STEM and Computer Science in Maine's Public Schools

Maine Department of Education

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Maine Department of Education

Programming, Coding, and Robotics

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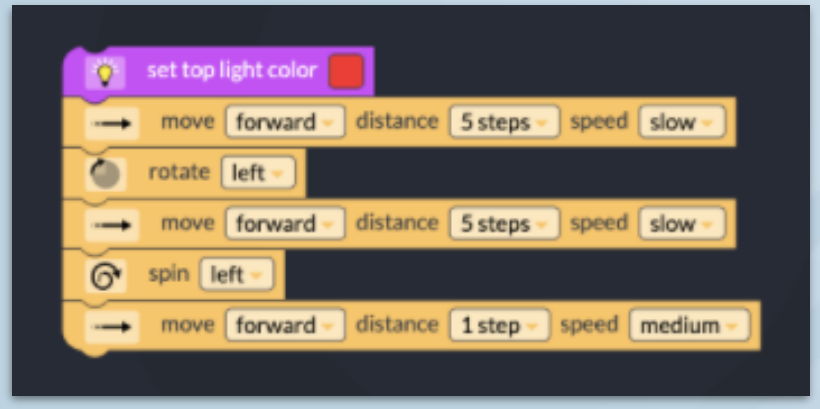
Ozobots at Lewiston

During #CSEdWeek2020, the STEM program at Lewiston Middle School deployed 100 Ozobots to students, both hybrid and remote. Within the first few days, teachers reported 80% of students were engaged AND turning in work early!



Samples of student code from their first experience with the Ozobots

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Girls Who Code at Edward Little HS

This week 8 new ELHS Girls Who Code club members discovered new avenues of technical creativity as they began working with Microbit microcontrollers gifted to the club from Walmart. Several girls expressed excitement about sharing coding activities with friends and family over the upcoming December break.

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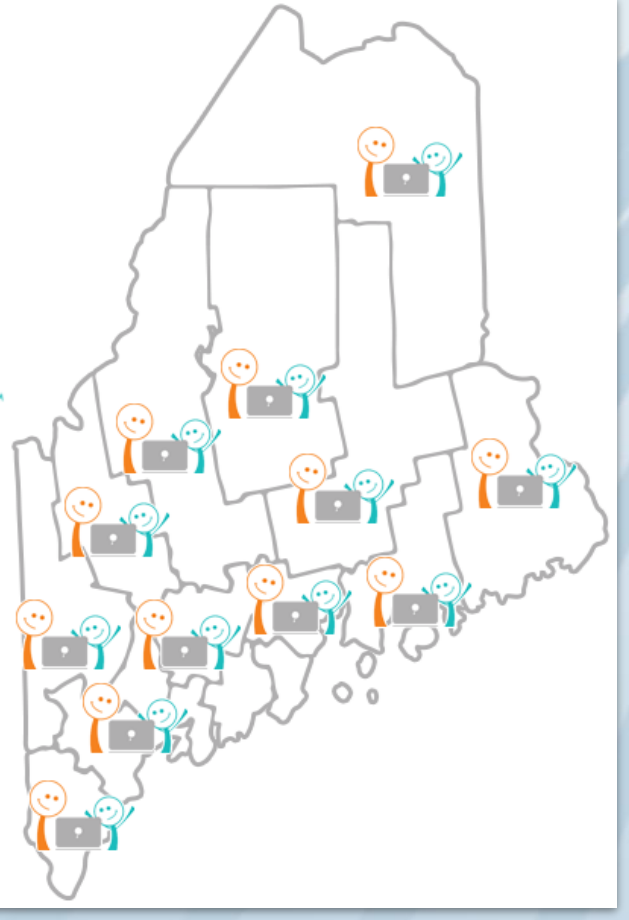
Host a Virtual Family Code Night!

Our goal for 2020:
20% of schools in
each county join

CS is Elementary™

by taking part in a

virtual FAMILY CODE NIGHT™



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Engineering, 3D Design & 3D Printing

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NASA HUNCH at Fort Kent Community High School

Fort Kent Community HS is one of many schools that participate in HUNCH (High Schools United with NASA in Construction of Hardware).

Two Fort Kent Community HS CTE students, Paige Paradis and Shelbie Dumais, were selected as finalists for their creation which was integrated with two other finalists to have a final design to be used on the Space Station.

Source: Fiddlehead Focus

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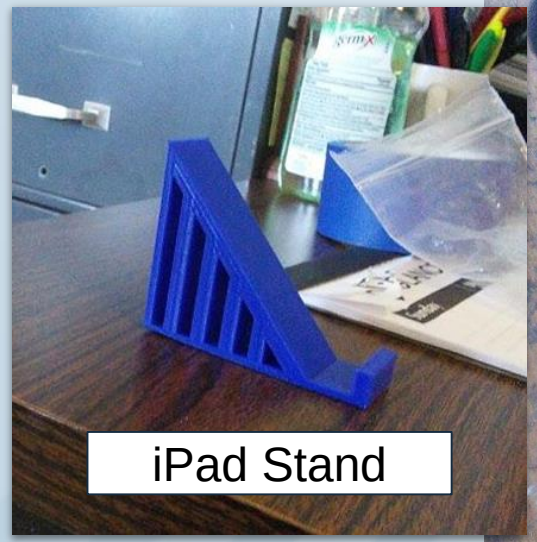
Noble Middle School
Solving Problems with 3D Design

Noble Middle School students identify a problem they can solve with a 3D printed item. Then they design the item, print it and test it. 3D printed solutions can be found all around Noble Middle School!


iPad Stand


Hair Band Holder

Dog Tags

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Integrating 3D Printing at Shapleigh Memorial School in RSU 57

Third graders studied different kinds of clouds and the kind of weather they predict. They created posters about the clouds they researched on the PicCollage app. They also created a 3D model of the cloud on Tinkercad that was printed using our 3D printer.

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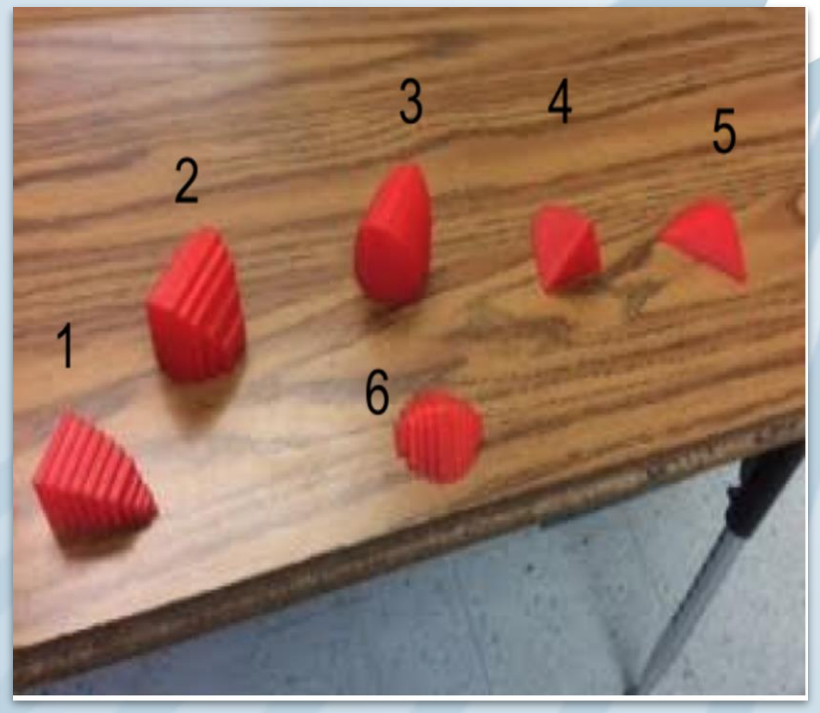
Math & Music

AP Calculus 3D Models of Integrals

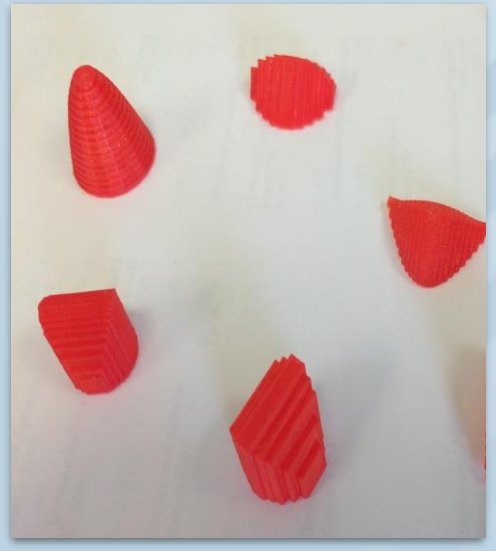
Damian Sorensen, Nokomis Regional High School

Calculating volume by integration can be challenging for students to visualize. Unlike area, where 2D models can be drawn, most shapes are irregular and extremely difficult to represent with an illustration. Seeing the individual cross sections will also allow us to more easily relate 3D integration methods the previously learned 2D methods.



In this project students...

- Choose an intergral to model.
- Determine cross sections necessary to be accurate.
- Algebraically determine dimensions of each cross section
- Convert dimensions into measurements (mm).
- Create model in TinkerCAD.
- Export their model and print.



1: Square cross-sections on a parabolic base
2: Square cross-sections on a circular base
3: Square cross-sections on a circular base
4: Triangular cross-sections on a parabolic base
5: Semi-Circular cross-sections on a sinusoidal base
6: Triangular cross-sections on a circular base

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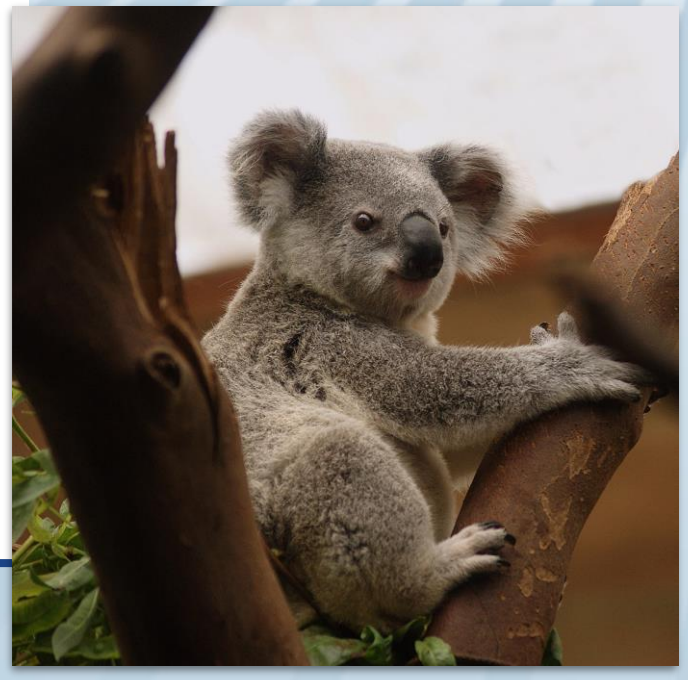
Palermo Consolidated students 3D Printing Project (koala pouches)

Diane Carrillo and her students at Palermo Consolidated School designed looms so they could knit pouches for koalas impacted by the wildfires in Australia.

A new story from WCHS6 was even shared out by MSN.com and they were spotlighted by the PETA Kids website.



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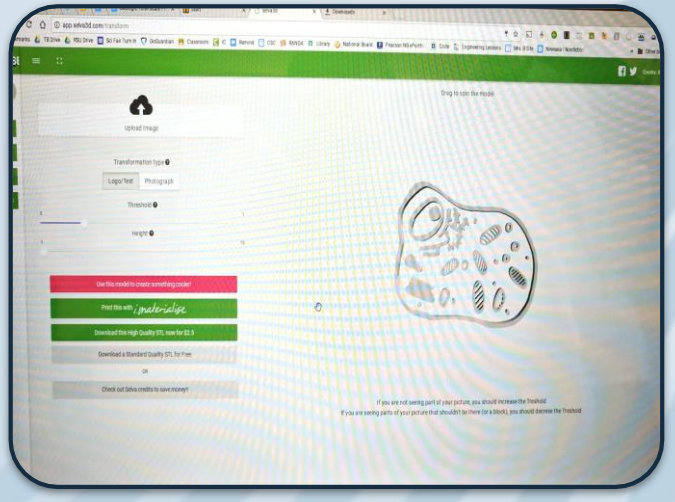
3D Models of Cells

Sebasticook Valley Middle School

The purpose of this project is for students create a 3D model of animal or plant cells. Students will diagram their own custom cells that reflect the components of a cell, take the image and print the results.



In this project students

- Draw a diagram of cell on white index cards with black markers.
- Make sure there is not too much space between pieces of the cell.
- Visit Selva3D.com and take a photo to transform the image.
- Adjust the settings.
- Download the .STL file and share with the 3D Printer account.
- Open the .STL file, turn on rafting and print.

Madawaska fifth graders work with a local soapmaker

Gina Jandreau's students at Madawaska Elementary designed screens for Nutritious Skin, a local soapmaker.

Their story was written up in the Fiddlehead Focus after presenting at the 2020 3D Printing Expo.

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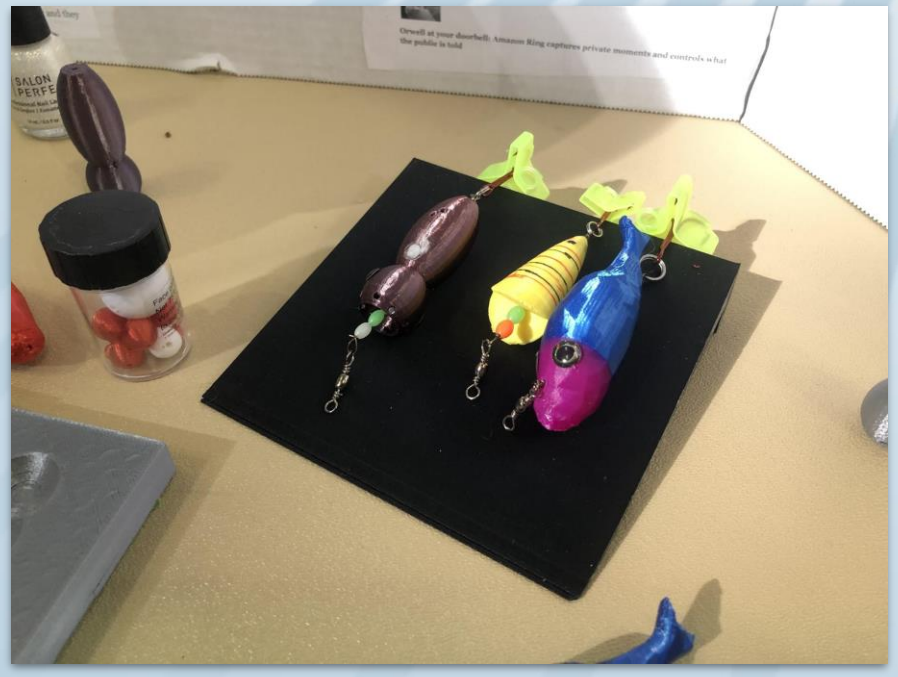
Carrabec fishing club make their lures

Richard Reichenbach, an art and STEM teacher at Carrabec Community School, and members of his fishing club spent some of their downtime in the winter, designing and printing lures to try out in the spring and summer.

They experimented with a variety of materials, shapes and and sizes.



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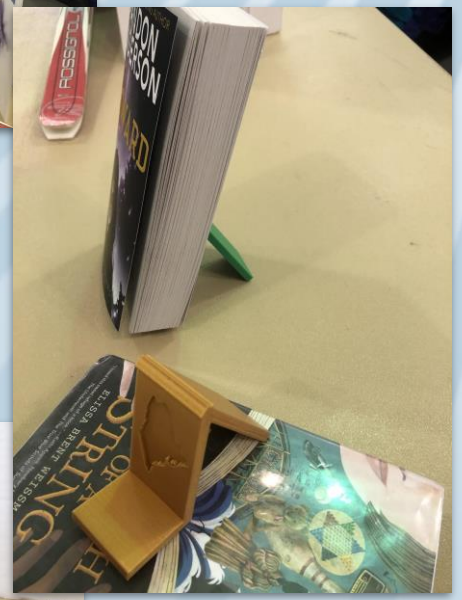
Students across Maine share their projects at the 2020 3D Printing Expo

Elementary through college level students and educators from around Maine shared their various projects at this one day event hosted by KVCC. Check out the program for more information.

Ski Tote



Book Stands (Maranacook MS)

Bee Houses (Hermon MS)

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3D Printing in MSAD6

1st Graders at Buxton Center Elementary designed and printed ornaments for their family.

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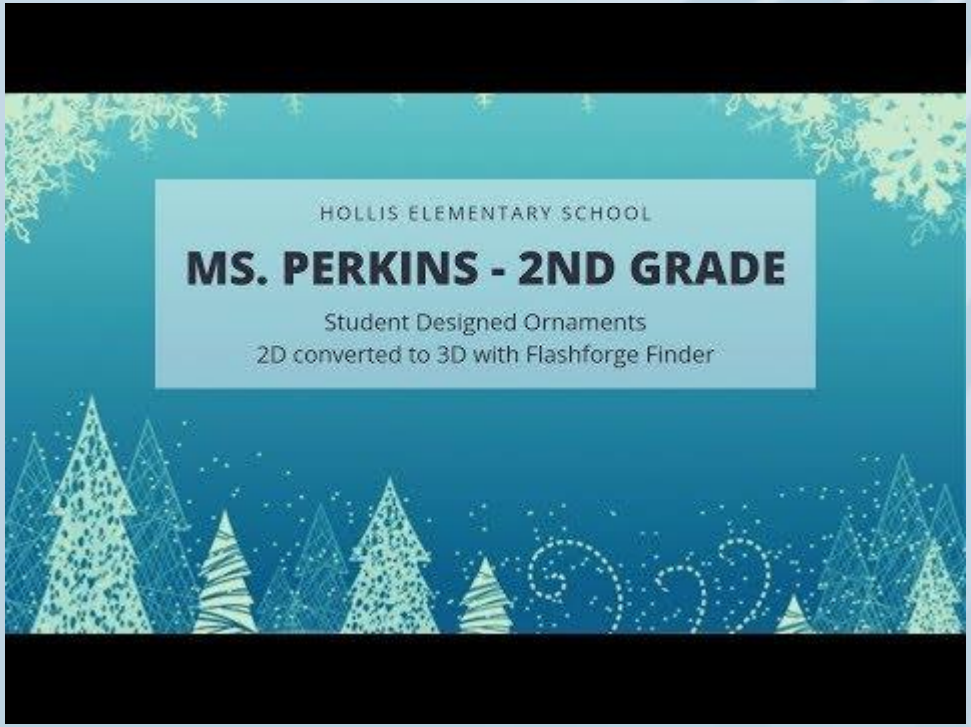
3D Printing in MSAD6 (cont.)

2nd grade students at Hollis Elementary enjoyed checking in on YouTube to see the status of their ornament designs being printed.



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Building Bridges

Bridge Build Project in Al Veneziano's middle school mathematics classes in MSAD 59 "bridging" science and engineering with math

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Augmented & Virtual Reality

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Central Maine Communities

Then and Now

Utilizing resources from the Penobscot Marine Museum, the students of R.S.U. #19 are overlapping historic photos from the area on a 360° image from today.

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Maine State Parks

Fourth graders across the state are required to engage in Maine studies. For the students of Newport Elementary, that meant studying the state parks, selecting or taking a 360° image and adding a video presentation about the park to their virtual environment.

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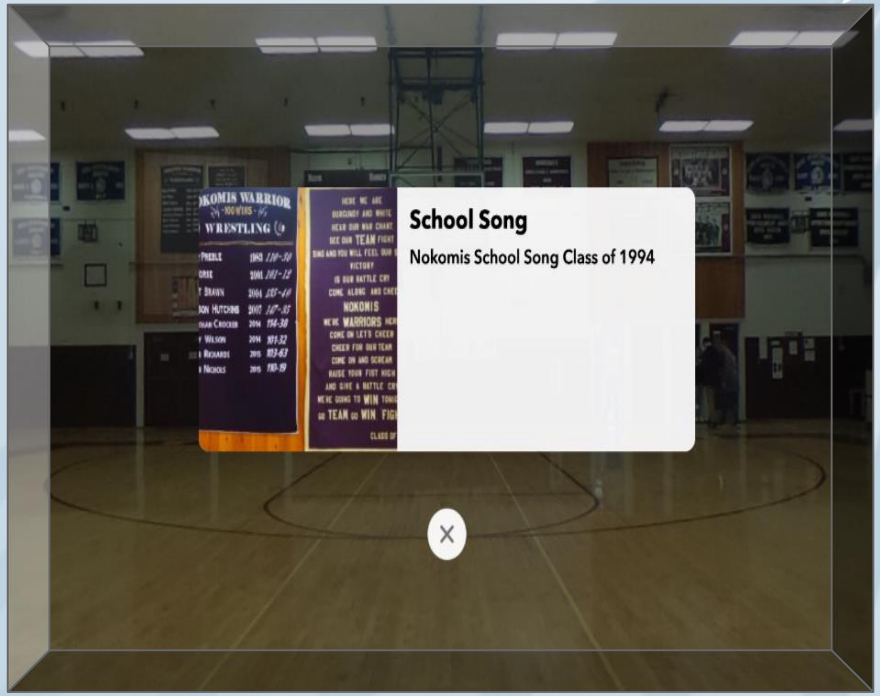
Tour of Nokomis High School

Nokomis High School has been a fixture of the community for over 60 years. A new high is being built in the district and the old one will be torn down. Students are using CoSpaces to build a virtual tour and preserve the history within the school.



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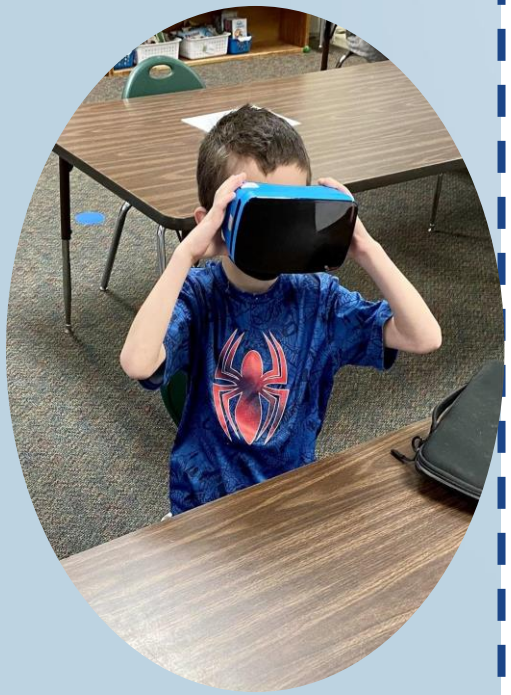
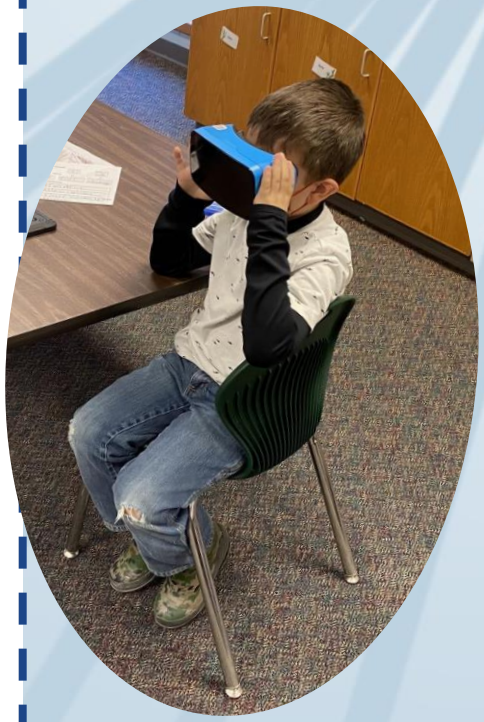
Virtual Field Trips with Google Expeditions in MSAD 6



2nd grade students at Hollis Elementary School discover the unique physical features of Earth by taking a Google Expedition to visit Antarctica, China, the Grand Canyon, the ocean floor, and the Serengeti.



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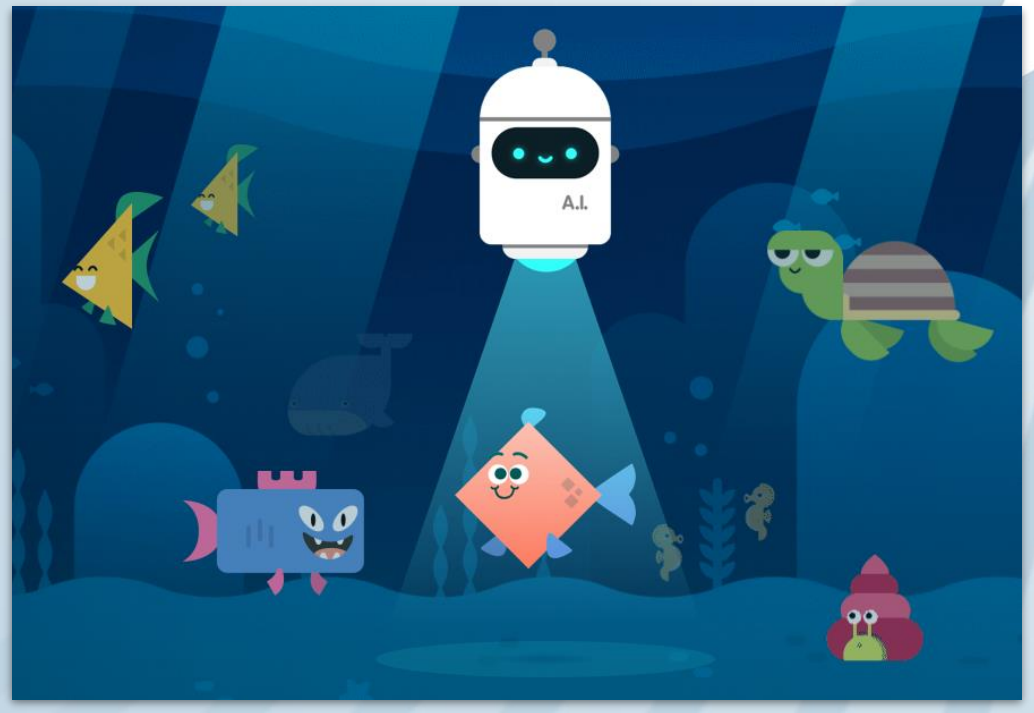
Google Expeditions

Lyman Moore Middle School - Portland

Lyman Moore Middle School participated in #CSEdWeek with an Hour of Code with our students. We learned about artificial intelligence and machine learning with Code.org's "AI for Oceans"



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Multimedia Creation

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RSU4 GT Students Present at Auburn's Leveraging Learning

Gifted & Talented Teacher Ruth Cote and a group of fifth grade students from Carrie Ricker presented Bloxels (a video game design app) and showed off several of their projects, which included topics such as states of matter, the life cycle of a ladybug and basic math facts.

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Staff Video to Start the Year in MSAD6

The staff at HB Emery Jr. School created a video for students before their return this school year to help alleviate anxiety over wearing masks.

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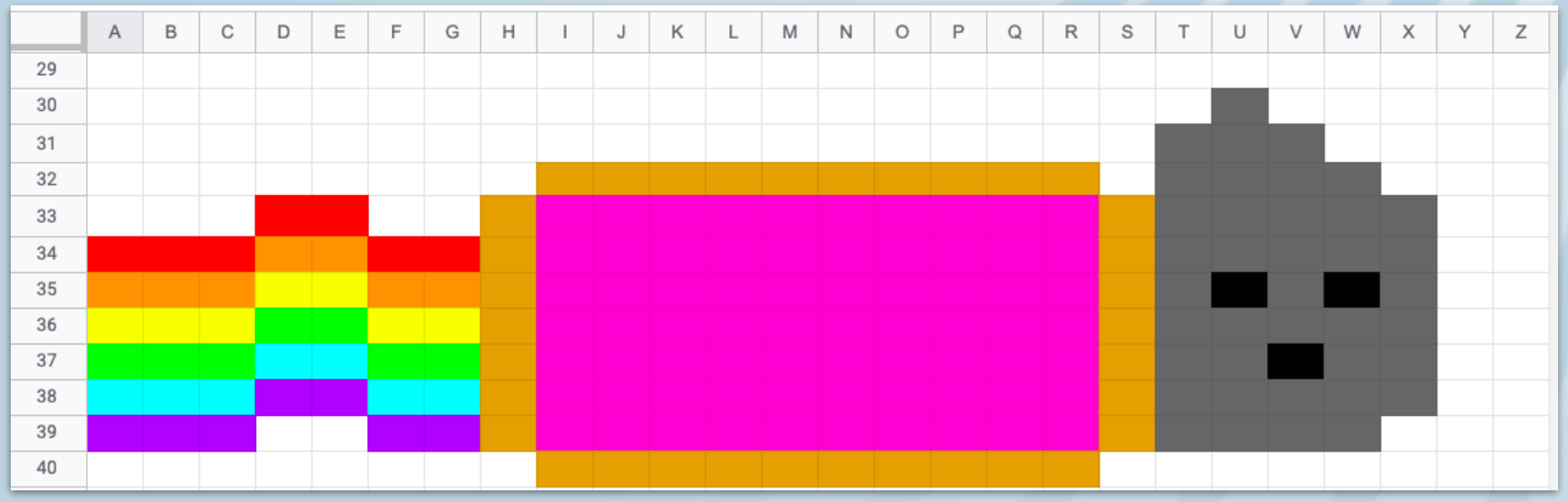
Pixel Art in Google Sheets in MSAD 6

5th grade students at Hollis Elementary learned how to use conditional formatting in Google Sheets to design pixel art.



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CS and STEM Initiatives

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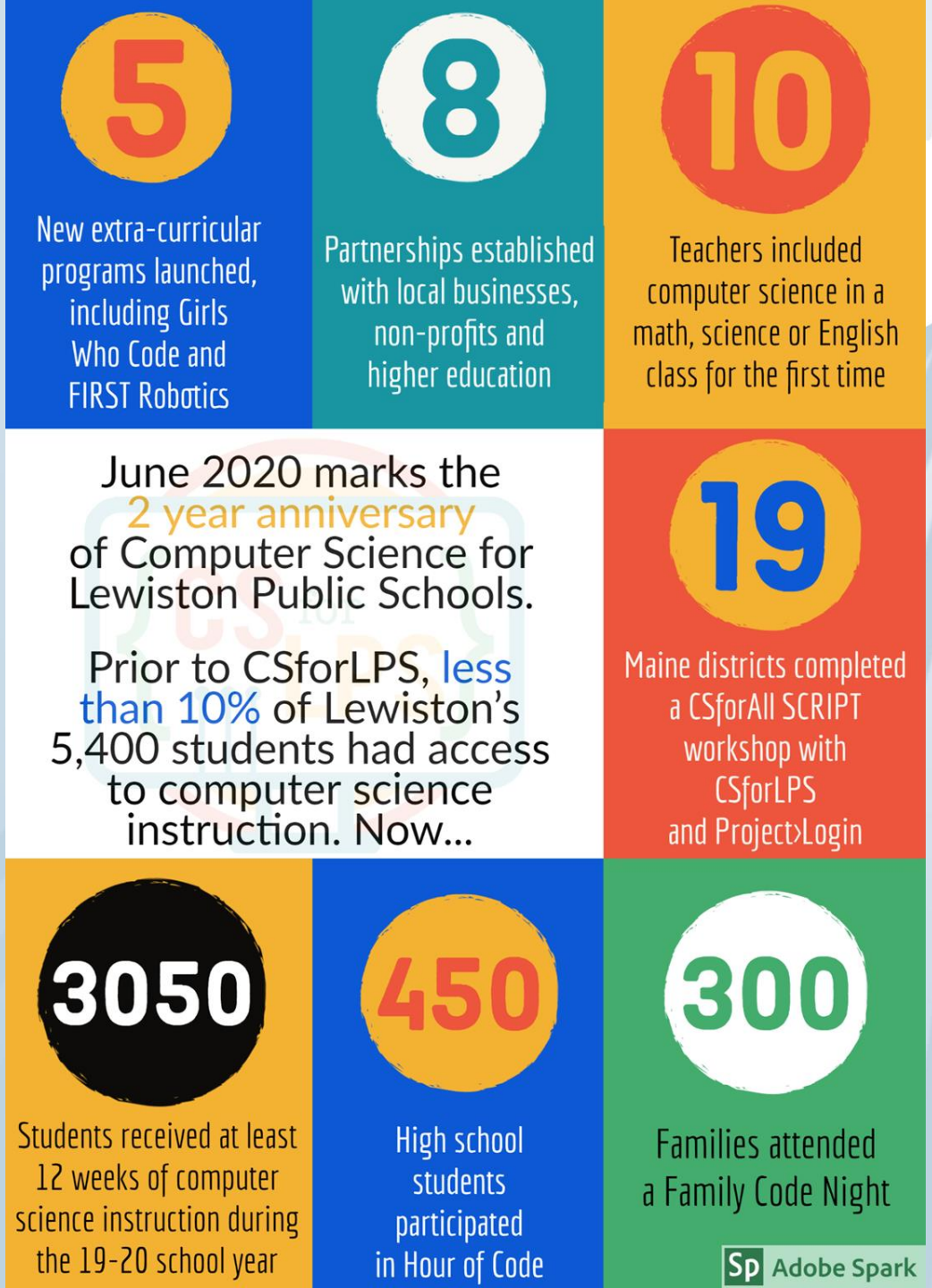
Computer Science in Lewiston

Pre-pandemic, over 50% of Lewison students received a minimum 12 weeks of computer science instruction during the school day. Learning was supported by a number of after school clubs, Family Code Nights, and Hour of Code events.



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CS at Lewiston during COVID-19

During the pandemic, Lewiston is offering a variety of ways for students to learn computer science both during and beyond the school day. Students are introduced to computer science in STEM class. If they want to go further, they can join a number of extracurriculars like Girls Who Code, Everybody Codes, WebDevs Club, Robotics Teams and more!

What interests you about GWC? It encourages girls to be involved in computer science as there is a huge gender gap. Technology is becoming more part of our lives and being part of that innovation is an amazing thing. I like how we are able to create something that we can help others and express ourselves.

Student response to Girls Who Code club at LHS

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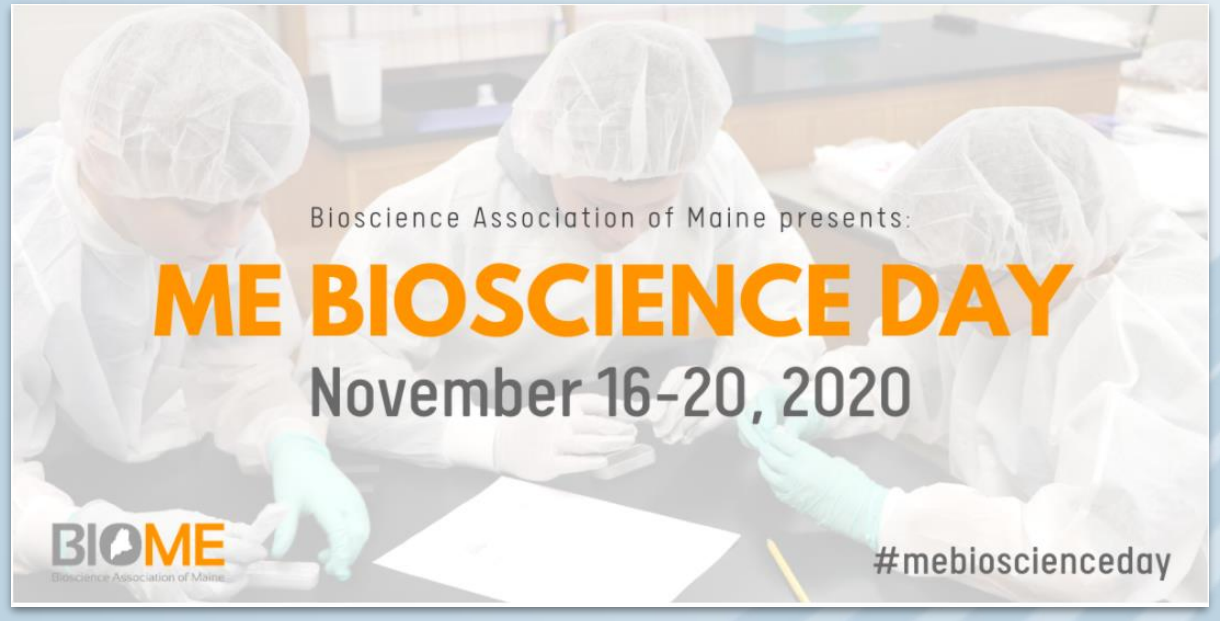
Maine Bioscience Day 2020



- ME Bioscience Day 2019 was able to reach over 3,300 students from 24 schools
- ME Bioscience Day 2020 reached over 5,100 students from 46 schools

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Read about the schools that participated

Bruins STEM week with EverFi

Boston Bruins STEM Week: October 19-23, 2020

Date	Workshop Title	Time	Description	Recommended Pre-Work
10/19	Equipment Manager	12:00pm EST	The evolution of hockey equipment & the role of STEM	Try one of the following Hockey Scholar Lessons; • Science: *The Stick* • Science: *Goalie Pads* • Math: *Skate Blades*
10/20	Build Your Own Rink	11:00am EST	Learn about creating the perfect ice surface, live from Warrior Ice Arena.	Complete the Build Your Own Ice Rink activity, winners will receive a prize! -and/or- Try the
10/21	STEM Career Panel	9:00am	team.	
		11:00am	Hear from Bruins staff as they describe their use of statistics when looking at player performance.	Graphing Goals with the Boston Bruins
10/23	Player Q &A	12:30pm	Participate in a Trivia/Q&A session	Get excited to hear from a Boston Bruin player!

Students participated in online games that taught Science and Math concepts through activities related to the Bruins, as well as virtual meetings with Bruins professionals.

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Integrating computer science into middle school science classrooms

The RiSE Center at the University of Maine is currently in year 3 of supporting 30 middle school science teacher to integrate computer science into their science classrooms. This work is support by a 3 year NSF STEM+C grant.

Learn more about this project!

Integrating sensors, data loggers, and Scratch into an ecology unit.

Integrating Scratch modeling into a plate tectonics unit.

National Models for Computer Science Integration

The Maine Mathematics and Science Alliance (MMSA) has received three grants from the National Science Foundation in the last year to move CS forward in Maine and beyond!

1. **integrate - 2- innovate (i2i)**
   - **3 rural school districts**
   - **25 educator and administrators**
   - **450 students**
2. **Weatherblur +C (WBC)**
   - **9 districts**
   - **40 educators ; 10 scientists;**
   - **253 students**
3. **INCLUDES**

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integrate - 2 - innovate (i2i)

Maine Mathematics and Science Alliance (MMSA) teamed up with MSAD 44 (Bethel), AOS 91 (MDI), and AOS 94 (Dexter) to investigate how and why to integrate computer science into the K-8 rural classroom through a National Science Foundation CSforALL planning grant.

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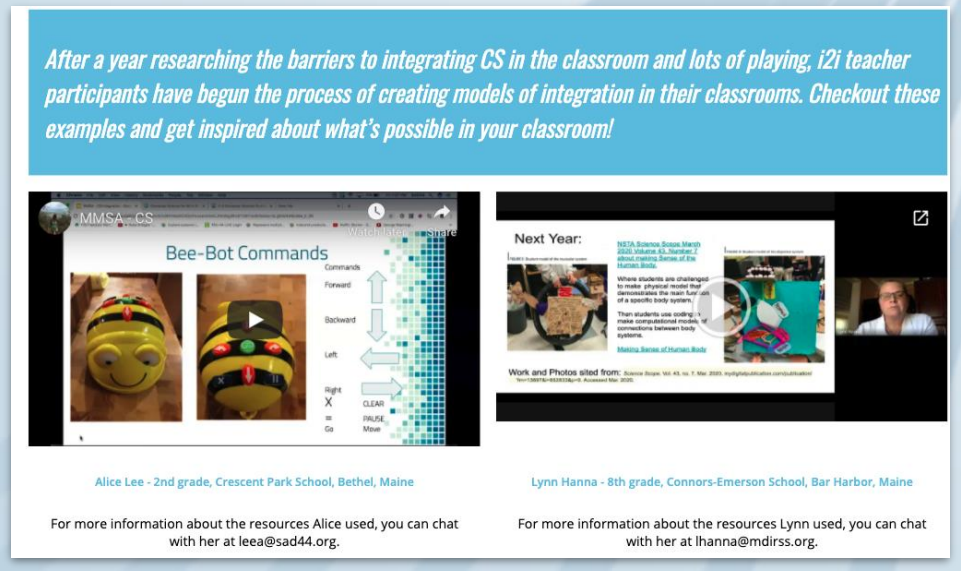
i2i CS Integration Examples

Check out <u>two examples</u> of what CS integrated into core content areas can look like - co-designed and piloted by Maine teachers!



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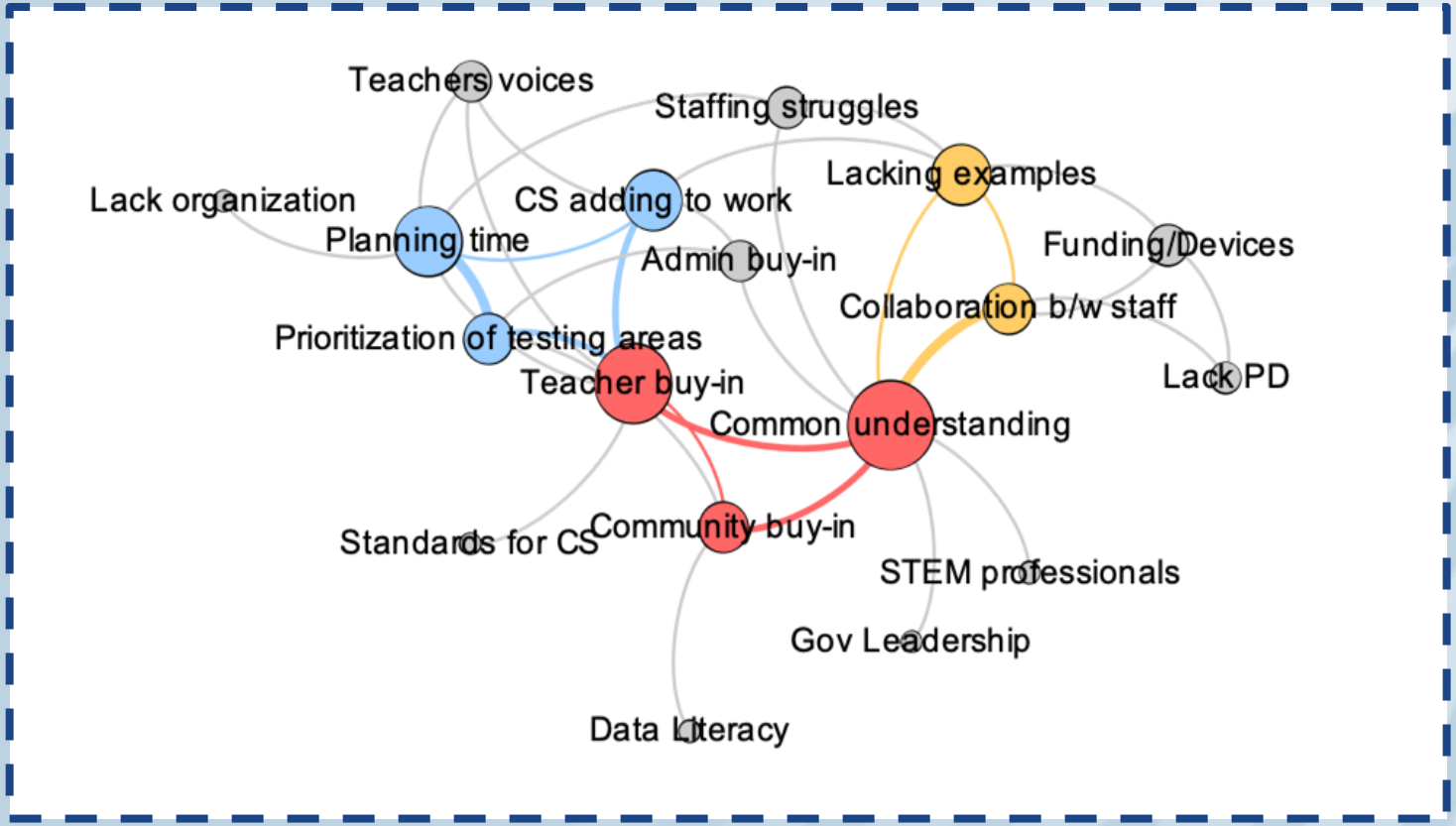
i2i Findings



Barriers to integration are connected, and fall into three BIG buckets:

- **"Buy-In" of all stakeholders**
- **Collaboration of admin, teachers, and community members**
- **Classroom level integration examples and professional learning supports.**

Main
Departme
Educ

CS Fundamentals - *bringing code.org to the elementary world*

As a regional partner, MMSA transitioned the CS Fundamentals professional learning to the virtual world.

- **15, new, Maine, school districts have tried CS Fundamentals in 2020!**

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INCLUDES - *Broadening Participation of Rural Girls in Careers in Advanced Mathematics such as Computer Science*

This just in! MMSA was recently awarded an NSF INCLUDES grant to work with rural educators, students, community partners, and families to investigate what barriers are faced by young women that pursue careers in advanced mathematics (including CS) and plan for solutions.

We can't wait to get started and hope many of you can become part of this critical conversation!

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The Innovation Center at Caribou Middle School

The new innovation center at Caribou Middle School includes opportunities in 3D design & printing, robotics, VR, programming, and more.

“The Innovation Center is not a separate class period like gym or library time, but a resource that all educators can use to augment their classes.”

Source: The County News

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-- Shared by Maureen Connell, Innovation Center Director RSU 39/Caribou Middle School

Maine State Science Fair

1. 1st Grand Award – Tyler Delargy, Bangor High School, “Developing Three-Dimensional Spatial Cognition for the Visually Impaired Using Computational Depth Mapping and Vibro-Tactile Display”

2. 2nd Grand Award – Antonina Zakorchemna and Artem Laptiev, Fryeburg Academy, “Product Development of an Alternative Low-cost Braille E-reader”

3. 3rd Grand Award – Amara Ifeji, Bangor High School, “Testing the Effectiveness of Mycorrhizae in the Phytoremediation of Heavy Metals from Stormwater”

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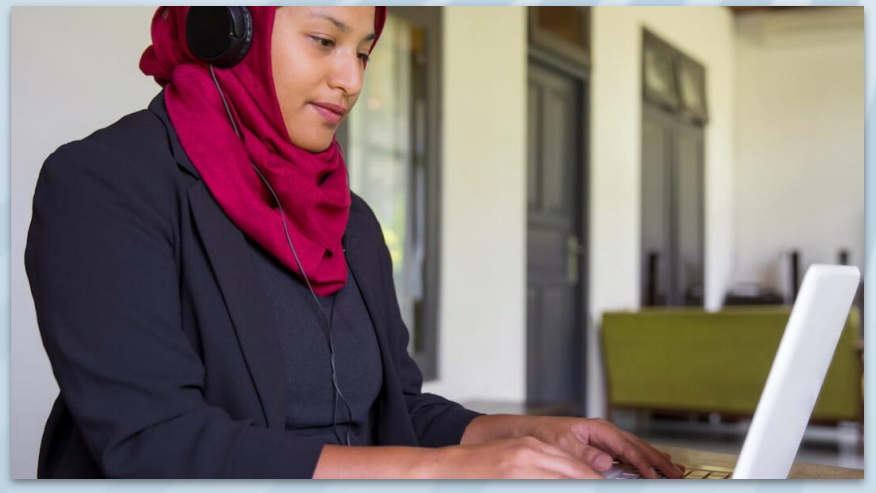
UMS Graduate Opportunities for Maine's K-12 Teachers

The University of Maine System offers programs in service to Maine's K-12 teachers that are interested in pursuing graduate credentials in STEM + Computing. These programs are offered entirely online and include:

- Graduate Certificate in Computing for Educators (preparing grade 9-12 teachers to teach high school advanced placement courses in computer science)
- Graduate Certificate in Computational Thinking for Educators (preparing teachers in methods for teaching computer science throughout the K-12 curriculum)

Students may continue on with five additional courses to earn the *MS in Information Systems*, *MS in Spatial Informatics*, or MS in one of several *Education Master's* degrees.

1865 THE UNIVERSITY OF MAINE



Source: University of Maine System

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The MLTI Student Conference

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MLTI Student Conference Presenters

Since 2011, the MLTI Student Conference has had over sixteen students present keynotes to their peers at this annual event. These students have gone on to prestigious schools such as Stanford, Wellesley, MIT, Boston College, Butler and Bates.

Several have founded businesses and developed brands while others have traveled and worked internationally.

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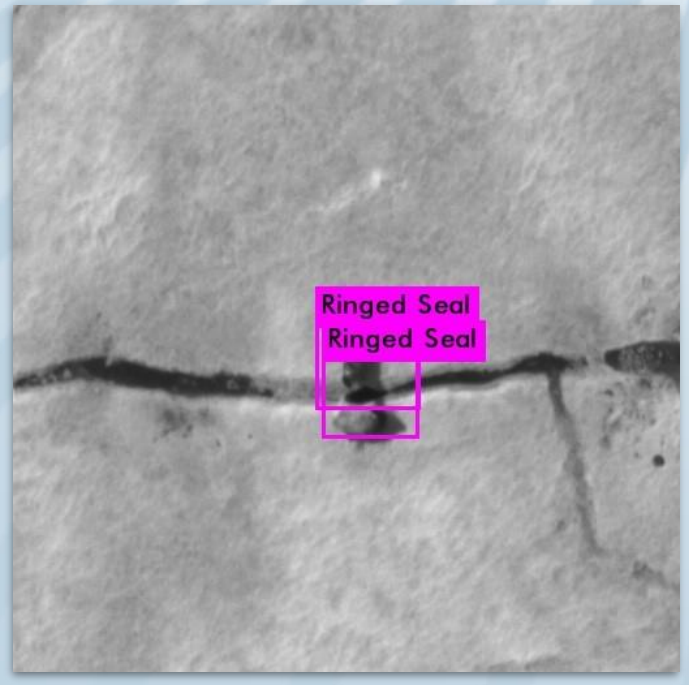
MLTI Student Conference Presenters

(continued)

Yuval Boss (Orono) went on to the University of Washington where he studied computer science and engineering.

He now works for NOAA and is “teaching a computer to count seals & polar bears.”



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MLTI Student Conference Presenters
(continued)

Tim Walsh (Kennebunk) went on to Eckherd and Boston College and holds a Masters in Cybersecurity and Governance

He currently works for Tyler Technologies as an Implementation Consultant.

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MLTI Student Conference Presenters
(continued)

Chris Jones (RSU4 / Oak Hill) went on to Wentworth and UMaine and holds a Masters in Educational Technology. He is currently the Creative Systems Lead at L.L. Bean.

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MLTI Student Conference Presenters

(continued)

Stephen Kaplan (Marshwood) went on to UMaine and is currently working on his computer science degree.

He has been working with the Servant Heart Research Collaborative and recently travelled to Sierra Leone to provide his technical expertise.

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MLTI Student Conference Presenters

(continued)

Hannah Potter (Yarmouth) attended Stanford and MIT and also received a Fulbright Scholarship to study in Spain and was a White House Intern in 2016.

She has worked on several international projects that have focused on design thinking and empowering women. She recently founded the brand Something Brazen

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MLTI Student Conference Presenters

(continued)

Sam Caron (Madawaska) founded "Sam Caron Media" right out of high school and has cornered the market on wedding photography and videography in the St. John Valley.

Check out some of his work!

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The “Maine App Challenge” Highlights

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“How to Help”

Description: An app for people to donate time, money, and items.

Parker started “How to Help” as a website and then developed it into an app to increase access to her creation.

Source: The Maine App Challenge

-- Parker Hartnett
Yarmouth High School

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“Physics Phone a Friend”

Description: An app to help students with physics.

Sarah developed this tool to include a calculator for kinematic equations, a mascot, and jokes that are rewarded for correct answers.

Source: The Maine App Challenge

-- Sarah Hagan
Cape Elizabeth High School

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“Scoregenix”

Description: An scorebook app for softball and baseball. Data can be exported to .xml.

Elena developed this app to make scorekeeping easy and accessible to everyone.

Source: The Maine App Challenge

-- Elena Miller
Yarmouth High School

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The “Congressional App Challenge” Highlights

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“Winditions”

Description: An app that informs users of weather conditions for outdoor recreation.

Aidan “hopes to encourage other students to better their communities by using their computer science skills.”

Source: Congressional App Challenge

-- Aidan Blum Levin
Deering High School

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Concussion Diagnosis

Description: An app that helps to quickly diagnose possible concussions.

The "app works by testing several criteria for gauging concussions outlined by the American Neurological Association: critical thinking, reflexes, hand-eye coordination, and short-term memory."

Source: Congressional App Challenge

-- John Walig & Pawan Yerramilli
Falmouth High School

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“Meteor Multiplication”

Description: A video game app that helps students learn multiplication.

Tyler “developed Meteor Multiplication to test multiplication skills in a fun video game environment.”

Source: Congressional App Challenge

-- Tyler Hansen
South Portland High School

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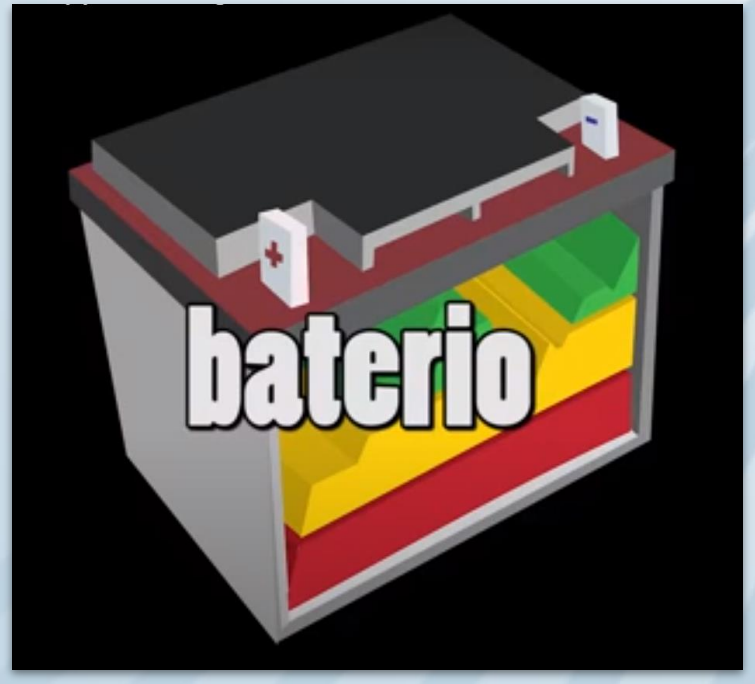
“baterio”

Description: An app that tracks battery usage for competition robots.

This app was developed as a solution to battery challenges they were facing with their First Robotics Competition robot.



Source: Congressional App Challenge

-- Jean Claude Zarate & Julian Bernard
South Portland High School

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Teachers on Computer Science and STEM in Maine

Quotes Retrieved from a 2019 CS Education Survey

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"What started as an Hour of Code at GNGHS led to offering two AP Computer Science Principles classes in the 2019-2020 school year!"

-- Christine Knudson, CS & Math Teacher
Gray/New Gloucester High School

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"Our district convened a STEM Task Force…[to] develop a STEM education plan for our district, focusing on K-5, Middle School, and High School opportunities.

I think the most successful outcome of this process was that our district is committed to providing students with multiple opportunities to participate in high-quality STEM/CS activities/lessons."

-- Josh Young, Technology Coordinator
AOS 91/MDIRSS

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"I was able to generate excitement around learning Mathematics through the use of small educational robots. Students have learned algorithmic thinking as well as core learning results and some of these students have joined our competitive robotics teams in order to further learning about engineering and programming."

-- Casey Murphy, Technology Director & Teacher
All Saints Catholic School

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"My school has embraced computer science and over 90% of our students have at least one trimester and most of our students have at least two years. The participation ratio is almost a 50:50 split between boys and girls."

-- Sean Wasson, Teacher
Lyman Moore Middle School

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"4th and 5th students have learned to use Google Sheets to collect data in a variety of settings including weather (temp, wind chill, humidity) and with our aquaponics kit (pH, ammonia, nitrites, nitrates), use functions to manipulate the data, and create charts to make visual representations of the data. Students learn to troubleshoot technology issues with linear thinking (if this, then that)."

-- Matthew Brown, Elementary Teacher
East End Community School

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"With my fifth and sixth graders, every year we have dissected old laptops to see what the parts of them are. The students enjoy the act of “destruction” and it gives them an understanding of what is inside. We attended several Robotics Expos and the kids found this challenging and fun. We also are at the beginning of learning 3-Printing."

-- George Crawford, Elementary Teacher
Union 103/Beals Elementary

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"Last year I taught a course on Javascript to high school students spanning grades 9-12. Every student in the class successfully created and presented an interesting project that met our course objectives."

-- Melorma Norman, Librarian
RSU 71/Belfast Area High School

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"First year doing AP CS Principles, all students scored at above state and global averages."

-- Brian Laich, CS & Chemistry Teacher
RSU 57/Massabesic

Maine Department of Education

"The biggest success story is when our class of 94 7th graders collaborated to put a sticker pack app on the app store. They were able to use the resources at their fingertips and a bit of hard work, to get their work into a global marketplace. All students were able to participate regardless of coding ability."

-- Ian McKenzie, Technology Teacher & Integrator
MSAD 28/Camden-Rockport Middle School

Maine Department of Education

"Tech club is an extracurricular activity run for grades 2-8. Grades 5-8 also have an added option to join the in school club we offer during our Friday STEAM block time where kids choose activities of interest for an hour on Friday mornings. This club is intended to get kids using various technologies and then encourage them to use those technologies outside of the club even. Kids can sign up throughout the year at any point and simply attend as they are able. Once I teach them the basics of a technology I then let them use, teach others, and explore and become the "teacher" of the technologies we have. We have 3D pens and 3D printing; coding with Edison bots, drones, bee bots, and various online platforms; drone photography; and Virtual Reality so far as well as many other technologies on our school devices. As kids explore and teach their peers I create and 3D print badges they earn and collect. They earn badges for showing skills in computer basics, great effort, wowing me with something they figured out, teaching others, taking leadership roles, and other badges as they show perseverance and accomplishment. "

-- Donna Netzer, Teacher
AOS 90/Princeton Elementary

Maine Department of Education

"I have had many students who struggle in traditional classrooms where they need to work on specific assignments. With the advent of computer science this has gained and captured their interest to a point where they are more successful in class and have less disciplinary issues."

-- John Marchelletta, 6-8 Science Teacher
RSU 12/Chelsea Elementary School

Maine Department of Education

"I was working on a robotics unit with a 4th grade class, several of the girls were very wary of the experience and felt out of their comfort zone, did not expect success, etc. By the end of the unit, they had built their robot, they learned what was expected, beaming smiles on faces, and said they could not wait to do it again."

-- Geoff Cyr, Technology Teacher & Integrator
MSAD 52/Turner Primary & Leeds Central

Maine Department of Education

"We started with Hour of Code as an optional piece in the students free time. A particular student, that did not necessarily stand out asked for more opportunities to code. He took a computer home over the summer to continue programming. The work was amazing and this student found their passion and actually taught his classmates the following school year."

-- Michele Charette, Teacher
Penobscot Community School

Maine Department of Education

"As an 8th grade math teacher I have struggled with students conceptualizing geometry transformations. This past school year I incorporated CUE robots into my classroom instruction. Students were able to code their robots to complete multiple transformations. The students were extremely engaged and determined to carry out specific transformations using their robots. I found that this also solidified their knowledge about angle relationships and distance measurements. I had multiple students come to me after these activities stating that the class time was their favorite from all of middle school."

-- Alison Avery, Computer Science Teacher
Lewiston Schools

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