videos, correlations and posters; Team Principles contract and STEM discussion prompts.

Program Summary

STEM in Action[®] (SIA) modules follow the Engineering Design Process of defining the problem, planning solutions, making a prototype, testing the prototype, reflecting, communicating results, and redesigning. SIA integrates NGSS PRACTICES and Iowa Core Curriculum while incorporating three-dimensional learning with an emphasis on engineering as well as AUTHENTIC hands-on, problem-based learning. Every module developed in conjunction with Purdue University or Texas A & M is tested in classrooms to ensure the lessons are teacher friendly, and the activities are fun and engaging for students. Each module strikes the perfect balance of rigor and ease of use.

Program Objectives and Description

The key objectives for STEM in Action are to: introduce students to the Engineering Design Process; seamlessly integrate science, technology, engineering, mathematics, and literacy; and teach students how to work in collaborative teams to solve real-world problems. Students conduct investigations; analyze data to make evidence-based prototypes/models as possible solutions, test, make claims, communicate their findings to other teams, and redesign. Math is embedded in the problems as measurement, budgeting, geometry, numeracy, fractions, data collection, etc.

For each module, there are 5–8 hands-on lessons. For grades K-2, each lesson takes no more than 30 minutes and for grades 3-5, a lesson is 30-60 minutes long. One module/kit takes about 2-3 weeks to complete. These lessons require little prep time; provide flexibility for use in centers, classrooms, STEM labs, STEM camps, afterschool programs, and summer school; and connect “real world” and school work through engaging activities.

What is required by the educator in order to implement this program?

Attend a half-day of professional development. Nothing else is required. Teachers will need to make copies of the student recording sheets and have common classroom materials such as crayons, scissors, etc. There is no digital requirement. There will be a \$50 Sub-Pay reimbursement to the district if a teacher misses school for the half day PD training session.

Links

Website: <http://www.hand2mind.com/Brands/STEM-in-Actionv4>

Standards: <https://drive.google.com/file/d/18M2ySry-YFNIWBqrhroA50pst9OpWY40/view>

Videos: <https://www.youtube.com/watch?v=zEGLYNXZ03k&feature=youtu.be>; and <https://www.youtube.com/playlist?list=PLpTmUvLNouD85joTI-uN2MhukNk9rF0vY>