Pivoting in a Pandemic:

Transitioning from in-person to Virtual K-8 Computing Professional Development

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This project is funded by the National Science Foundation (Grant #1923314)

Overview

This poster reports on year one of a three-year NSF-funded Research Practitioner Partnership (RPP) to develop a K-8 pipeline for computer science (CS) and computational thinking (CT) education within two rural school districts in Eastern Kentucky: **Pikeville Independent School District** and **Floyd County Schools**. Economically devastated by the departure of the coal industry, these communities are committed to developing high-quality computing curricula for all students, beginning in their earliest years.

The poster has two components. First, it reports on the genesis and development of the RPP. Second, given the Covid-19 pandemic it focuses on development of a series of summer workshops for Kentucky Appalachia K-8 instructors to learn the basics of CS and CT and how to integrate them.

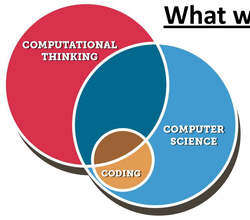
Research Questions

Tough as Nails will **design, study, and improve how each district's Computing Pathway can intentionally and effectively access and address equity and access for each district.** It has three underlying 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?

"Pivoting in a Pandemic"

What we Mean by CS, CT, & Coding



CT: a problem solving process that is central to CS, *and also* applies to learning in any discipline

CS: an academic discipline

Coding: a technical skill

Overview of Pikeville & Floyd County School Districts

Summary

- School Count: 2
- Students: 1,145
- Grades Preschool-12th

Summary

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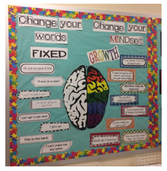
- Students: 5,458
- Grades Preschool-12th



Immediate Next Challenges

Challenge #1
Identifying Integration vs. Stand-Alone Coursework

Challenge #2
Developing Substantial Body of Lesson Plans & Student Work via Educator Micro-Credentials in K-8 Computational Thinking.

Beginning to Unpack the Big "Why" Behind CS & CT within Districts

Established K-8 integration approach/philosophy.
HS CT/CS pathways established
K-8 materials procured in alignment with district goals and PD offerings
Lesson capture tool created
[In-progress] Initial K-8 lessons designed, piloted and documented. Lesson development support includes incentives and structures (MCs). Vertical alignment of lessons to KY technology standards

What do We Mean by "Pathway"?

Defining a CS Pathway
Vertically aligned lessons growing progressively deeper and more complex through a series of graduated and interrelated projects.

Defining Equity in CS & CT for Your District
Identifying inequitable practices that impede access, participation and outcomes. Creating inclusive environments to increase self-efficacy and identity development.

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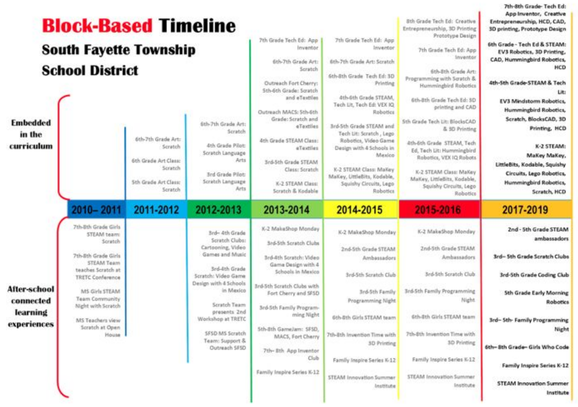
Existing courses across K-5, 6-8, 9-12? Creating an ecosystem of interconnected after-school to curriculum connections. Professional development models? Qualified teachers?

The South Fayette Model



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Your turn!

Are you developing CS/ CT Pathways? How are you defining success?

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Professional Development

2021 SIGCSE Technical Symposium

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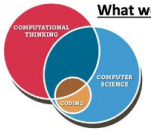

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Materials, Curriculum, Content Refinement
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- ✓ K-8 materials procured in alignment with district goals. Lesson capture tool created
- ✓ [In-progress] Initial K-8 lessons designed, piloted and documented. Lesson development support includes incentives and structures (MCs). Vertical alignment to KY tech standards.

Leadership
- ✓ "STEAM teams" and "SCRIPT teams" established
- ✓ SCRIPT vision and goal setting
- ✓ 31 administrators trained in CT pathway leadership
- ✓ [In-progress] Defining and measuring outcomes at various levels

Teacher Capacity & Development
- ✓ 80 teachers attend SI 2020
- ✓ CT Boosters & other PD during school year
- ✓ 15 teachers (and counting) implemented related lesson
- ✓ [In-progress] 18 teacher-leaders to earn CT micro-credentials

Partners & Community
- ✓ New partnerships formed (e.g., NSF grant partners, SOAR, DELL Tech Crew, Steele Reese Foundation, Mountain Top Media, The App, University of the Cumberlands)
- ✓ Increased family involvement with CS (Remake Learning Days, Open House, Family CS Nights, SLL podcast etc.)
- ✓ Stronger inter-district relationships

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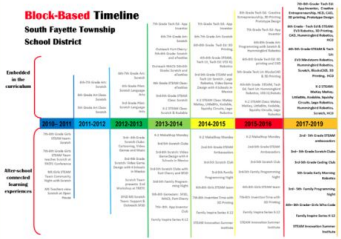

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Your turn!

Are you developing CS/ CT Pathways? How are you defining success?

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

TOUGH AS NAILS, NIMBLE FINGERS:

Our Partnership

NSF Grant 2019-2022

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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

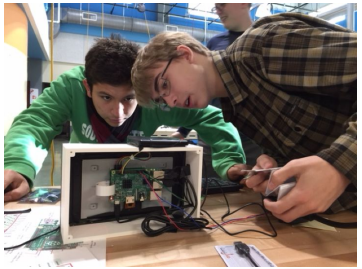
The South Fayette School District (PA) Model

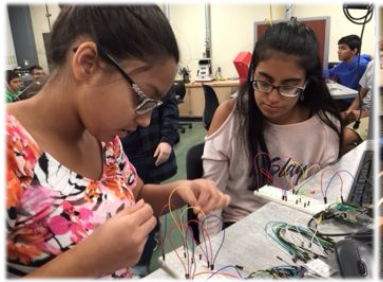
Block-Based Timeline

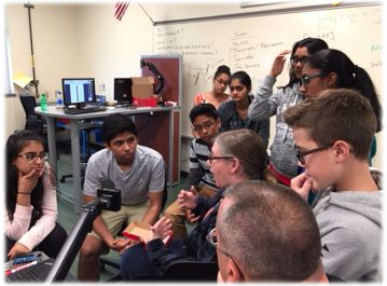
South Fayette Township School District

	2010– 2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2017-2019
Embedded in the curriculum		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: BlocksCAD & 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
After-school connected learning experiences	7th-8th Grade Girls STEAM team: Scratch 7th-8th Grade Girls STEAM Team teaches Scratch at TRETC 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 TRETC 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 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 STEAM Innovation Summer Institute	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 STEAM Innovation Summer Institute	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)

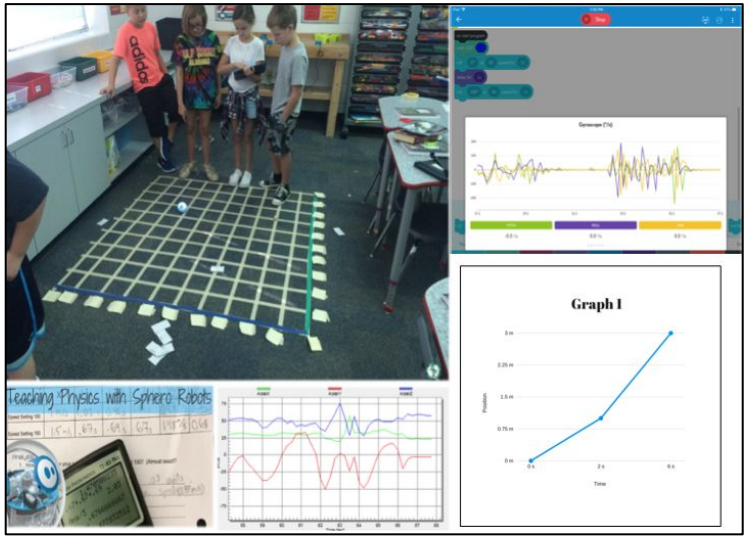
Computational Thinking (computer science including coding in the virtual and physical environment)

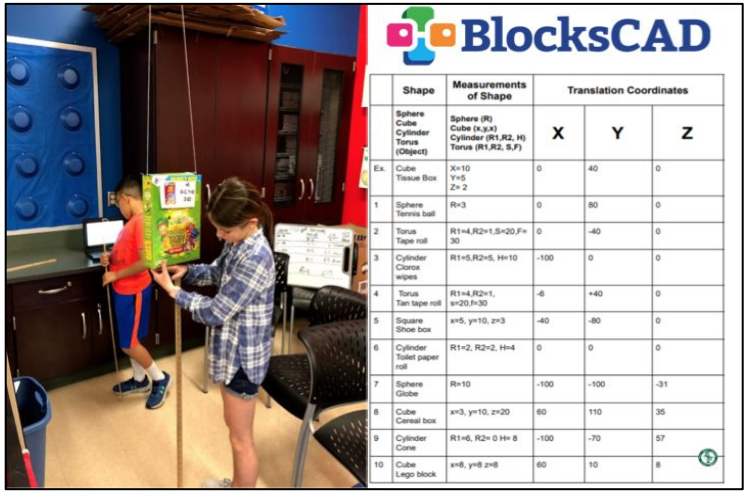
Spatial Reasoning & Discrete Math (the ability to imagine things in three-dimensions & understanding mathematical modeling)

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.





	Shape	Measurements of Shape	Translation Coordinates		
	Sphere Cube Cylinder Torus (Object)	Sphere (R) Cube (x,y,z) Cylinder (R1,R2, H) Torus (R1,R2, S,F)	X	Y	Z
Ex.	Cube Tissue Box	X=10 Y=5 Z= 2	0	40	0
1	Sphere Tennis ball	R=3	0	80	0
2	Torus Tape roll	R1=4,R2=1,S=20,F=30	0	-40	0
3	Cylinder Clorox wipes	R1=5,R2=5, H=10	-100	0	0
4	Torus Tan tape roll	R1=4,R2=1, s=20,f=30	-6	+40	0
5	Square Shoe box	x=5, y=10, z=3	-40	-80	0
6	Cylinder Toilet paper roll	R1=2, R2=2, H=4	0	0	0
7	Sphere Globe	R=10	-100	-100	-31
8	Cube Cereal box	x=3, y=10, z=20	60	110	35
9	Cylinder Cone	R1=6, R2= 0 H= 8	-100	-70	57
10	Cube Lego block	x=8, y=8 z=8	60	10	8

“Translating” the SFSD Model to Pikeville & Floyd County School Districts

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

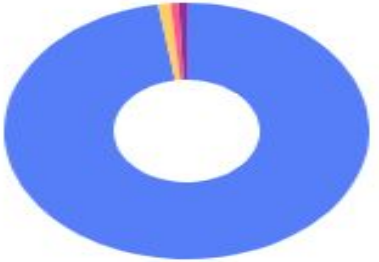
Economically Disadvantaged
74.2%

Not Economically Disadvantaged
25.8%

Pikeville Independent Schools

- **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

Floyd County Schools



- **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

ntucky

FLL
WORLD
CLASS
Learning Unleashed
NXT

At least one of those three must be
from the red or green section

Challenger Learning Center of Kentucky
FIRST LEGO League 2013
Regional Qualifying Tournament
THANK OUR SPONSORS:
Panther
Commander

WANTED
Junior Engineers
PES Library
THURSDAYS
3:15 pm - 4:15 pm
PROJECT
STEAM
CODE
SCRATCH
SCIENCE
TECHNOLOGY
ENGINEERING
ARTS
MATHEMATICS
Club

Hospital
Home
SPORTS

South Fayette Briefing and Observations

Research Questions

What does it take to create an integrated K-8 CS pathway in Floyd & Pikeville?

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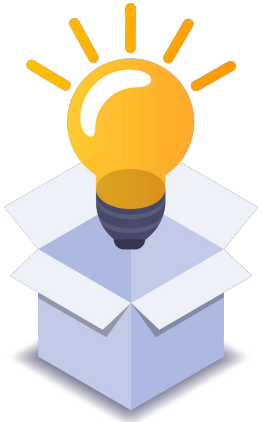

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Pivoting from in-person professional development to the virtual world

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/vbgnfwfin
To register: https://tinyurl.com/vbhu9nft

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/vbgnfwfin To register: https://tinyurl.com/y8brl3z8

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/vbgnfwfin To register: https://tinyurl.com/y8rmh9ax

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

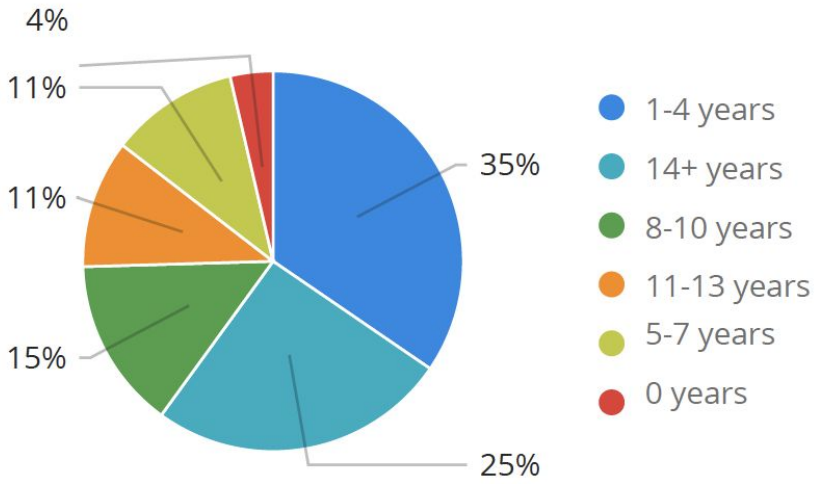
How might we create a culture of making, building, and designing? Explore ways to engage, excite, and promote creativity among your learners! From virtual lesson designing to assessment, this session will give you all the tips you need to create a successful discovery learning environment in your virtual 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/vbgnfwfin To register: https://tinyurl.com/yc73inck

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

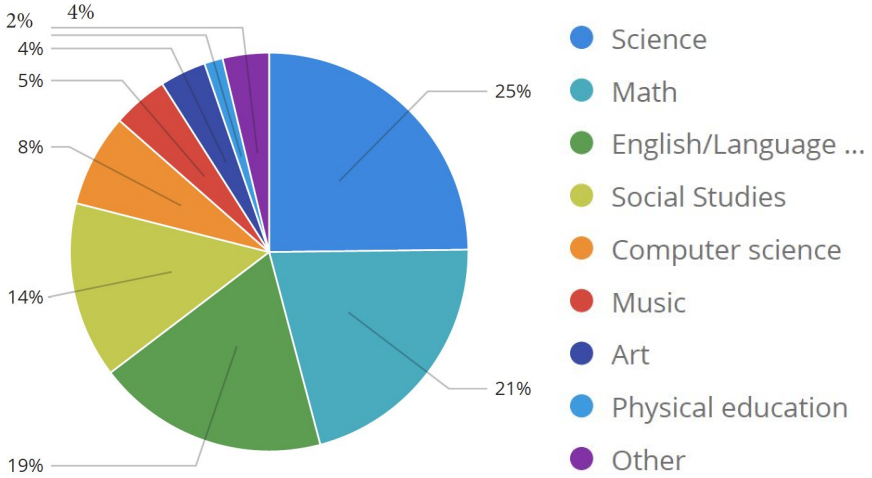
Seating is limited. Registration for the Workshop Sessions must be completed by May 25 *in order for our team to enroll you into Canvas, the LMS system. Register for these sessions only if you are committed to attending since we cannot add new participants after May 15. We are also coordinating the delivery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

Summer Institute 2020: Profile of Incoming K-8 KY Teachers

Year Teaching? **(n=55)**

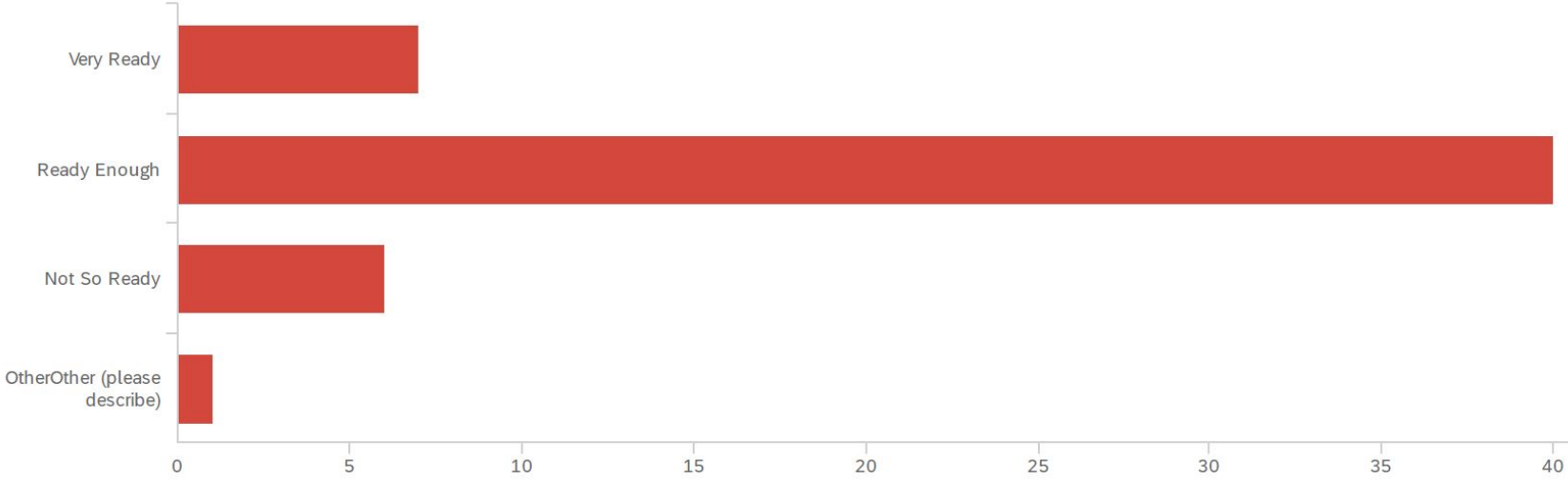


Subjects where you've embedded CS/ CT? (n=55)



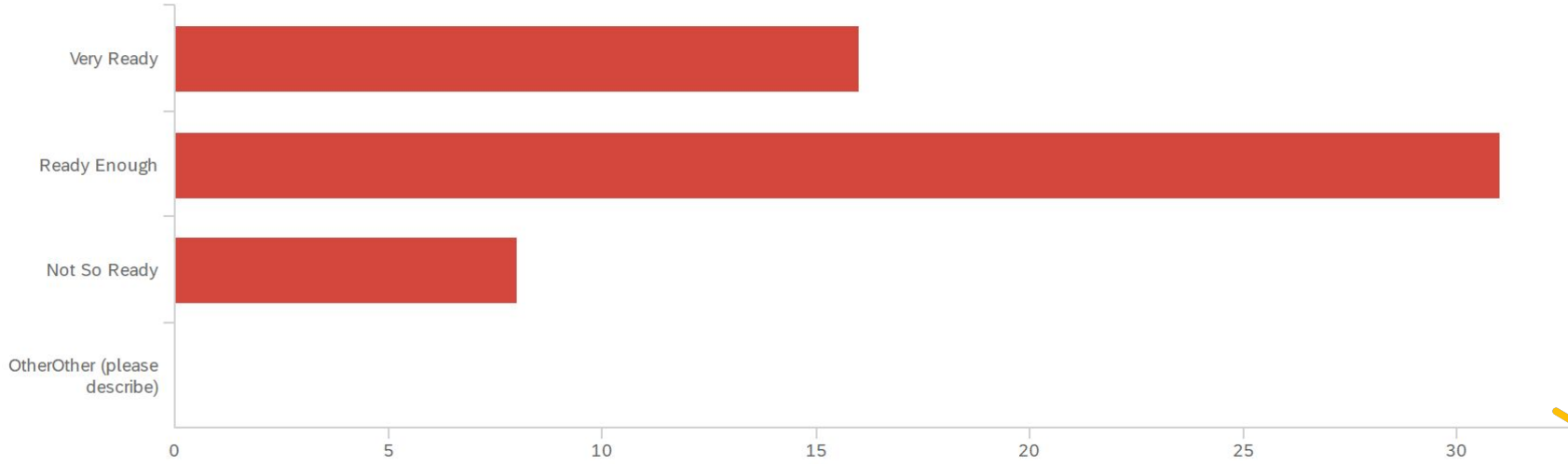
Summer Institute 2020: Responses from KY Teachers

How prepared do you feel to teach elements of computational thinking to your class?
(n=54)



Summer Institute 2020: Responses from KY Teachers

How prepared do you feel to share what you learned in the Summer Institute to other teachers/administrators in your school or district? **(n=54)**



Summer Institute 2020: Responses from KY Instructors

On things that worked:

"There was a teacher who said that she is now going to change her teaching practice because of the way this was provided to her. She said that before, she didn't let her kids struggle enough; maybe she didn't have enough confidence that they could solve the problem. And so having us model [the process] for the [KY teachers], then step back and let them struggle a little bit, she felt --she said--she's totally going to change her practice...It's hard to feel a personalized experience, but for some reason, this really did work, especially for this particular teacher. And I'm really excited about that."

- SFSD Teacher working w/ KY Middle School Teachers

"I was really impressed with one teacher who wasn't very comfortable with the programming, but in the end, she was actually starting to develop little bits of what she wanted to do throughout the year. And she actually formalized it--I want to do this in this week, I want to make sure that I do this in these nine weeks.

- SFSD Teacher working w/ KY Elementary School Teachers

"It is an overarching theme that participants kept asking for more student examples. So we would just keep dragging and dropping any pictures, videos, lesson plans that we have had already done. So kind of that goes with something that we would keep [in the online format]."

- SFSD Teacher working w/ KY Elementary School Teachers

Summer Institute 2020: Responses from KY Instructors

On things that could have been worked on:

"(W)e weren't able to kind of see their learning throughout, which is different obviously than in person. In person, we'd walk around to their tables and say like, how's it going? And we'd be able to see and get them to ask us questions then, but online it's a lot harder to do that."

- SFSD Teacher working w/ KY Elementary & Middle School Teachers

"I mean, it gets tricky obviously because this is all virtual, but we felt like the participants that kept their cameras on longer, those just stood out to us more because we got to see that more. So I'm not sure if that's how the rest of our team felt, but those that had their cameras on definitely stood out to me more."

- SFSD Teacher working w/ KY Elementary School Teachers

"I would agree with that about the cameras. I feel like when you're presenting and you can see people's facial expressions and the nodding, you just, it gives you comfort, like, okay, I'm saying something that they understand or that they can relate to. And it's kind of hard when you're talking on Zoom and it feels like nobody's there, you're just talking into a computer."

- SFSD Teacher working w/ KY Middle School Teachers

Questions? Ideas?

Contact Us

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