



Digital Promise

Accelerating Innovation in Education



Computing in Rural America: Developing K-8 Coding Pathways for Kentucky Appalachia

December 2nd 2020 (3-4PM PT)

ISTE  LIVE
NOV 29 - DEC 5



Agenda

1. Introductions - Welcome to KY Appalachia (5 min)
2. Project overview (15 min)
3. About Pikeville & Floyd Counties (5 min)
4. Pivoting in a Pandemic - Remote PD
5. Discussion of pressing questions (40 min)

Introductions

Our partnership



TOUGH AS NAILS: NIMBLE FINGERS

NSF Grant 2019-2022



Our setting



The “why”

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=arIDau-H2UM>

The “why”

Computational thinking is a skill set
for solving complex problems



Degradation of water quality



Releasing toxic gases into the atmosphere



Climate Change



US greenhouse gas emissions



Project Overview

RPP Goals

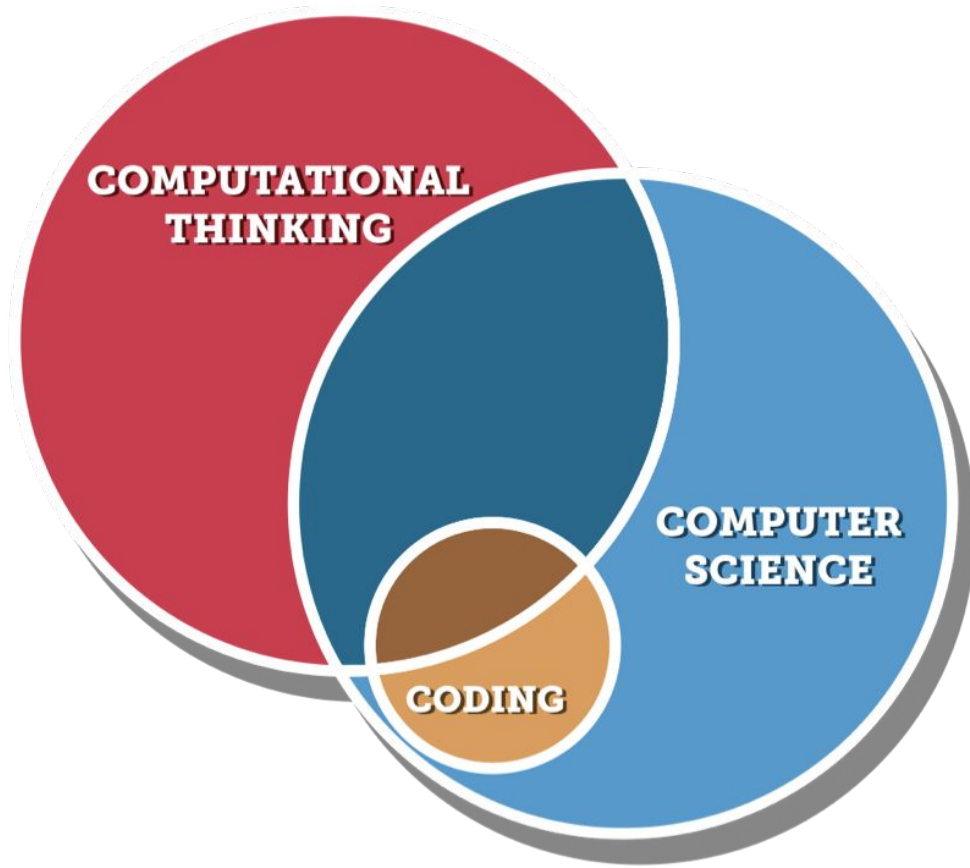


Design

Create a K-8 “**Computational Thinking Pathway**” in Floyd County & Pikeville Independent Schools by applying South Fayette School District’s model and training 75+ teachers over 3 years

Research

Study **what it takes** to make this happen and sustain it, **what the pathways looks like**, what **impact** it might have



Fitting the buzzwords together

- **Coding:** a technical skill
- **CS:** an academic discipline
- **CT:** a problem-solving process that is central to CS, *and also* applies to learning in any discipline

CT Tools vs Themes vs Competencies

Tools Curricula, technology, languages	Themes Topics, integration approaches	Competencies Student knowledge + abilities
e.g., Scratch, Code.org, PLTW, ECS	e.g., innovation, maker learning, STEAM, digital literacy	e.g., algorithms, data, simulations, etc
Changes over time (especially as programs mature)		Remains consistent (may shift grade bands)
Implementation may be even		May reveal student outcomes that are uneven

Stages of Developing CT Pathways

Getting Started	Getting Going	Getting Better
Informing ... Exploring... Committing...	Documenting... (aligning) Communicating... Leading...	Implementing... Improving... Seeing results...
District has CT activity and local expertise, but little consistency, cumulativity, etc.	District has wide buy-in to a progression that is cumulative, consistent, competency-based	District has wide implementation with metrics, and knows where improvement is needed next.

How a CT pathway might develop

Block-Based Timeline

South Fayette Township School District

Embedded in the curriculum

After-school connected learning experiences

2010-2011

2011-2012

2012-2013

2013-2014

2014-2015

2015-2016

2017-2019

6th-7th Grade Art: Scratch

6th Grade Art Class: Scratch

5th Grade Art Class: Scratch

6th-7th Grade Art: Scratch

4th Grade Pilot: Scratch Language Arts

3rd Grade Pilot: Scratch Language Arts

7th Grade Tech Ed: App Inventor

6th-7th Grade Art: Scratch

Outreach Fort Cherry: 5th-6th Grade: Scratch and eTextiles

Outreach MACS: 5th-6th Grade: Scratch and eTextiles

4th Grade STEAM Class: eTextiles

3rd-5th Grade STEAM Class: Scratch

K-2 STEAM Class: Scratch & Kodable

7th Grade Tech Ed: App Inventor

6th-7th Grade Art: Scratch

6th-8th Grade Tech Ed: 3D Printing

4th-6th Grade STEAM, Tech Lit, Tech Ed: VEX IQ Robotics

3rd-5th Grade STEAM and Tech Lit: Scratch, Lego Robotics, Video Game Design with 4 Schools in Mexico

K-2 STEAM Class: MaKey MaKey, LittleBits, Kodable, Squishy Circuits, Lego Robotics

8th Grade Tech Ed: Creative Entrepreneurship, 3D Printing Prototype Design

7th Grade Tech Ed: App Inventor

6th-8th Grade Art: Programming with Scratch & Hummingbird Robotics

6th-8th Grade Tech Ed: 3D printing and CAD

5th Grade Tech Lit: BlockCAD & 3D Printing

4th-6th Grade STEAM, Tech Ed, Tech Lit: Hummingbird Robotics, VEX IQ Robots

K-2 STEAM Class: MaKey MaKey, LittleBits, Kodable, Squishy Circuits, Lego Robotics

7th-8th Grade Tech Ed: App Inventor, Creative Entrepreneurship, HCD, CAD, 3D printing, Prototype Design

6th Grade - Tech Ed & STEAM: EV3 Robotics, 3D Printing, CAD, Hummingbird Robotics, HCD

4th-5th Grade-STEAM & Tech Lit:

EV3 Mindstorm Robotics, Hummingbird Robotics, Scratch, BlocksCAD, 3D Printing, HCD

K-2 STEAM: MaKey MaKey, LittleBits, Kodable, Squishy Circuits, Lego Robotics, Hummingbird Robotics, Scratch, HCD

7th-8th Grade Girls STEAM team: Scratch

7th-8th Grade Girls STEAM Team teaches Scratch at TRET Conference

MS Girls STEAM Team Community Night with Scratch

MS Teachers view Scratch at Open House

3rd-4th Grade Scratch Clubs: Cartooning, Video Games and Music

3rd-4th Grade Scratch: Video Game Design with 4 Schools in Mexico

Scratch Team presents 2nd Workshop at TRET

SFSD MS Scratch Team: Support & Outreach SFSD

K-2 MakeShop Monday

3rd-5th Scratch Clubs

3rd-4th Scratch: Video Game Design with 4 Schools in Mexico

3rd-5th Scratch Clubs with Fort Cherry and SFSD

3rd-5th Family Programming Night

5th-8th GameJam: SFSD, MACS, Fort Cherry

7th-8th App Inventor Club

K-2 MakeShop Monday

2nd-5th Grade STEAM Ambassadors

3rd-5th Scratch Club

3rd-5th Family Programming Night

6th-8th Girls STEAM team

7th-8th Invention Time with 3D Printing

Family Inspire Series K-12

K-2 MakeShop Monday

2nd-5th Grade STEAM Ambassadors

3rd-5th Scratch Club

3rd-5th Family Programming Night

6th-8th Girls STEAM team

7th-8th Invention Time with 3D Printing

Family Inspire Series K-12

2nd - 5th Grade STEAM ambassadors

3rd- 5th Grade Scratch Clubs

3rd-5th Grade Coding Club

5th Grade Early Morning Robotics

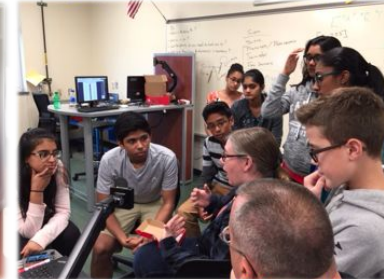
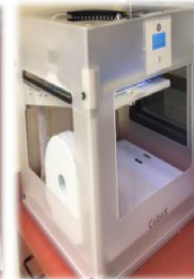
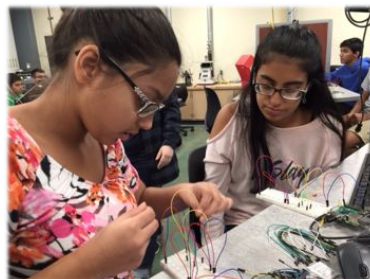
3rd- 5th- Family Programming Night

6th- 8th Grade- Girls Who Code

Family Inspire Series K-12

STEAM Innovation Summer Institute

Glimpses of South Fayette SD's pathway



Throughlines Found in the CS/STEAM Pathway

Maker Education (artistic expression and creativity)

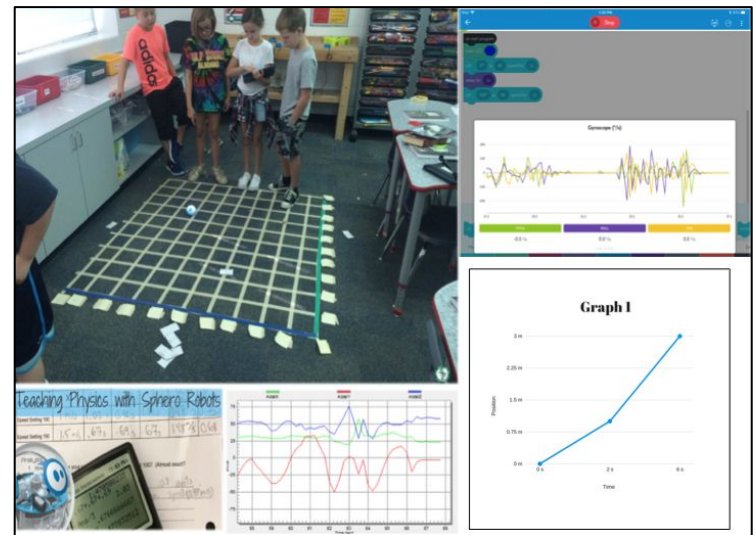
Computational Thinking (computer science including coding in the virtual and physical environment)

Spatial Reasoning & Discrete Math (the ability to imagine things in three-dimensions & understanding mathematical modeling)

Manufacturing and Design (engineering, human centered design thinking)

Lesson Development

Lesson plans include student agency, computational thinking competencies and practices, habits of mind and examples of student artifacts.



The photograph shows two students working on a project, with a table of BlocksCAD data to the right.

		Translation Coordinates		
		X	Y	Z
	Sphere (R)			
	Cube (x,y,z)			
	Cylinder (R1,R2,H)			
	Torus (R1,R2,S,F)			
Ex.	Cube Tissue Box	X=10 Y=5 Z=2		
1	Sphere Tennis ball	R=3		
2	Torus Tape roll	R1=4,R2=1,S=20,F=30		
3	Cylinder Clock wheels	R1=5,R2=5,H=10		
4	Torus Tape roll	R1=4,R2=1,S=20,F=30		
5	Square Shoe box	x=5,y=10,z=3		
6	Cylinder Toilet paper roll	R1=2,R2=2,H=4		
7	Sphere Globe	R=10		
8	Cube Cereal box	x=3,y=10,z=20		
9	Cylinder Cone	R1=6,R2=0,H=8		
10	Cube Lego block	x=8,y=8,z=8		

The Key Components of a Pathway

- Develop a district-wide **vision** for curricular integration of CT & CS in each grade band, including attention to the “why” in the eyes of students, teachers and parents
- Clear **statements of competencies** in terms of what students should know and be able to do in each grade band, annotated w/ short, illustrative examples or videos
- Identification & adaptation of **useful curricular resources** to support learning
- Identification of **teacher professional development needs** based on stated competencies & curricula resources
- Articulation of **formative assessment** for students & teachers, guiding improvement

Development activities

Getting Started SY19-20	Getting Going SY20-21	Getting Better SY21-22
Develop innovation mindset; Get buy-in	Training & Piloting	More training, piloting and refining
Visit South Fayette Book clubs SCRIPT assessment Inventory taking	Summer Institute #1 (SF teachers lead) Pilot lessons Microcredentials Sketch pathway	Summer Institute #2 (SF & KY teachers lead) Pilot lessons Microcredentials Refine pathway

3 central outputs

- Competencies
- Curricula
- Credentialing

Research overview

Research questions

- What does it take to create an integrated K-8 CS pathway in Floyd & Pikeville?
- What does the school district identify as the crucial K-8 grade-band skills for thinking computationally & learning basic coding concepts & practices?
- To what degree does a competency-based framework for PD assist instructors at demonstrating teaching proficiency?

Key activities: Observations, interviews & focus groups, examine curricular artifacts, expert opinion

Pressing Questions

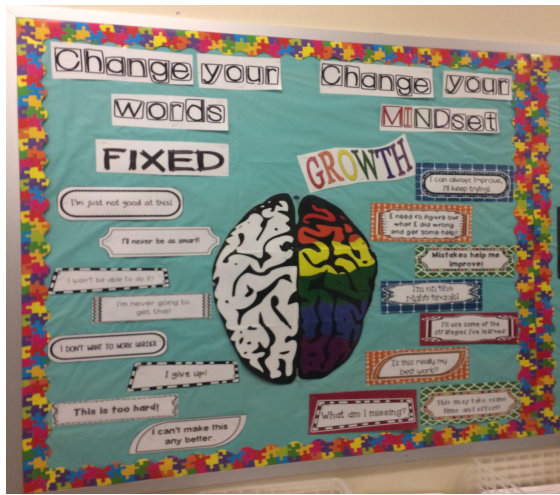
1. How to **balance** a uniform vision for CS & CT while still maintaining districts'/ schools' capacity to develop a unique approach to integration?
2. How might we **evaluate “success”** - on district level, school level, teacher level, & student level?
3. How might we **establish a pipeline for feedback** to districts (and even schools)?
4. What types of **data** should we be collecting and asking teachers to collect?
5. What opportunities might this project have for introducing **culturally relevant and sustaining pedagogy**?

4th “C” - Culturally sustaining pedagogy (Paris, 2012; Paris & Alim, 2014; Wilson-Lopez, 2016)

1. **Foregrounds students' cultural practices**, and it **seeks the maintenance** of these cultural practices as a primary goal, rather than using them solely as bridges to academic practices or hybrid practices.
2. Seeks to **“honor, explore and extend” heritage practices** and evolving contemporary practices, rather than focusing exclusively on heritage practices (Paris & Alim, 2014, p. 87).
3. Encourages students to **reflectively critique both dominant and non-dominant cultural practices**, rather than focusing exclusively on the critique of dominant cultural practices.

About Pikeville & Floyd Counties







WANTED

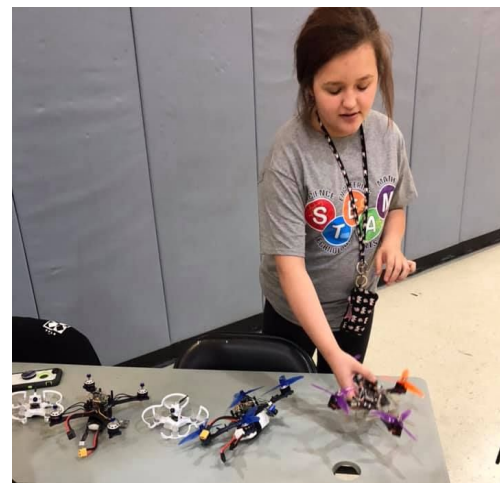
Junior Engineers

PES Library
THURSDAYS
3:15 pm - 4:15 pm

PROJECT STEAM

Scratch Science Technology Engineering Arts Mathematics Club







Pikeville Independent Schools

Summary

 School Count: 2

 Students: 1,175

 Grades Preschool-12th

Pikeville Elementary PreK-6

Pikeville High School 7-12

Floyd County Schools



Summary

 School Count 13

 Students: 5,468

 Grades Preschool-12th

Allen Elementary PreK-8

Duff Allen Central Elementary PreK-8

Betsy Layne Elementary PreK-8

John M. Stumbo PreK-8

May Valley Elementary PreK-5

Prestonsburg Elementary PreK-5

South Floyd Elementary PreK-8

Adams Middle School 6-8

3 High Schools



Pikeville Independent Schools

Floyd County Schools



ECONOMICALLY DISADVANTAGED ⓘ



- Economically Disadvantaged
37%
- Not Economically Disadvantaged
63%

ECONOMICALLY DISADVANTAGED ⓘ



- Economically Disadvantaged
74.2%
- Not Economically Disadvantaged
25.8%

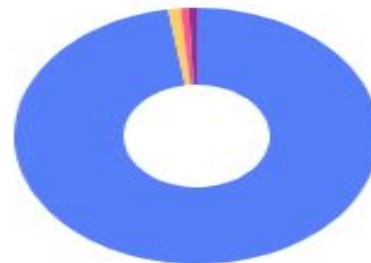


Pikeville Independent Schools

Floyd County Schools



- 91.1%** White (non-Hispanic)
1070 students
- 2.7%** Asian
32 students
- 2.1%** Two or More Races
25 students
- 4.1%** Other
48 students



- 97.5%** White (non-Hispanic)
5330 students
- 1.1%** Hispanic or Latino
61 students
- 0.7%** Two or More Races
39 students
- 0.7%** Other
38 students

Pivoting in a Pandemic: Taking the Summer Institute Online

Pivoting from in-person professional development to the virtual world



CS/STEAM Summer Institute 2020

Institute Workshop Sessions (Limited Seating)



Session 100: June 15-16, 8:30am – 3:30pm

Join the Maker Movement: Nurture Your Youngest Engineers, Inventors, and Computer Programmers

You will learn how to introduce elementary classrooms to engineering concepts by making squishy circuits with conductive Play-Doh and LED lights and then automate student inventions using MaKey-MaKey. **Using online resources and "unplugged" activities**, you'll learn the basics of computer programming and computational thinking as you design digital projects. Then venture into physical computing by exploring various robotics options for your students. There will be many exciting opportunities to share—both high tech and low tech for the virtual or physical space. To learn more: <https://tinyurl.com/vb8nbf6n>
To register: <https://tinyurl.com/vb8nbf6n>

Presenter: Melissa Unger,
CS/STEAM Teacher, South
Fayette Township School
District



Session 101: June 17, 8:30am – 3:30pm

Low-Tech, High-Impact CS/STEAM Activities for Elementary Students

Let's celebrate a day of Making as participants take part in a variety of building and design challenges. Learn how to introduce elementary classrooms to the engineering design process as you build your own robot, create a cardboard arcade, explore chain reactions, create 3D storybooks, and more. Suitable for instruction in the virtual or physical world.
To learn more: <https://tinyurl.com/vb8nbf6n> To register: <https://tinyurl.com/vb8nbf6n>

Presenter: Melissa Unger,
CS/STEAM Teacher, South
Fayette Township School
District



Session 102: June 15-16, 8:30am – 3:30pm

Scratch Foundations of Coding through Project Design

Join this session if you would like to find ways to integrate coding in any curricular area. You will learn how to use Scratch to create interactive stories, quizzes, games, music and art. In addition to gaining computational thinking skills you will be introduced to computer science concepts and the knowledge skills, and dispositions necessary for your students to succeed in the future of work in this global economy. Great for the virtual classroom! To learn more: <https://tinyurl.com/vb8nbf6n> To register: <https://tinyurl.com/vb8nbf6n>

Presenter: South Fayette
Township CS/Technology
Literacy Teacher, Shad
Wachter



Session 103: June 15-16, 8:30am – 3:30pm

Setting Yourself Up for Success in Your Makerspace & STEAM Virtual or Physical Classroom

How might we create a culture of making, building, and designing? Explore ways to engage, excite, and promote creativity among your learners! From virtual lesson designing to assessment, this session will give you all the tips you need to create a successful discovery learning environment in your virtual and physical classroom. This session will leave you with many tried and true tools, Makerspace procedures, questioning techniques, and more to start your year off right!
To learn more: <https://tinyurl.com/vb8nbf6n> To register: <https://tinyurl.com/vb8nbf6n>

Presenters: South Fayette
Township CS/STEAM
Teachers Tori Lojek and
Samantha Edkins

Seating is limited. Registration for the Workshop Sessions must be completed by May 25 in order for our team to enroll you into Canvas, the LMS system. Register for these sessions only if you are committed to attending since we cannot add new participants after May 15. We are also coordinating the delivery of equipment for a few sessions so getting registered early is important. Please contact Aileen Owens at awovens@southfayette.org with questions or for additional information.

Next Steps

Questions?