

Computational Thinking at the Intersection of Education and an Economic Redevelopment Initiative



The Future of Work

Transforming a Disrupted Economy

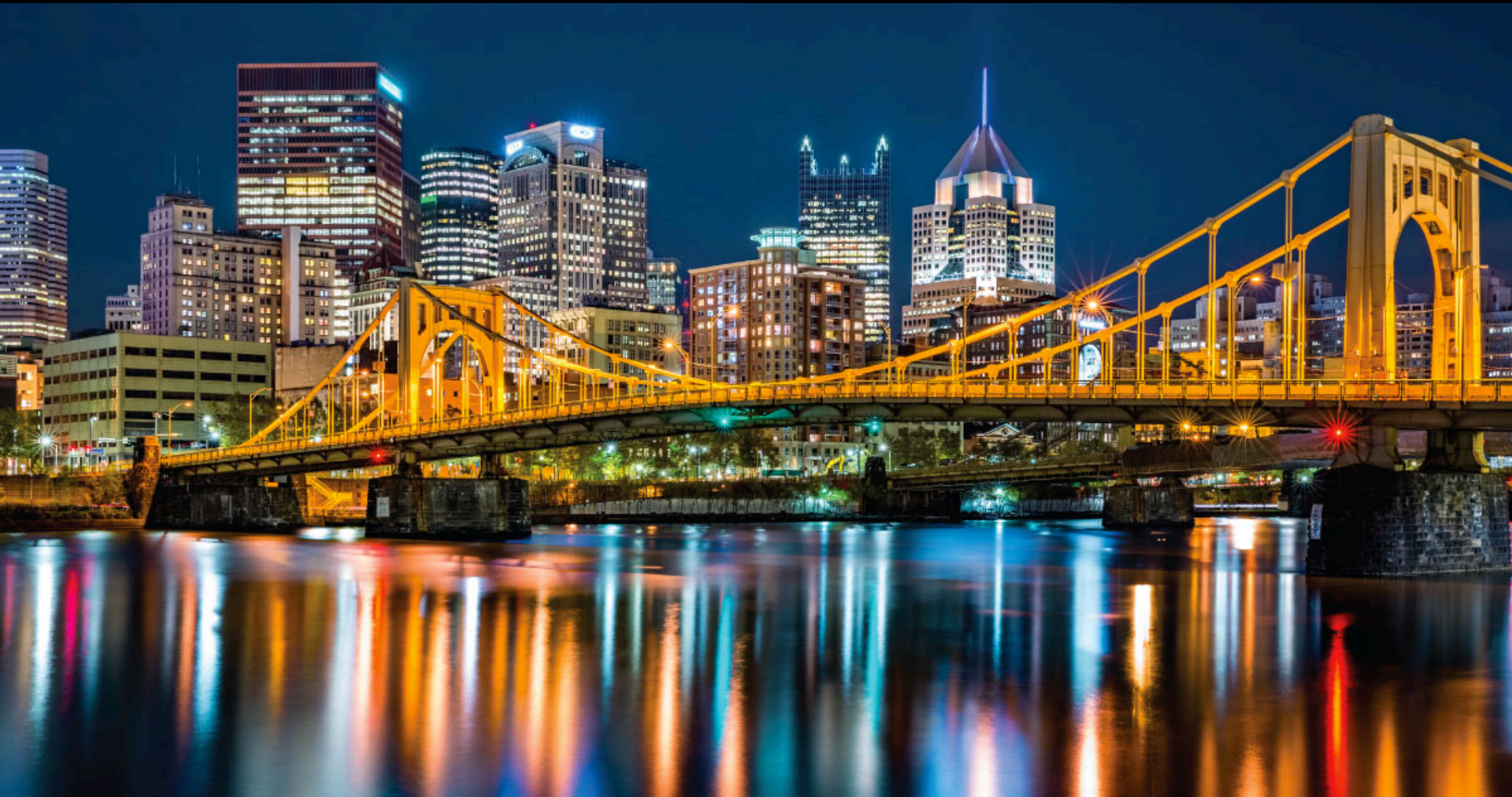
How do communities at the front lines of economic disruption develop the skills, resources, and public imagination to transform their narrative and economies?



We will share with you:

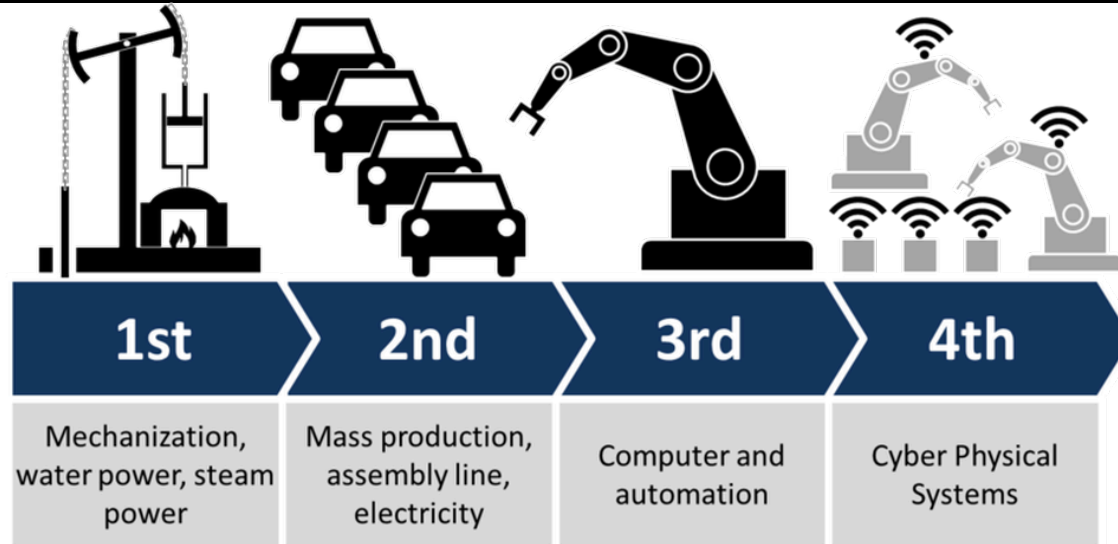
- How education plays an important role in economic redevelopment
- How Pittsburgh's model is helping to accelerate the educational component of the economic redevelopment of Appalachia

The Future of Work: A Pittsburgh Transformation



How do communities at the front lines of economic disruption reimagine the future of work?

The Future of Work: The Fourth Industrial Revolution



As innovations in artificial intelligence, robotics, and other technology bring us virtual assistants, wearable health tech, autonomous vehicles, and more, many industries are transforming rapidly. While these new technologies have brought unimaginable benefits, they also are disrupting many industries and changing the structure of the workforce.

~ Darrell West, “The Future of Work: Robotics, AI, and Automation”

ACTIVITY 1: EXPLORING THE FUTURE OF WORK

Exercise: Considering Possible Futures

Given the changes from KnowledgeWorks' research and those that you identified, explore what employment landscape today's youngest children might find themselves entering in 2040. Select one or more of the trends, drivers of change, efforts, or potential disruptions and extrapolate forward to envision a different future. Use the examples in the chart to guide you, and complete the chart with your own ideas.

TIP

As you work, remember that exactly how a change will shape the future is uncertain; considering a range of possible futures, some of which may contradict one another, can help stakeholders consider and plan for any number of possibilities that might emerge.

CHANGE <i>Trend, driver, effort, or disruption that could change the future of work</i>	POSSIBLE FUTURES OF WORK <i>Possible future outcomes of those changes</i>
– Rise of smart machines	– What if smart machines augmented the contributions of people in the workplace, creating new jobs; reconfiguring current work; and making many jobs safer, easier and more interesting?

CAN YOU TEACH A COAL MINER TO CODE?



J. Paul Gorman, one of Appalachia's newest coders.
PHILIP SCOTT ANDREWS

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COMMENT

EMAIL

“What’s happening in Kentucky right now is, if we’re lucky, 20 years ahead of what’s going to happen elsewhere. Huge numbers of Americans, including those in booming coastal cities like Boston, are going to need help re-imagining themselves. We all need to hope MIT learns as much as it can from Kentucky.”

Jeff Howe—co-author of Whiplash: How to Survive Our Faster Future

Justice never imagined the crash would be this sudden nor this bad, but things just keep piling on. EPA clean air regulations have power plants changing over to natural gas, there’s greater regulation of strip mining, and a series of cities, universities, and state pension plans are divesting themselves from coal.

Justice compares the disruption to the way Uber’s turning the cab industry inside out. With some coal company stocks crashing 95 percent in value over the last five years, I would say it’s way, way worse.



Clothes and personal belongings of coal miners are locked and hoisted to the ceiling of the locker room at one of the areas last operating coal mines. PHILIP SCOTT ANDREWS

The Future of Work: Appalachian Ingenuity



How do communities at the front lines of economic disruption
reimagine the future of work?

<https://www.youtube.com/watch?v=arJ0au-H2UM>

The Future of Work: Main Areas of Focus

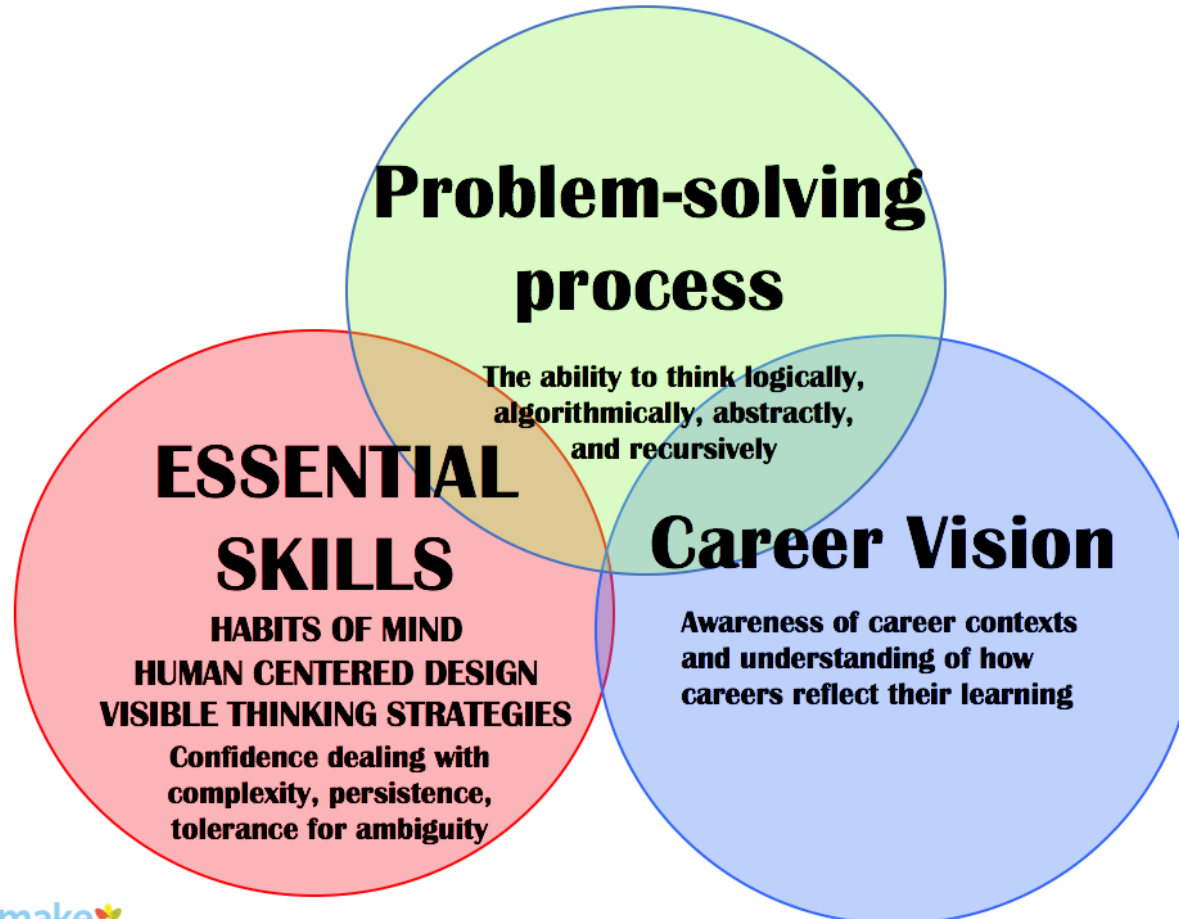


We must cultivate a resilient, regenerative economy and workforce prepared for a continued state of disruption—and ready to identify the opportunities in each new change that comes along - SOAR (Shaping our Appalachian Region)

- **Digital literacy**, and establishing the role technology plays in all facets of life, not just work in the technology sector;
- **Computational thinking**, and the broad range of ways it should be integrated in STEAM education for lifelong learning; and
- **Re-imagination**, changing narratives and expectations about Kentucky's history of economic resiliency and the potential place of the state and its individual residents in the future of work, both within and outside of the Commonwealth

The Future of Work: Knowledge Skills & Dispositions

Computational Thinking: The New Literacy



Exercise: A New Profile of a Graduate

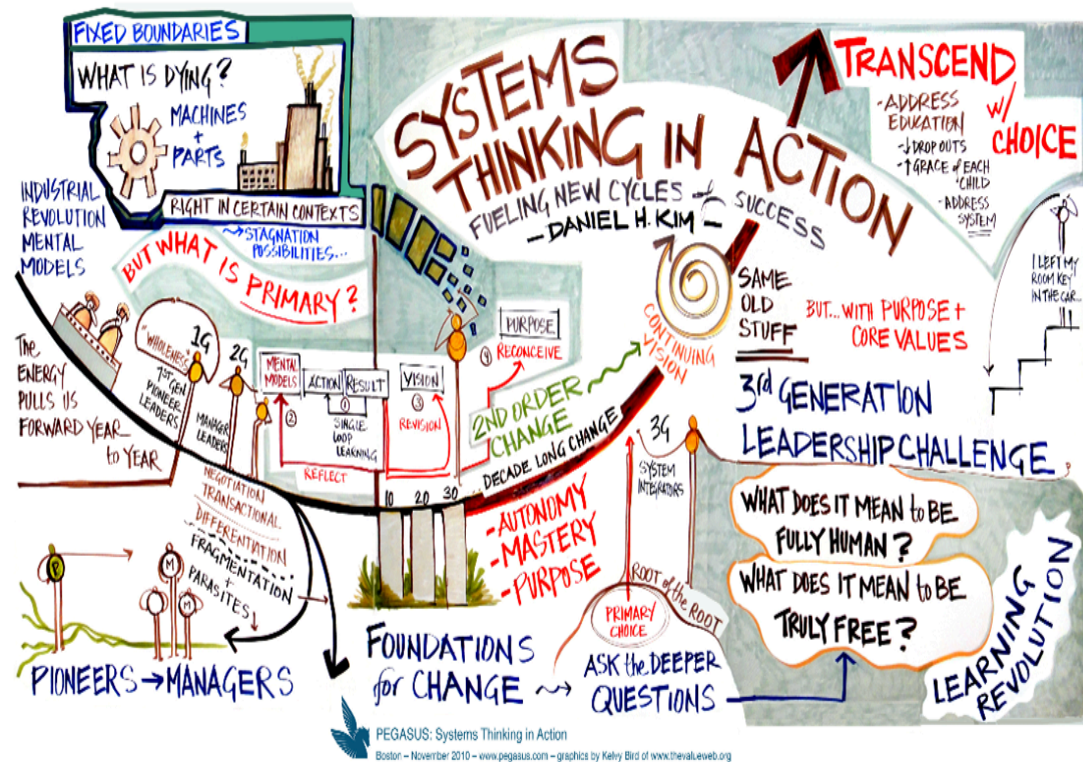
Discuss which knowledge, skills, and dispositions from the new foundation for readiness seem most critical and what else young people might need to thrive in the future. Use the examples in the chart to guide you, and complete the chart with your own ideas.

KNOWLEDGE	SKILLS	DISPOSITIONS
- Historical context	- Learn anything, anywhere	- Thrive in ambiguity and uncertainty
- Knowledge of self	- emotional regulation	- entrepreneurial spirit
- Career awareness/competencies	- written & oral communication	- flexibility / adaptability
- multi-cultural/global competencies	- computational thinking	- empathy
- financial literacy	- critical reading & writing	- creativity
- social justice	- life-long learning	- persistence/resiliency
- ethics	- critical thinking	- accepting/inclusive
- technology literacy	- self advocacy	- reflective
	- analytical problem solving	- confident
	- collaboration	- collaborative
	- managing conflict & adversity	- open-minded
	- understanding diverse perspectives	- intrinsic motivation
	- textual analysis	- sense of humor
		- kindness/compassion.

Systems Thinking: Creating a Mechanism for Innovation

Designing Systems

- Remake Existing Positions & Create New Positions
 - STEAM Teachers K-2; 3-5; 6-8
 - Technology Education
 - Business Technology to STEAM Literacy
 - Future Focused Librarians
- Embrace the Iterative Process of Innovation
 - Develop Incubators before Full-scale Implementation
- Participate in Educational Research
 - Understand What Works and Why



- Remake Course Offerings & Professional Development - Enlist Partnerships
 - Innovation Studio, Game Design, 8th Grade Science, Computer Science Grade 8-12
 - Connected Learning Experiences
 - Embedded Professional Development
 - STEAM Innovation Summer Institute



Exploring the CT Pathway: Grades K-2

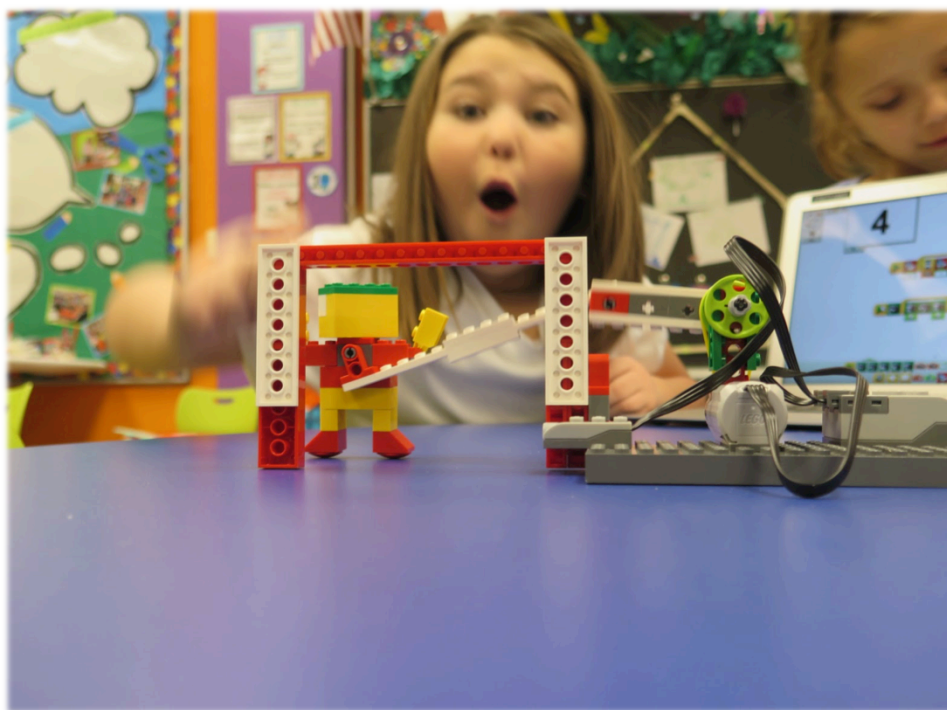
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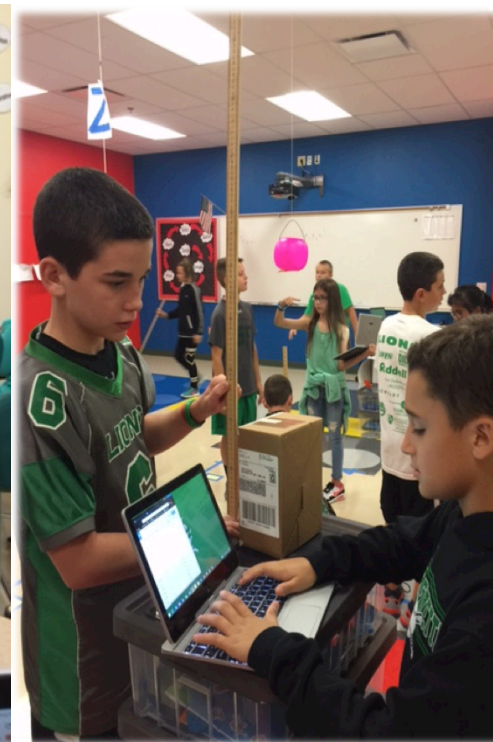
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SFSD
K-2 Learning Lab









**SFSD
Grades 3-5
STEAM Studio &
STEAM Literacy**





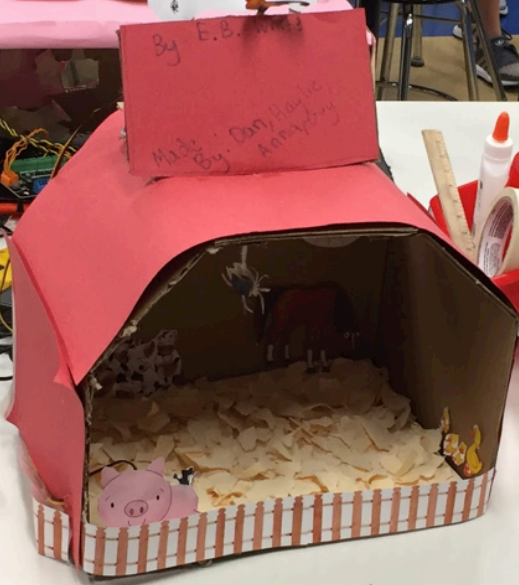
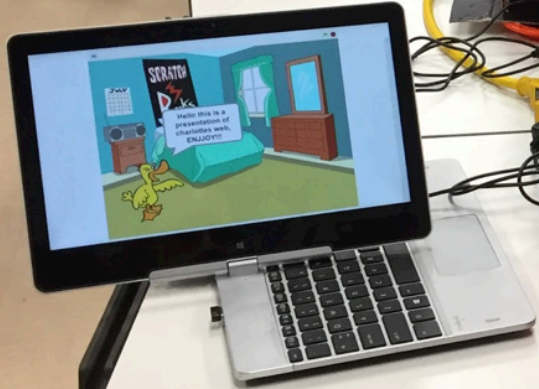
**South Fayette Township School District
Elementary, Grades 3-5
Applied Engineering and Programming: Ping Pong Launchers**



Charlotte's Web

By E.B. White
Made By: Dan, Hannah, Amy, and John

Diary of a Whimpy Kid: Rodrick Rules.
By: Mia, Jayaram, Ava, Tyler, and John.

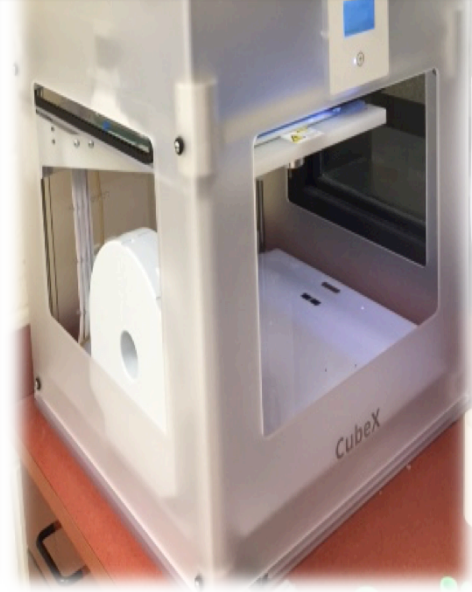
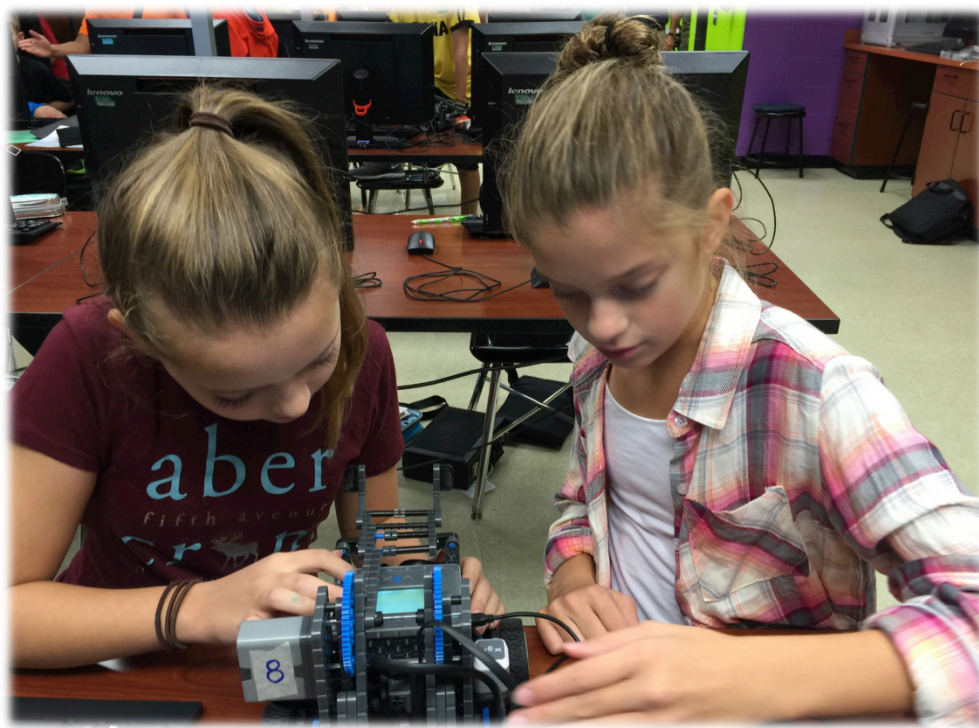




Exploring the CT Pathway: Grades 6-8

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SFSD Grades 6-8 Robotics, App Inventor, Entrepreneurship



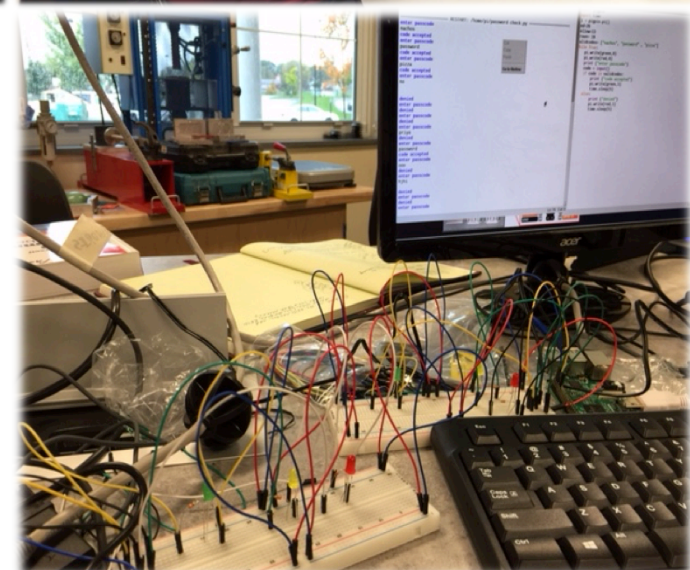
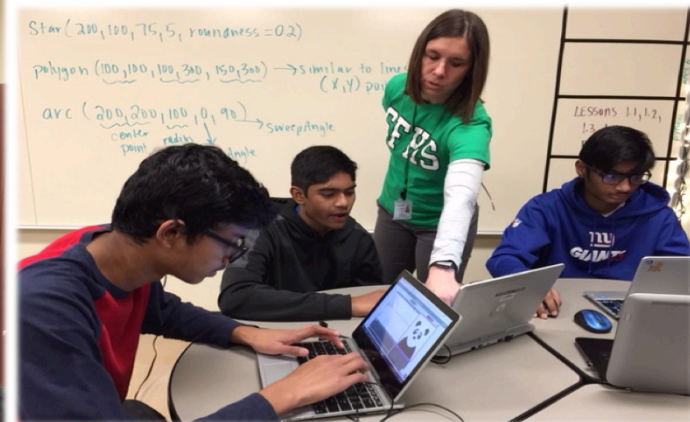
SFSD Grade 8 Python: from Incubator to Classroom





Exploring the CT Pathway: Grades 9-12

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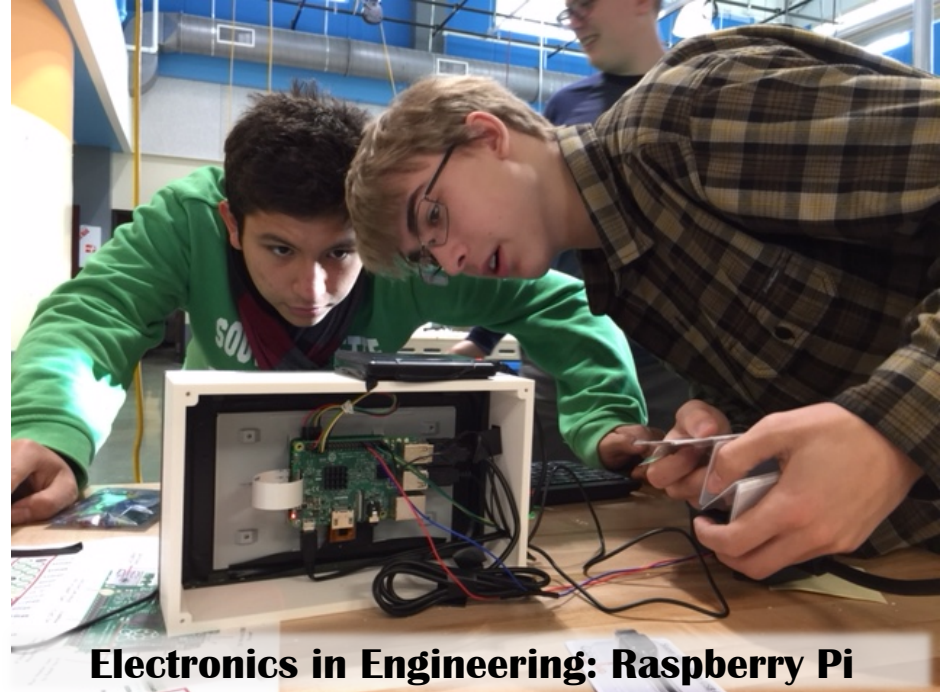


Computer Science Courses Grades 9-12

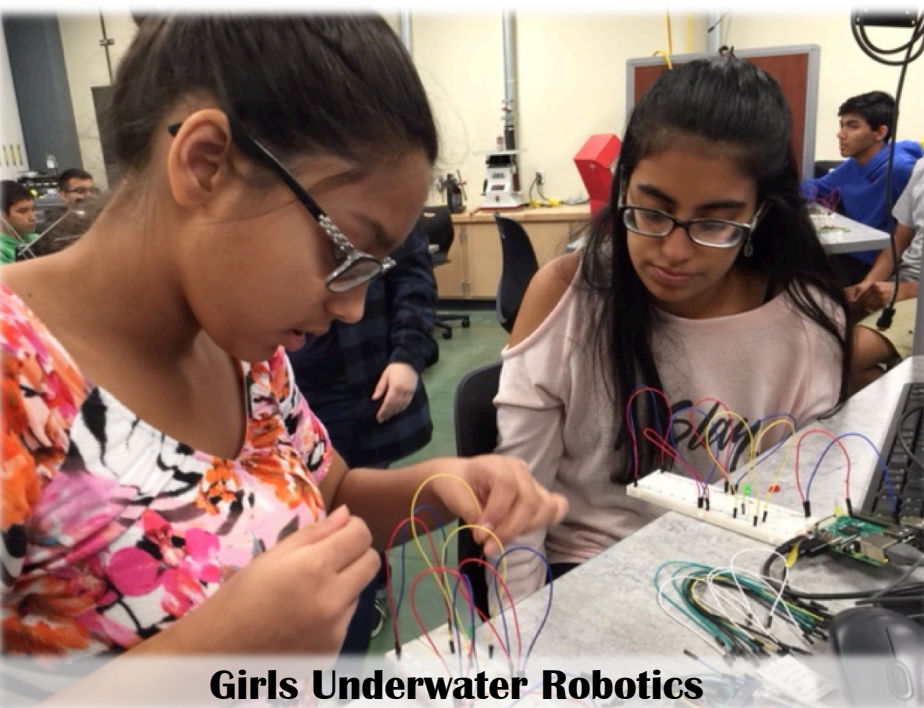
- Python: CMU CS Academy (Currently taught)
- Java (Currently taught)
- AP CS A (Currently taught)
- AP CS Principles (Currently taught)
- Computational Applications in Python (Pipeline)
- Cybersecurity (Pipeline)
- *Machine Learning (Incubator – Post AP)*
- *Android Studio (Incubator – Post AP)*



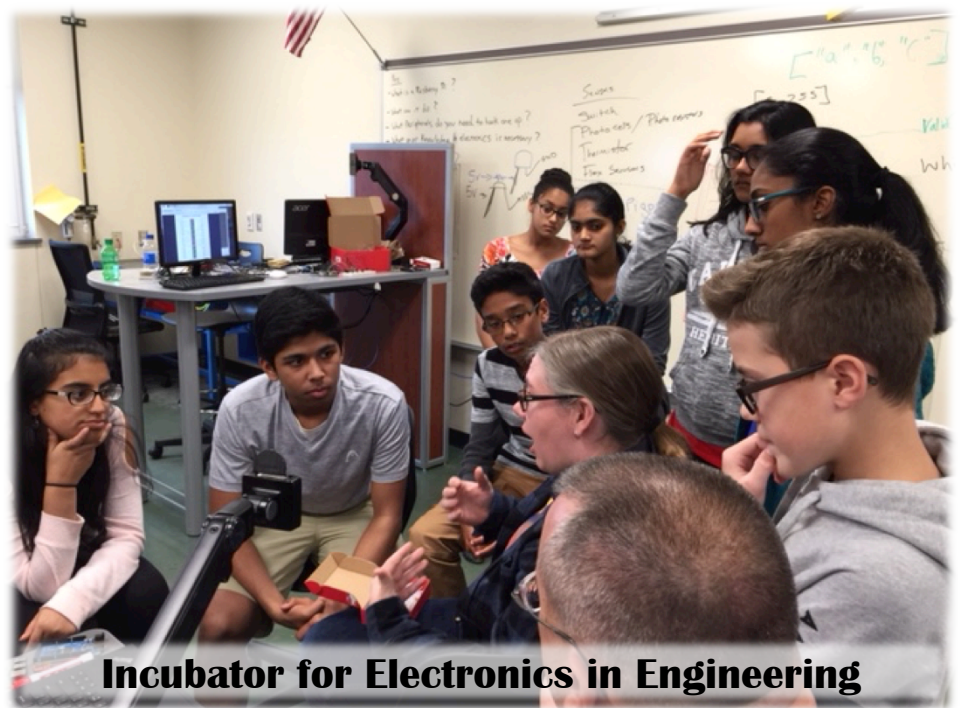
Innovation Studio: Solutions for Businesses



Electronics in Engineering: Raspberry Pi



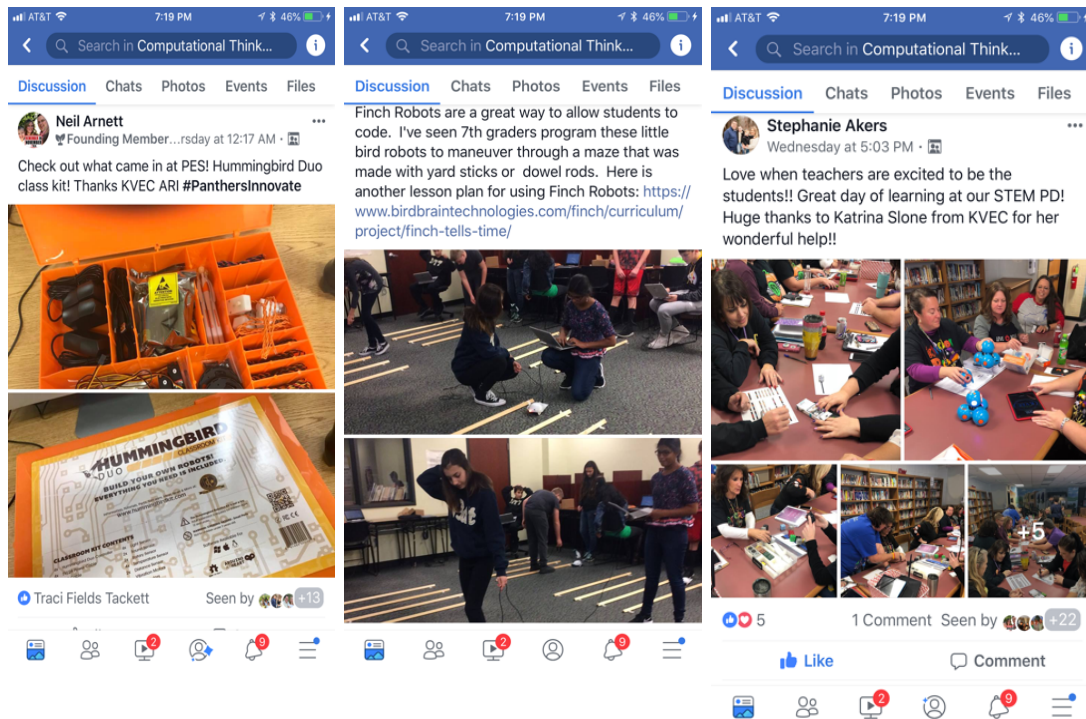
Girls Underwater Robotics



Incubator for Electronics in Engineering

Kentucky Schools Progress: South Floyd Elementary & Pikeville Elementary

Facebook Group: Computational Thinking Trailblazers



South Floyd Elementary (K-8)

- The Asst. Principal and 3 teachers attended Summer Institute
- Created two STEAM teacher positions K-4 & 5-8
- Began 8th grade Python Course
- Sent teachers to CMU Academy training for high school Python course

Kentucky Schools Progress: Remake Learning Members

South Floyd Elementary & Pikeville Elementary

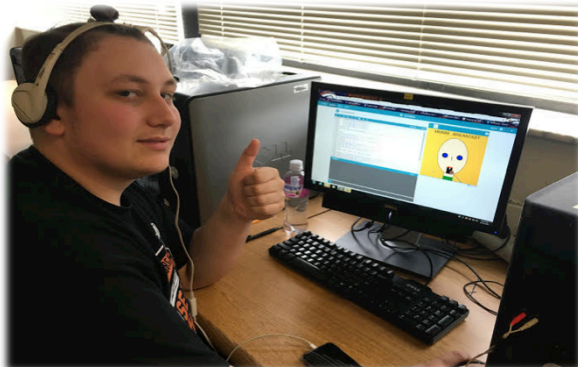
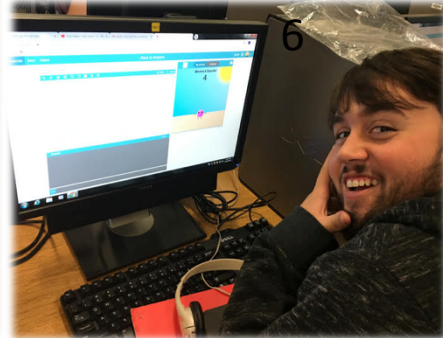
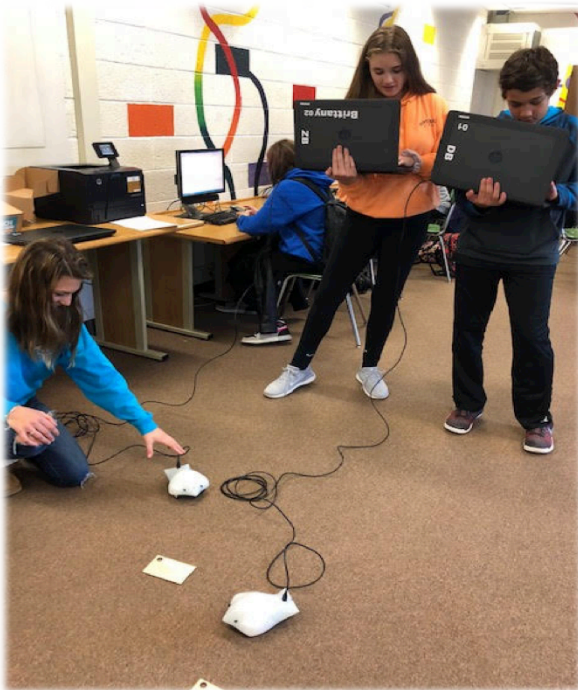
Growth Mindset Professional Development



Pikeville Elementary (K-6)

- Admin Team attended SFSD Briefing
- Received four \$1,000 grants for computational thinking:
 - Computer Lab – Hummingbird Robotics
 - Library Maker Space: MakeyMakey, Squishy Circuits
 - Gifted: EV3 Lego Robotics
 - K-2 Lego Robotics
- Flex PD Plan taught by teacher who attended the summer institute
- App Inventor Hackathon being planned
- Bringing new teaching team to SFSD briefing

Greene County Schools Progress: Jefferson Morgan, Carmichaels Area School, & South Eastern Greene



Jefferson Morgan

- Implementing 8th Grade Python Course
- Trained & implementing CMU Academy Python Course for high school
- Sent teachers to CMU Academy training for high school Python course

Jefferson Morgan, Carmichaels Area School & South Eastern Greene

- Each district is in the process of setting planning sessions with both administration and teachers to draft a 5 year plan to advance STEAM learning
- Schools have added STEAM learning to their budget plans

WHAT IS YOUR LITTLE BET?

WHAT IS YOUR BIG IDEA?

WHO ARE THE KEY STAKEHOLDERS?

HOW MIGHT THIS WORK AS A CATALYST FOR ACHIEVING A GREATER IMPACT? INCLUDE AN ILLUSTRATION OR DESCRIPTION OF THE PROJECT AND PROCESS.

CONNECTIONS & VERTICAL ALIGNMENT:

HOW WILL WE MEASURE SUCCESS YEAR ONE? OVER THE NEXT FOUR YEARS?

WHAT ARE SOME KEY MILESTONES?

Computational Thinking at the Intersection of Education and an Economic Redevelopment Initiative



Discussion Questions

- How might we as a region help prepare our students for the future of work?
- What other opportunities might this bring to our region?
- How might you leverage what you are currently doing to build partnerships and expand your own networks (education and business)?



Publications Discussing South Fayette's Computational Thinking Model 2016-2018

- Justice, Charles and Ford, Sam and Owens, Aileen. SXSW Presentation, “Coal to Code: Reimagining a Disrupted Economy.” March 13, 2018. Podcast.
- Zheng, Robert. ***Digital Technologies and Instructional Design for Personalized Learning***. IGI Global, 2018. Print. Chapter “Computational Thinking and Participatory Teaching as Pathways to Personalized Learning.” Eric Hamilton and Aileen M. Owens. 212 - 228.
- Vander Ark, Tom. “South Fayette Schools: A Computational Carnival for Kids.” Education Week. December 11, 2017. Online and Print.
- Murphy Paul, Annie. “The Coding Revolution.” **Scientific American** Aug. 2016:42-49. Online and Print.
- Hodges, Charles B. ***Emerging Research, Practice, and Policy on Computational Thinking***. Ed. Peter J. Rich. N.p.: Springer Verlag, 2017. Print. Chapter “A Future-Focused Education: Designed to Create the Innovators of Tomorrow.” Laurie F. Ruberg and Aileen Owens. 367-392.
- Rondinelli, Bille, Dr., and Aileen M. Owens. “Computational Thinking.” **AASA** May 2017: 23-27. Print and Online. <http://www.aasa.org/schooladministratorissue.aspx?id=28274>
- Gormley, William T., Jr. **Critical Advantage**. S.I.: Harvard Education, 2017. Print Chapter 7. Critical Thinking and the Technological Revolution. 157-185.
- Herold, Ben. “Classroom Technology: Where Schools Stand.” **Education Week**. Retrieved from <http://tinyurl.com/y935show5>