STEM Scale-Up Program

Menu for 2021-2022

GREATNESS®
STEMS
FROM IOWANS

GOVERNOR'S STEM ADVISORY COUNCIL

2021-2022 STEM Scale-Up Program Menu

CodeJoy Computational Thinking in Action with Micro:bit.....4
Description: Helps students understand the power of computer science and how things work in the real world by seeing their projects come to life.
Grade Level: 3-12
Contact: Kelsey Derringer, CodeJoy LLC, kelsey@codejoyedu.com
For more information: www.codejoyeducation.com

DreamBox Learning® Math.....5
Description: Engages students in algebraic reasoning that results in conceptual understanding, procedural fluency and the capacity for creative problem solving needed for the STEM careers of tomorrow.
Grade Level: K-8
Contact: Mary Kareem Smith, DreamBox Learning, kareem.smith@dreambox.com
For more information: www.dreambox.com

Fierce and Fearless STEAM Teacher Training.....6
Description: Monthly professional development in the form of short, on-demand videos taught in the context of real-world problems or phenomena.
Grade Level: PreK-5
Contact: Dr. Yen Verhoeven, QI Learning Research Group, yen@qilearning.com
For more information: https://qilearning.ffst.pages.ontraport.net/

FIRST® LEGO® League Explore.....7
Description: Teams of up to six students discover and learn about the topic, present their findings in the form of a team poster and LEGO model they design, build and program to move autonomously.
Grade Level: K-4
Contact: Camille Schroeder, Iowa State University, camilles@iastate.edu
For more information: www.firstinspires.org/robotics/fll

Ioponics.....8
Description: Creates a foundation for students to understand where their food comes from, how it is grown and its integration into curricular disciplines.
Grade Level: PreK-12
Contact: Michael Bechtel, Wartburg College, michael.bechtel@wartburg.edu
For more information: www.wartburg.edu/ioponics/

Light & Shadow.....9
Description: Framework that assists the teacher in facilitating the physical and social environment of the classroom to allow children to investigate the macro questions of, “What does light allow me to do?” over time.
Grade Level: PreK-3
Contact: Dr. Beth VanMeeteren, University of Northern Iowa, beth.vanmeeteren@uni.edu
For more information: https://regentsctr.uni.edu/

Nepris.....10
Description: A cloud-based platform that connects teachers with industry professionals from various STEM pathways to virtually interact with students to bring abstract lessons to life.
Grade Level: K-12
Contact: Amanda Holsclaw, Nepris, amanda@nepris.com
For more information: https://www.nepris.com

Project Lead the Way Gateway Medical Detectives.....11
Description: Students play the role of real-life medical detectives as they collect and analyze medical data to diagnose disease.
Grade Level: 6-8
Contact: Vic Dreier, PLTW, vdreier@pltw.org
For more information: https://www.pltw.org/our-programs/pltw-gateway-curriculum#curriculum-10

SoapyCilantro.....12
Description: Engages students in acquiring fundamental knowledge about principles of genetics, molecular biology and bioinformatics.
Grade Level: 6-12
Contact: Dr. Pramod Mahajan, Drake University, pramod.mahajan@drake.edu
For more information: https://www.drake.edu/cphs/soapycilantro/

Storytime STEM-packs™.....13
Description: Educational innovation designed to connect children's literature with STEM. Enables educators of young children to successfully incorporate age appropriate STEM concepts into children's programming.
Grade Level: PreK-2
Contact: Gabriela Rose, Allegheny Intermediate Unit, gabriela.rose@aiu3.net
For more information: https://storytimestem.com/

Teaching Energy Transformations and Energy Sources.....14
Description: Explains the science of energy, sources of energy, electricity generation and transmission, transportation and efficiency and conservation at home and at school.
Grade Level: 3-12
Contact: Rebecca Lamb, National Energy Education Development (NEED), rlamb@need.org
For more information: www.need.org

VEX IQ Challenge.....15
Description: A snap-together robotics system designed to encourage future engineers of all skill levels.
Grade Level: 5-8
Contact: Cheryl Burley Rausch, Robotics Education Competition (REC) Foundation, cheryl@roboticseducation.org
For more information: https://www.roboticseducation.org/

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CodeJoy Computational Thinking In Action with Micro:bit

2021-2022 STEM Scale-Up Program

Grade Levels: 3-12, available in or out of school

Website: www.codejoyeducation.com

Award Provides:

- Two 3-hour online workshops, flexible scheduling
- Class set of 30 micro:bits, plus USB cords, AAA battery pack, AAA batteries
- 1 Hummingbird breakout board controller, 2 motors, additional AA battery pack
- Project write ups for physical computing and creative robotics
- Access to online asynchronous teacher materials
- Ongoing tech support
- 1 hour of virtual co-teaching/field trips for students during the school year

Additional Cost(s) to Awardee In 2021-2022:

- Batteries – 4 AA needed for motor power
- No travel or accommodations needed

Approximate Sustainability Cost After Award Period:

- Batteries – 2 AAA needed for micro:bit, 4 AA batteries needed for motor power
- Curriculum and online asynchronous teacher materials are free

Program Summary:

Computer science is quickly becoming a basic skill in today's world. But not every student is excited about "computer science." How about playing Rock-Paper-Scissors? Or building a Tiny Drummer from popsicle sticks and cups? Physical computing, an extension of CS, involves using devices to bring computer science off the screen and into the real world. Mounting evidence suggests that physical computing represents a strong and effective way to engage more diverse students in CS, including girls, students of color, students of lower socio-economic status, rural students, and students with learning exceptionalities. Seeing their projects come to life helps students understand the power of computer science and how things work in the real world. (EdWeek.org)

In order to teach CS and physical computing, especially at scale across the state, Iowa educators need thoughtful, inexpensive, and well-supported tools. The micro:bit, with funding from the BBC, is a small, durable microcontroller costing under $15 per student, developed for classroom use, with inputs (sensors) and outputs (actions) built into the board. It can be programmed using coding languages specifically designed for use by elementary, middle, and high school students, and can scale in complexity over many grades and projects.

Teachers will receive a classroom set of 30 micro:bits to use for immediate implementation in either in-person or online instruction. Teachers will also receive a breakout board, called a Hummingbird, and 2 motors, to use their micro:bit to control motors and LEDs. (Many teachers across the state already have classroom sets of Hummingbirds.) PD sessions will be conducted online, allowing for accessibility and connection for teachers across Iowa. In two three-hour virtual sessions, educators will learn multiple projects to serve beginners and intermediate students across 3rd-12th grades.

In addition, as an online learning company, CodeJoy is also able to offer a unique opportunity: In virtual field trips directly serving students, teachers can observe micro:bit being taught virtually by CodeJoy's experienced teachers. In this innovative extension of PD, targeted peer observation is a form of collaborative professional development to share instructional techniques and pedagogy. Flexible scheduling throughout the school year is available.

What is Required to Implement the Program:

Educator(s) must participate in two online workshops, each lasting three hours. Scheduling of these is flexible. Teachers should join online workshops from a computer or Chromebook. Educator(s) must participating in the STEM Council Scale-Up Educator Survey.

Professional Development:

Duration: Two three-hour online workshops scheduled July-October, plus one hour of virtual co-teaching/field trip available for students during school year.
Date(s): TBD, Summer 2021 and School Year 2021-2022
Location: Online

STEM Scale-Up Program Application Link: www.IowaSTEM.org/Scale-Up-Application

DreamBox Learning® Math

2021-2022 STEM Scale-Up Program

Grade Levels: K-8, available in school and out of school

Website: www.dreambox.com
Video Link: DreamBox Learning / Hear from a Student

Award Provides:

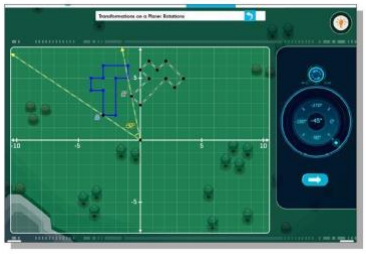
- License K-5 = $15.00 License 6-8 = $10.00 Minimum purchase is $375 0-25 students for K-5, Minimum purchase is 6-8 $250
- Professional Development Package (includes 1-hour implementation webinar and access to DreamBox Learning Library for the duration of the program) = $0

Additional Cost(s) to Awardee In 2021-2022: Optional professional development beyond the initial 1-hour Webinar = $450.00

Approximate Sustainability Cost After Award Period:

- License K-5 = No more than $24, based on volume.
- License 6-8 = $13.00
- Additional 1-hour Professional Development Sessions = $450

Program Summary:
DreamBox is a K-8 digital math program designed to complement your math curriculum whether in the classroom or at home. Proven to positively impact student achievement by multiple independent studies, DreamBox encourages students to think deeply about math while providing educators with valuable insights about learning progress across topics and standards for each student.



WHAT MAKES DREAMBOX UNIQUE?
Engaging lessons. Designed by educators with years of classroom experience and advanced degrees, DreamBox lessons are thoughtfully designed to create real learning progress and are built from the ground up to be adaptive and leverage the capabilities of a digital experience.

DreamBox lessons are also engaging, fun, and thought provoking for students. Stories and fun game elements combined with the right level of challenge help students build intrinsic motivation and stay engaged in their learning.

Leading adaptivity and personalization: DreamBox lessons are based on the use of virtual manipulatives that use multiple representations and contexts to deliver experiential mathematics instruction and support deep understanding. DreamBox analyzes each approach, decision, and interaction students make before they even enter the final answer. This allows for scaffolded, personalized instruction that strengthens understanding of math concepts while building student confidence.

Robust reporting and insight: With data from leading adaptivity and personalized learning insight, DreamBox provides educators substantial insight into student progress at both the aggregate and individual level.

Educators can access the **Insight Dashboard**, which organizes reports and information about student progress through standards, current activity, progress on assignments, and much more including forward-looking reports with predictions about year-end state-level exam proficiency. Find out why more than 5 million students and 200,000 K-8 teachers make DreamBox an important part of their curriculum and classrooms.

What is Required to Implement the Program: **Desktops** (includes Laptops and Chromebooks): *Operating System;* Chrome OS (auto-updated), Windows 7+, Mac OS 10.10+. *Browser:* The latest versions of Chrome, Edge, Safari, Firefox, and Internet Explorer 11 - as well as the current ESR version of Firefox - are always supported. **iPad:** *Device* iPad 2+, iPad Mini (1st Gen+); *iOS* iOS 9.3 or above. Educators must participate in the STEM Council Scale-Up Educator Survey.

Professional Development: DreamBox Learning Library and 1-hour training webinar
Duration: 1-hour webinar
Date(s): (three date options TBD)
Location: Virtual

STEM Scale-Up Program Application Link: www.IowaSTEM.org/Scale-Up-Application

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Fierce and Fearless STEAM Teacher Training

2021-2022 STEM Scale-Up Program

Grade Levels: PreK-5, available in school and out of school

Information Sessions: February 9, 6pm Register here for session via Zoom
Website: https://qilearning.ffst.pages.ontraport.net/

Award Provides:

- Monthly Professional Development (5hrs/month)
- Live Zoom and pre-recorded webinars on science topics to help build scientific content knowledge
- Year-long online professional community to discuss reflections, insights, and take-aways
- STEAM materials
- $200 bi-monthly training allowance (up to $1,000)
- Subscription to Readorium, an interactive tutoring program
- Subscription to StarrMatica's leveled informational texts
- Subscription to the STEAM Café Library
- Subscription to the Distance Learning Toolkit
- STEM Challenge bundle by Feel-Good Teaching

Additional Cost(s) to Awardee In 2021-2022:
Participants may enroll to earn 3 grad credits for FFST from Drake University at their own expense.

Approximate Sustainability Cost After Award Period:

- Training new educator: $2,075 for training materials
- $1,000 for five $200 bi-monthly training allowance
- Annual StarrMatica, Readorium, and STEAM Café subscriptions (variable cost)

Program Summary: Fierce and Fearless STEAM Teacher Training (FFST) participants will receive 3 monthly synchronous online PD sessions that focus on STEAM teaching methodology, mindset, and science content grounded in social emotional learning (SEL) and culturally responsive pedagogy. Teachers apply these methodologies in the classroom using STEAM resources that situate the learning in real-world contexts and phenomena. These resources cover the disciplinary core ideas (DCIs) throughout the year. Our private Facebook PD community provides mentoring, guidance, examples, and inspiration to support teachers' classroom practices. We take a transdisciplinary approach to our skills-based PD, which emphasizes 21st Century Skills and their intersections with the NGSS, Common Core Mathematics and Literacy, Social Studies, and Fine Arts standards. Culturally responsive pedagogy and practices within STEAM provides students with interactions that support their academic success.

FFST is a culmination of the work developed from Dr. Yen Verhoeven's thesis regarding online learning, her collaborations with the Ames Community School District in Ames, Iowa, and her PD workshops and videos in STEAM education and distance learning. This program utilizes a unique culturally responsive SEL lens that Jennifer Terry brings from her work as a Culturally Responsive Teaching coach for school districts, businesses and organizations.

In addition to PD and resources, FFST participants receive: (a) two textbooks that support science and culturally responsive instruction; (b) $200 bi-monthly training allowance to cover off-contract time (training preparation and participation), technology, equipment and supplies (c) a subscription to the interactive tutoring program, Readorium; (d) StarrMatica's leveled informational texts; (e) a STEAM resource library; and (f) a bundle of year-long STEM challenges from Feel-Good Teaching. FFST participants also receive free admission to STEM Con 2022 and any events hosted by Qi Learning.

Requirements to Implement the Program:

- Attendance required at each professional development session (3 hours/month).
- Monthly interactive responses and peer posts through the Facebook private group (1 hour/month).
- Monthly journal reflection and evaluation survey (1 hour/month).
- Participation in the spring STEM Scale-Up Evaluation is required.

Professional Development:
Synchronous virtual sessions for the first three Tuesdays of every month: July* 6, 13, 20; August 3,10, 17; September 7, 14, 21; October 5, 12, 19; November 2, 9, 16; December 7, 14, 21; January* 4, 11, 18; February 1, 8, 15; March 1, 8, 15; April 5, 12, 19
*Weather and COVID permitting, July, and January dates will be swapped for a 5-hour in-person workshop on July 10 and January 29th.

Monthly sessions will be recorded for later viewing.
Week 1: 1-hour synchronous Zoom PD on teacher leadership, self-care, and STEAM mindset (live and recorded)
Week 2: 1-hour synchronous Zoom PD on distance learning and in-person instructional design and STEAM teaching methodology (live and recorded)
Week 3: 1-hour synchronous Zoom PD on a STEAM topic for teachers to gain scientific content knowledge (live and recorded)
Week 4: Facebook asynchronous discussions, reflections, insights, and take-aways (2 hours of out-of-class time).

STEM Scale-Up Program Application Link: www.IowaSTEM.gov/Scale-Up-Application

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FIRST® LEGO® League Explore

2021-2022 STEM Scale-Up Program

Grade Levels: K-4, available in school or out of school

Information Sessions: February 5, 12, 19 – 8:00a.m.
Please click this URL to start or join: https://iastate.zoom.us/j/96923670455
Or, go to https://iastate.zoom.us/join and enter meeting ID: 969 2367 0455
Join via phone line: Dial: 312-626-6799 or 646-876-9923 Meeting ID: 969 2367 0455
Website: https://www.firstinspires.org/robotics/fll;www.isek.iastate.edu
Video Link: https://youtu.be/pUONOiVSqTs, https://youtu.be/afYrsiQ48wA

Award Provides:

- Team Registration for FIRST LEGO League Explore
- LEGO Education WeDo 2.0 set
- Engineering Notebooks and Team Guidebooks
- Access to online resources and alignment tools for team of 6 students and 2 adult coach/teacher
- Half-day training
- Access to attend Expo event

Additional Cost(s) to Awardee In 2021-2022:
No additional costs to awardees.

Approximate Sustainability Cost After Award Period:
$100/year for team registration

Program Summary:
FIRST LEGO League (FLL) Explore is an international program created by LEGO® and the nonprofit FIRST (For Inspiration and Recognition of Science and Technology) for students in grades K-4 (up to age 10). The program in Iowa is directed by ISU College of Engineering. Each August a new Challenge for teams is released that focuses on a scientific topic. Teams of up to 6 students discover and learn about the topic, present their findings in the form of a team poster and LEGO model they design, build and program to move autonomously. They also explore core values, teamwork and STEM concepts such as computational thinking and engineering design through in-class or after-school options. The framework is for facilitators (educators/coaches) to guide their students through 12 modules where they will use their Engineering Notebooks to explore the fundamentals of engineering through a real-world problem, learn to design and code, and create unique solutions made with creativity and artistic expression through LEGO® bricks and powered by the LEGO® WeDo 2.0 robotics kit. Teams are invited to attend regional showcases (Expo) with other teams where they can share their learning and show off their programming, design and artistic creativity through their Show Me poster, WeDo 2.0 programming and LEGO model. Teams discuss their learning with background screened, trained professionals who volunteer to act as Reviewers and serve as STEM role models. Team coaches may have multiple teams. FLL Explore is mapped to the national educational standards at https://info.firstinspires.org/curriculum.

What is Required to Implement the Program:
Each team must have at least 2 adults designated as coaches. Teams must register with *FIRST* and have a LEGO WeDo 2.0 kit to be an official team. Team registration for ***FIRST*** LEGO League Explore includes:

- Official *FIRST* LEGO League Explore team number
- Explore Set, used by the team to complete their challenge for the season
- Access to printed and digital season materials

Resources include the Team Meeting guide, static and interactive version of the Engineering Notebook and a library of other tools and resources you can use throughout the year. Access to attend Expo events which may include physical, remote, or a combination. WeDo 2.0 programming is supported for languages including: English, Spanish, German, French, Danish, Swedish, Norwegian, Japanese, Chinese, Russian, Arabic, Portuguese and Korean. A laptop, Chromebook or other device with Bluetooth will be needed for programming (not provided in this grant).
https://www.firstinspires.org/sites/default/files/uploads/resource_library/first-lego-league-explore-how-it-works.pdf

Educators must participate in the STEM Council Scale-Up Educator Survey.

Professional Development:
Duration: Half-day training
Date(s): July 9, July 16, 2021, 8:30a-12:30p; more dates TBD based on applicants
Location: Virtual or at ISU College of Engineering, Ames, Iowa

Email fll@iastate.edu with any questions about the program.

STEM Scale-Up Program Application Link: www.IowaSTEM.org/Scale-Up-Application

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Ioponics

2021-2022 STEM Scale-Up Program

Grade Levels: PreK-12, available in or out of school

Information Sessions: Any one of the 6 synchronous remote opportunities (Wednesday, January 27 or Friday, February 19 - 7:30, 11:30, or 3:30)
Website: https://www.wartburg.edu/ioponics/
Video Link: https://www.youtube.com/watch?v=94RS3T5hBTw&feature=youtu.be

Award Provides:
- One complete 1-gallon or 30-gallon Ioponics system
- 4 hours of professional development with $120 stipend (or sub reimbursement)
- Standard-aligned lesson plans for grades PreK-4, 5-8 and 9-12
- Technical support

30-gallon System Includes:
- 30-gallon aquarium
- Plant grow bed
- Base and stand
- UV light
- Timer
- Water pump & tubing
- Air pump & tubing
- PVC piping
- Seeds
- Fish & starter pellets

1-gallon System Includes:
- Two 1-gallon containers
- Net cup and plug
- Aquarium rocks
- Plant
- Fish

Additional Cost(s) to Awardee In 2021-2022:
- Travel to training
- Additional aquaponics fish pellets
- Seeds & plants (personal choice)

Approximate Sustainability Cost After Award Period:
Consumables such as aquaponics fish pellets, fish, seeds, plants, etc.

Program Summary:
Ioponics, a classroom aquaponics system, based on E.O. Wilson's concepts of biophilia. The term "biophilia" puts a label on humanity's innate tendency to seek connections, or attachments, to other living things. Ioponics is an educational tool that easily incorporates biophilia in the classroom with NGSS (Next Generation Science Standards) and AFNR (Agriculture, Food, and Natural Resources) standards into a "living" learning setting. The model provides a hands-on, minds-on approach to STEAM (Science, Technology, Engineering, Agriculture and Mathematics) curriculum. The 1-gallon and 30-gallon Ioponics systems allow for any educational setting to actively engage with living organisms for agricultural and scientific purposes, independent of an outdoor environment. Beyond the STEAM and AFNR lessons, the Ioponics system engages with natural andragogical practices, builds student self-efficacy, strengthens 21st century skills and provides a classroom foundation for other curricular disciplines. Understanding the process of food production develops vested community members and creates engaged and knowledgeable citizens.

Ioponics creates a foundation for students to understand where their food comes from, how it is grown and its integration into curricular disciplines. While plants and animals are common in classrooms, typically they are not part of a food production cycle. The Ioponics systems naturally provide a linchpin which support the seven NGSS crosscutting concepts and the eight AFNR pathways. The overarching NGSS concepts are: 1) patterns, 2) cause and effect, 3) scale, proportion, and quantity, 4) systems and system models, 5) energy and matter, 6) structure and function, and 7) stability and change. The AFNR pathways (systems) include: 1) agribusiness, 2) animal, 3) biotechnology, 4) environmental service, 5) food products, 6) natural resources, 7) plant, and 8) power, structural, and technical. Ioponics provides a context to address all standards and pathways in one self-contained model.

Ioponics is different from other aquaponics systems because it couples an easily modifiable hands-on unit with academic supports; standard-aligned lessons, systems support network and the ability to add personally created lessons to the composite system. Participating educators can create their own lessons to be shared with the Ioponics community or provide ideas for lessons which will be created by pre-service educators at Wartburg College.

What is Required to Implement the Program:
Educator must attend a half-day of professional development and participate in the Iowa STEM Council program evaluation. Educator must choose between the 1-gallon and 30-gallon system. For 30-gallon system (minimum): 1) Square floor/ counter space 41" (104 cm) wide by 16" (41 cm) deep, 2) Height availability of 52" (132 cm), and 3) accessibility to an outlet. For participant(s): 1) construct, use, and maintain the system, 2) teach the lessons, 3) communicate successes and problems with Ioponics. Educators must participate in the Iowa STEM Council program evaluation.

Professional Development:
A half-day professional development session includes lesson presentation and hands-on system construction. Educators may also choose to attend virtual one-hour training opportunities throughout the year.

Duration: One half-day of training (4 hours)
Date(s): Training dates will be offered in late summer between July 15 – September 15 (8:30am to 12:30pm or 1:00pm to 5:00pm)
Location: Trainings may be held in each of the six STEM regions

STEM Scale-Up Program Application Link: www.IowaSTEM.org/Scale-Up-Application

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Light & Shadow

2021-2022 STEM Scale-Up Program

Grade Levels: PreK-3, available in school or out of school

Website: https://regentsctr.uni.edu/
Video Link: https://drive.google.com/file/d/13b2FJRxrMTbGsvAyW-9j5s9BoNTDL2XI/view?usp=sharing

Award Provides:

- Classroom kit with a large floor screen, small table screen, a variety of light sources and materials
- Wooden storage cart for materials
- Teacher's Guide
- High quality professional learning taught by degreed early childhood master teachers with classroom experience
- One UNI graduate or undergraduate credit (based on educator's needs)
- Educator stipend of $240

Additional Cost(s) to Awardee In 2021-2022:
Travel to and from professional learning sessions

Approximate Sustainability Cost After Award Period:
Materials are non-consumable and will last for years with typical classroom use.

Testimonial from Past Scale Up Participant:
"Your professional learning changed my approach to teaching. I notice it in the observations I make, and in the questions I ask. I notice it in my conscious decisions not to help them too much, fix it for them, or tell them the answer. It has been a wonderful experience for me professional and for our students!"

Program Summary:
Technology has been defined by the National Academy of Engineering as "any modification of the natural world done to fulfill human needs or desires". In Light & Shadow (L&S), students construct the technology of shadows to fulfill their human need or want to make an object interact with light in an interesting way. Through construction, they **engage in the processes of engineering design** and **grapple with the constraints of physics** to cast different kinds of light and/or develop shadows using a variety of objects, screens, and light sources. In the act of shadow construction, students **engage in the mathematics of spatial thinking, geometry and measurement.** In L&S students collect and compare data, instilling a desire to communicate through print, speaking and listening. **This garners their interest to master print concepts, develop phonological awareness, and phonics and word fluency**. Students participate in conversations about object properties, light, reflection and design. They recount their construction experiences with appropriate facts and relevant descriptive details. They encounter unknown and multiple-meanings of words and phrases as they seek to explain and **engage in scientific argumentation**. Students develop **21st century skills such as creativity and innovation** when they create new and worthwhile ideas to explore light to create shadows. **Civic Literacy** is experienced as they co-create rules and management systems for working within L&S investigations. Students are nurtured in **Life and Career Skills** as they work independently to pursue a design goal and interact with others to problem solve. Rather than learning *about* productivity and accountability, students are immersed in an atmosphere where *these traits are practiced and developed.* As a result, L&S is a fully integrative STEM activity that meets many **Iowa Early Learning Standards** and **Next Generation Science and Engineering Standards.**

What is Required to Implement the Program:
Educator(s) must attend 2 six-hour days of highly interactive professional development (one before the start of the school year when the educator receives the classroom kit, one in the fall after implementation begins) and a minimum of 3 hours of online interaction with peers and Instructor throughout the fall semester. Educators must participate in the Iowa STEM Council program evaluation.

Professional Development:
Research shows preschool and primary grade teachers are uncomfortable teaching science content, particularly physical science content. **L&S professional learning is structured to allow teachers to explore the same materials that will be provided to their students.** In the process of manipulating light and shadow, concepts in physics are revealed/revisited. **Teachers learn to view technology as more than computers or electronic devices, and begin to value students' creative endeavors to explore L&S as opportunities to nurture the next great inventor.** L&S professional learning introduces engineering's simple definition of "design under constraint." This definition encourages teachers to re-envision (re-engineer) their physical classroom, routines and time schedules under state and district constraints to optimize their students' learning. **As a result, standards in engineering and physical science become more relevant and authentic in their work with students and teachers discern many opportunities for addressing literacy, math and 21st century skills.** L&S professional learning assists teachers in documenting children's growth in inquiry and engineering practices. Throughout the fall semester, teachers will have the opportunity to engage in online professional learning communities, sharing photos, video, experiences and successes to assist each other in problem solving obstacles in implementing high quality STEM experiences in their settings.

Duration: 2 six-hour days plus communicating with peers and instructor through social media
Date(s): First date on weekday in summer, second date on a Saturday after school begins
Location: In your STEM Hub area at a place to be determined

STEM Scale-Up Program Application Link: www.IowaSTEM.org/Scale-Up-Application

Nepris – Virtual Industry Connections to Real World Learning (Cloud-Based Platform)

2021-2022 STEM Scale-Up Program

Grade Levels: K-12; available in or out of school
Information Sessions: Multiple ongoing webinars available. Register: http://bit.ly/NeprisIowaSTEM
Website: https://www.nepris.com
Video Link: http://bit.ly/NeprisIowaSTEMVideo

Award Provides:

- One-year subscription for unlimited access to Nepris – Virtual Industry Connections to Real World Learning.
- A two-hour webinar training.
- Access to OnDemand PD courses and ongoing live webinars.
- $50 educator stipend for attending the two-hour webinar training.

Additional Cost(s) to Awardee In 2021-2022:
Internet, webcam and audio speaker are required. If the learning environment does not have these capabilities, this could be an additional cost.

Approximate Sustainability Cost After Award Period:
Each following year subscription cost per school site can vary between $1,500-$3,500 based on student enrollment.

Program Summary:
Nepris provides a web-based platform that connects teachers with industry professionals from various STEM pathways to virtually interact with students to bring abstract lessons to life, mentor students on class projects, evaluate student work, provide insight into a day in the life of a professional, conduct virtual job shadows, participate in career days and offer virtual tours of workspaces. Nepris has over 5,000 companies and 40,000 professionals represented in the platform with partnerships that bring diverse STEM role models to students. See video link above. Nepris engagement models include:

a. Live synchronous **Industry Chats** offered by hundreds of Industry Partners. Topics range from Computer science careers to the application of Robotics.
b. **Teacher Requested Live Sessions** where Nepris will match one or more industry professionals to an educator for the purposes of curriculum relevancy, career development, project mentorship, etc.
c. **Video Library** - 12,000+ career videos, a repository including on-demand recordings of live Industry sessions to provide an asynchronous learning option. This repository grows daily as new sessions are completed.
d. Nepris **Career Explorer** tool which aligns to the US Department of Labor and O-Net careers.
e. **Reinforcement Tools** include micro-lessons and activity sheets for students to complete in conjunction with their live interaction with the industry professionals.

Nepris provides single-sign-on and roster integration to make it easy for teachers to use this platform as part of existing solutions at their schools. Email Amanda@nepris.com for details.

What is Required to Implement the Program:

- Educators must attend a 2-hour virtual training or get a certificate of completion from OnDemand PD courses.
- Educators must take a short survey after each virtual session and also administer at least 3 surveys to students during the school year.
- All points of contact (POCs) for each site should attend an onboarding and goal setting meeting before launch, midyear and end of year.
- Classrooms must have access to at least one teacher device that is connected to a projector with webcam and audio capabilities.
- Participation in the STEM Council Scale-Up Educator Survey.

Professional Development:
All educators must attend one of the following training options before receiving access to the platform:

- LIVE Virtual training workshops: Duration 2 hours. A variety of training dates and times are available through summer and fall.
- OnDemand PD: Duration is 15-30 minutes per module. Self-paced, self-guided online training courses with unlimited access. Certification of completion provided for each module.

Optional ongoing webinars: Duration is 30 minutes. Weekly ongoing webinars, offered throughout the school year to support educators with implementation of Nepris.

STEM Scale-Up Program Application Link: www.IowaSTEM.org/Scale-Up-Application

PLTW Gateway Medical Detectives

2021-2022 STEM Scale-Up Program

Grade Levels: 6-8, available in or out of school

Information Sessions: Thursday, Jan 21 3:30 https://tinyurl.com/pltw-iowastem
Website: https://www.pltw.org/our-programs/pltw-gateway-curriculum#curriculum-10

Award Provides:
Access to Project Lead The Way's PLTW Gateway Medical Detectives curriculum and to all PLTW Gateway program features including:

- Connections with PLTW teachers both in Iowa and across the country through training and online forums
- Ongoing access to teacher resources and learning opportunities and 24/7 school and technical support
- Required software licenses
- Five days of Medical Detectives Core Training, unit curriculum and supplies and PLTW participation fee for one year

Additional Cost(s) to Awardee In 2021-2022:
None required but districts may choose to provide the educator a stipend for training.

Approximate Sustainability Cost After Award Period:

- Annual PLTW Participation Fee for PLTW Gateway ($950)
- Annual cost of consumables ($942.00 per section of the course offered)

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. PLTW Gateway was developed for students in grades 6-8.

In the Medical Detectives 10-week unit, students play the role of real-life medical detectives as they collect and analyze medical data to diagnose disease. They solve medical mysteries by performing a brain dissection and conducting crime scene investigations. Students use tools such as the engineering design process, an engineering notebook and electrophoresis to solve a murder. Your students can learn how creative thinking and problem solving can change the world.

Students solve medical mysteries through hands-on projects and labs, measure and interpret vital signs, examine nervous system structure and function, investigate disease outbreaks and explore how a breakdown within the human body can lead to dysfunction. The curriculum is available in English and Spanish.

Below are related course documents:
Course Outline
Course Standards

For more information, please contact Vic Dreier at vdreier@pltw.org.

What is Required to Implement the Program:

- Educator(s) must participate and successfully complete PLTW's Gateway Medical Detectives Core Training.
- Awarded applicants will be expected to implement the Medical Detectives unit during the 2021-2022 school year.
- An agreement and participation form indicating participation in PLTW Gateway Medical Detectives signed by the building administrator is required before receiving training or materials.
- Participation in the STEM Council Scale-Up Educator Survey.

Professional Development:
In order to implement PLTW Gateway Medical Detectives, teachers will need to participate in and successfully complete PLTW's Medical Detectives Core Training.

PLTW Core Training immerses teachers in a hands-on, collaborative learning environment that challenges them to look at their classrooms in a new way. Teachers take on the role of a student, engage in in-depth exploration of PLTW coursework and gain invaluable experience to take back to their classrooms.

Duration: 5 days
Date: July 26-30, 2021
Location: virtual

STEM Scale-Up Program Application Link: www.IowaSTEM.org/Scale-Up-Application

SoapyCilantro: A Hands-On Introduction to Genomics

2021-2022 STEM Scale-Up Program

Grade Levels: 6-12, available in school and out of school

Information Sessions: January 26, 4pm via zoom
Contact Information: Dr. Pramod Mahajan 515 271 3022 Pramod.mahajan@drake.edu
Video Link: https://vimeo.com/492622238
Website: https://www.drake.edu/cphs/soapycilantro/

Award Provides:

- 5-day, 45 hr Professional Development
- Consumables: molecular biology grade reagents, disposable and consumable plastics, and copies of instruction manuals for each DNA analysis kit (for 25 students)
- Non-Consumable equipment: Four micropipettes, one microcentrifuge, one thermocycler, one gel electrophoresis apparatus including a constant voltage power supply, and an imaging station.
- $50 travel/day support/educator
- $120/day stipend to attend training
- Continuing education credits (3)

Additional Cost(s) to Awardee In 2021-2022:
Optional continuing education credits

Approximate Sustainability Cost After Award Period:

- $825 in consumable materials/25 students
- $150-250 to train a new educator
- $1,250-1,400 to replace equipment (every 4-5 years)

Program Summary:
The SoapyCilantro practicum offers hands-on learning experience in Precision Medicine connecting genomics to human health and agriculture. In this Iowa-grown program, students isolate and analyze their own DNA in their classroom. Students taste fresh cilantro leaves and note down the taste: Spicy, mild spicy or soapy. They collect their own buccal (cheek) cells, purify genomic DNA, amplify their gene responsible for cilantro taste and detect their genotype. Students correlate their genetic and taste-test results and discuss implications of genetic variations to human health using this innocuous 'cilantro taste' human trait. Student centered: students isolate and analyze their own DNA, and relate it to their own genetic trait.

Connecting genetic variations to individual health brings it into the realm of 'real-world' scenarios where students relate to issues like health insurance, patient privacy and social responsibility. The hands-on learning experience engages students in acquiring fundamental knowledge about principles of genetics, molecular biology and bioinformatics. They also learn how to apply these principles and the knowledge to improve human health and/or agriculture. Additionally, students acquire transferable research skills such as building and testing hypotheses, planning and conducting experiments, as well as collecting, recording, analyzing, interpreting and presenting results. Learners also gain experience in team-work, communication, leadership and time management.

What is Required to Implement the Program:

- Attendance at 5-day (45 hour) summer professional development.
- Participation in the spring STEM Scale-Up Evaluation.

Professional Development:
Our week-long enquiry-based course combines didactic, hands-on and team-based learning experiences. In the morning sessions, participants learn basic concepts and select applications of Precision Medicine (PM) through lectures and team discussions. In the afternoon, participants conduct laboratory and bioinformatic protocols to isolate and analyze human DNA, and learn to apply this information to human health. Through team-based discussions, participants explore the ethical, social and legal implications of Precision Medicine, in preparation for implementation and discussion with students in class. Successful completion of this course enables participants to receive three continuing-education credits.

Duration: 5 day (45 hours)
Date(s): July 19-23 and August 9-13
Location: TBD

STEM Scale-Up Program Application Link: www.IowaSTEM.org/Scale-Up-Application

GREATNESS STEMS FROM IOWANS

GOVERNOR'S STEM ADVISORY COUNCIL

Storytime STEM-packs™

2021-2022 STEM Scale-Up Program

Grade Levels: PreK-2, available in school or out of school

Website: https://storytimestem.com/ / Detailed Description & Standards Alignment
Video Link: https://youtu.be/qHjRWuThtec

Award Provides:

- **1 Storytime STEM + Computer Science Adventure** (choose Moon, Dragonland or Earth Day Adventures)
- **1 Science or Engineering Design Storytime STEM-pack** (choose 1 from *When the Wind Blows, Drum City, The Boy Who Harnessed the Wind, Giraffes Can't Dance*, or *On the Construction Site*)
- **1 Mathematics Storytime STEM-pack** (choose 1 from *The Secret Life of Squirrels, Ten Black Dots, Over and Under the Pond, The Rainbow Fish*, or *Margaret and the Moon)*
- 3 hours virtual synchronous PD
- $ 60.00 stipend

Additional Cost(s) to Awardee In 2021-2022: N/A

Approximate Sustainability Cost After Award Period: Refurbishment costs for consumable materials range between $10-$20 per Storytime STEM+C Adventure, and between $0-$12 per Storytime STEM-pack.

Program Summary:

Storytime STEM-packs are a PreK-2 educational innovation designed to connect children's literature with STEM. They enable educators of young children to successfully incorporate age-appropriate STEM concepts into children's programming.

Using the storybook as context, Storytime STEM-packs present children with a phenomenon or problem. Through engagement in the practice standards for science, engineering or mathematics, and the use of a crosscutting concept, children collaboratively explain the phenomenon or solve the problem, thereby making sense of the STEM concept. The facilitation guide offers suggestions for open-ended questions to elicit children's thinking and promote discussion.

Developed as part of a National Science Foundation I-Corps grant, Storytime STEM-packs are fun and engaging for kids, easy to use with minimal preparation time and aligned to Next Generation Science and Common Core Mathematics Standards, also with alignment to Iowa content and 21st century standards.

Storytime STEM-packs can be used in classrooms, as centers, in STEAM labs, as well as public libraries, STEM camps, out-of-school programs and summer school. It takes approximately 45 minutes to complete one Storytime STEM+C Challenge or one STEM-pack.

Included in each Storytime STEM+C Adventure:

- 3 Storybooks
- Facilitator guides for each of the five learning challenges (each 45 min)
- Print materials
- Hands-on materials for 24 children
- 6 colorful themed vinyl mats
- 6 Bee-Bots with charging station

Included in each Storytime STEM-pack:

- 1 Storybook
- A facilitator guide with STEM-background and lesson plan (45 min)
- Print materials
- Hands-on materials for 24 children

What is Required to Implement the Program:

Educator(s) choose 1 Storytime STEM+C Adventure and 2 Storytime STEM-packs (1 science/engineering and 1 mathematics) and attend the half-day professional development. A memorandum of understanding signed by the building administrator is required before materials can be delivered. Participation in the STEM Council Scale-Up Educator Survey is also required.

Professional Development:

Professional Development includes an introduction to STEM learning for young children and Storytime STEM-packs, engagement in parts of your selected Storytime STEM+C Adventure and facilitation support for math and science Storytime STEM-packs.
Duration: Half-day training (3 hours)
Date(s): Summer, Tuesday-Thursday, July 13- August 5, 2021
Location: Synchronous virtual

STEM Scale-Up Program Application Link: www.IowaSTEM.org/Scale-Up-Application

Teaching Energy Transformations and Energy Sources

2021-2022 STEM Scale-Up Program

Grade Levels: 3-12, available in school and out of school

Information Sessions: Feb 2, 2021 4:30 PM CST, https://bit.ly/37LQSZY
Website: www.need.org
Video Link: https://youtu.be/j51LNU7Yap0

Award Provides:

- Science of Energy classroom kit
- NEED Basic Curriculum Unit
- One-day regional in-person workshop
- Ongoing teachers support
- Stipend for workshop attendees
- Workshop mileage reimbursement

Additional Cost(s) to Awardee In 2021-2022:
No additional costs to awardees.

Approximate Sustainability Cost After Award Period:
$25-$35/year to replenish consumables

Program Summary:
Teaching Energy Transformations and Energy Sources will provide professional development, lesson plans and hands-on materials. Leveled curriculum provided to teach concepts at the elementary, intermediate and secondary levels.

This program includes

- Forms of Energy, Energy Transformations
- Renewable and Nonrenewable Resources
- Electricity and Iowa's Energy Picture
- Renewable Energy Engineering Design Challenges
- Energy Careers
- Interdisciplinary Activities
- Correlations to Iowa Core Standards

Participants will receive NEED's Science of Energy kit and a Basic Curriculum Packet. The Science of Energy kit includes materials, black-line reproducibles and lesson plans in three grade bands for hands-on learning about energy transformations as the basis for understanding the energy we use today. The kit is well suited for inclusive and differentiated classrooms, as it uses the same hands-on materials to cover transformations in the elementary, intermediate and secondary grade bands. The basic curriculum packet includes NEED's most popular activities as well as activities from the program workshops.

The NEED Project is a 501(c)3 nonprofit organization dedicated to creating an energy literate society. NEED programs explain the science of energy, sources of energy, electricity generation and transmission, transportation and efficiency and conservation at home and at school. Materials are designed for four levels – primary, elementary, intermediate and secondary. For the 2021-2022 school year, the program offered through the STEM Scale-Up program will focus on 3rd – 12th grade.

What is Required to Implement the Program:

- Participants should plan at least 8 class periods (or equivalent) over the course of the school year to teach the lessons.
- Attendance at one-day professional development workshop.
- Participation in the STEM Council Scale-Up Educator Survey.

Professional Development:
Teachers will attend a one-day hands-on regional workshop. The fast paced workshop will provide background information and experience with the classroom resources. Workshop attendees often cite NEED workshops as: *"The best professional development I've ever attended."*

Duration: One-day workshop
Date(s): Week of July 26, 2021
Location: Regional in-person workshops (virtual workshops if required based on local health and safety guidance – hands-on materials will be sent prior to virtual workshop for hands-on experience)

STEM Scale-Up Program Application Link: www.IowaSTEM.org/Scale-Up-Application

VEX IQ Challenge – Presented by the REC Foundation

2021-2022 STEM Scale-Up Program

Grade Levels: 4-8; available in or out of school

Information Sessions: https://www.roboticseducation.org/new-to-robotics/
Website: https://www.roboticseducation.org/
Video Link: https://www.roboticseducation.org/current-game-information/

Award Provides:
-VEX IQ Challenge materials
-12-16 hours of professional development plus a sub stipend
-Student curriculum
-Continuing online education available as needed for educators
-Technical support
-One school year of team competition registration fees
-One school year of local competition fees

Additional Cost(s) to Awardee In 2021-2022:
-Travel costs to attend regional, state or national competitions if a team qualifies

Approximate Sustainability Cost After Award Period:
-Team registration fee $150 annually
-Replacement parts vary but under $100, including shipping, if something breaks

Program Summary:
The path towards a passion for STEM starts early. The VEX IQ Challenge Robotics Competition program provides 4th – 8th grade students with a snap-together robotics system designed from the ground up to provide the opportunity to learn introductory programming and engineering skills. The study of robotics inherently incorporates all four pillars of STEM through hands-on, student-centered learning. The program can be implemented in a classroom or out-of-school time club setting and is ongoing throughout the school year.

The VEX IQ Challenge kit is self-contained. No fabrication, welding or special tools are needed for construction. Kits do not take up much storage space and building them only requires regular classroom table space. One kit will serve up to 4 students. The programming software is preloaded onto the robot brain and any classroom computer/laptop or chromebook can communicate with the robot. In addition to technical engineering, programming and design notebook skills, the program teaches highly sought-after soft skills such as communication, creative thinking, teamwork and time management. Tech industry employers have stated that they look for soft skills before technical skills when interviewing potential employees and that success in the workplace is 80% dependent upon soft skills.

Sustainability:

- VEX Robotics programs are student centered meaning no previous robotics experience is needed of the educator (coach).
- VEX Robotics programs are affordable and sustainable. The robot kit lasts for up to 5 years. Replacement parts are inexpensive, and the only additional fees needed each year are team registration fees for the team to participate in official VEX competitions locally, regionally, and at the state level. The program can stand alone without competition participation.
- With the initial award, free student curriculum and continuing teacher professional development education is available online and a technical support team is available to answer questions.

Time commitment:
For out-of-school time programs, educators will spend up to **two 1-2 hour blocks of time weekly**. Local competition events usually take place after school and on weekends. Attendance at competitions is optional.

What is Required to Implement the Program:

1. Attendance at 12-16 hours of professional development; additional educator support is available as needed.
2. Each team needs a coach, a meeting place and technology to support the program. Any computer or laptop will support one team.
3. Participation in the STEM Council Scale-Up Educator Survey.

Professional Development:
12-16 hours of professional development with CEU's is required.

Duration: 2-day virtual training
Date(s): Virtual options will be offered during the months of July and August
Location: Virtual/Online

STEM Scale-Up Program Application Link: www.IowaSTEM.org/Scale-Up-Application