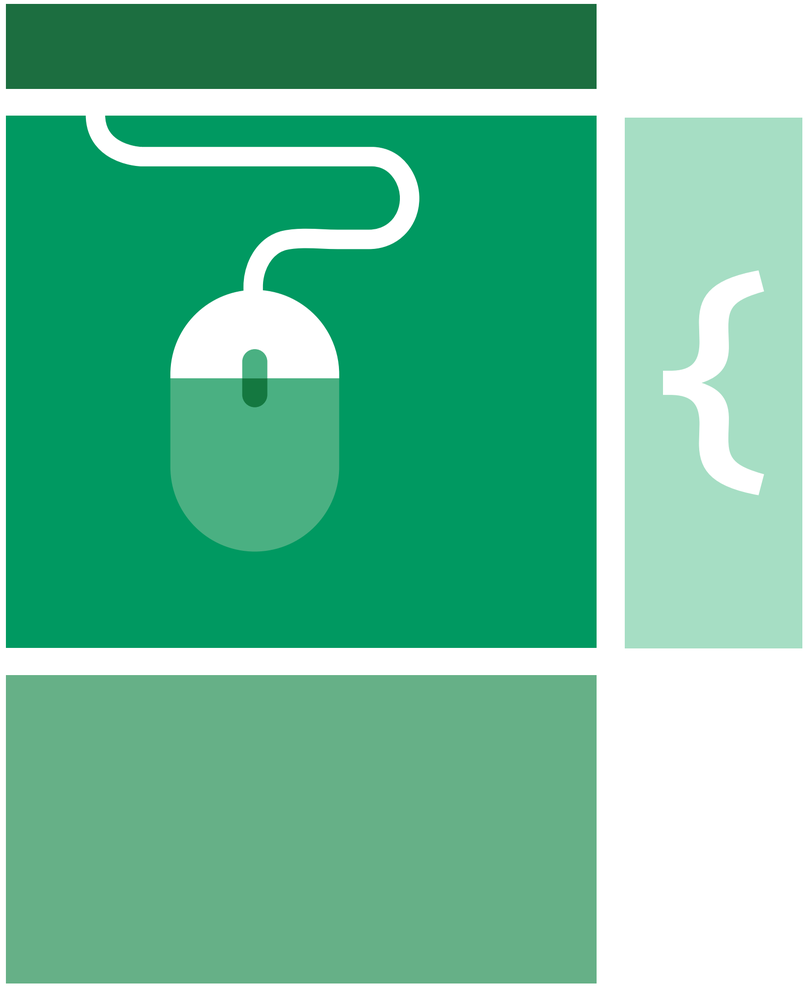


Learnings from 4-H's Computer Science Pathway

with support from Google

Bringing computer science to all

Once upon tomorrow, Jordan will solve problems that save lives.

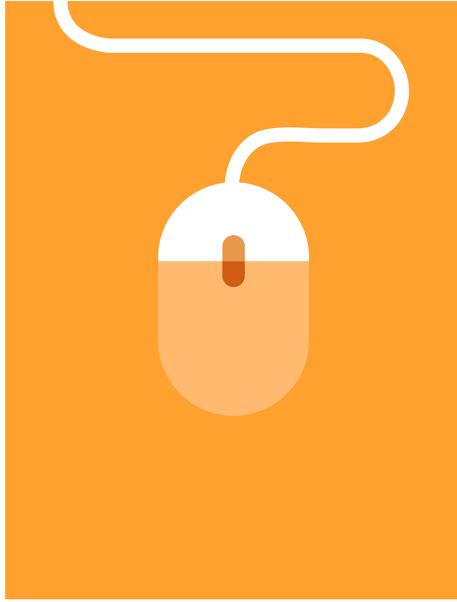
To make this dream come true, Jordan needs a computer science education. But in the U.S. many kids don’t have access to this kind of education.

One day, a teacher tells Jordan about a program for kids like her. One that will help make once upon tomorrow come true.

01

Chapter

The Computer Science Pathway



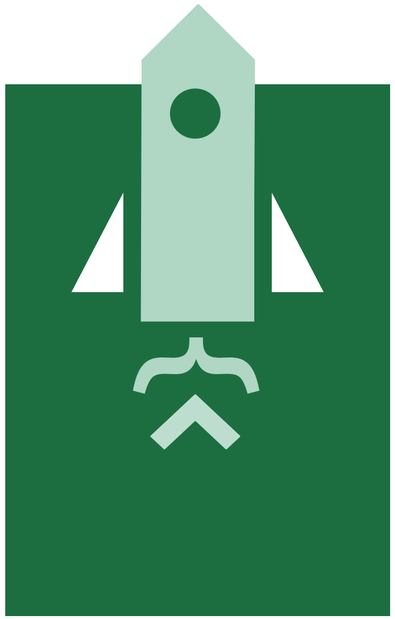
In today's workforce, **computer science (CS) skills** are in high demand. However, many women and racially diverse individuals don't get the chance to learn these skills in school and pursue a career in CS.

To bridge the education gap, 4-H created the Computer Science Pathway, a program that provides students from all 50 states real-world applications of CS, future career opportunities and lifelong mentorship.

The Pathway consists of four stages: Explore, Learn, Practice, and Experience. This structure helps kids progress from casual interest in CS to dedicated learning and ultimately, career experience.

02

Chapter



Results

Making dreams come true

With support from Google, we set out to give one million students access to a CS education by 2021’

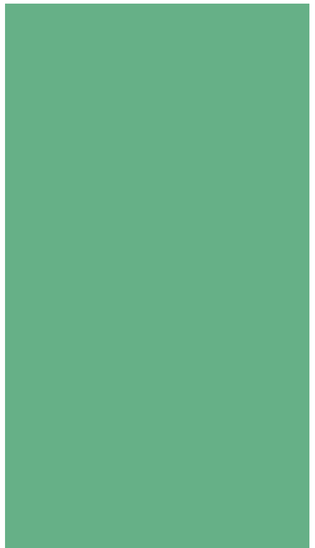
So far, 1.4 million youth have participated in the program

65% live rurally

56% of teen leaders are girls

55% of in-depth participants are girls

47% are racially diverse



Young people are sharpening their technical and life skills

94% Report liking computer science (CS)

80% are interested in a job that involves CS

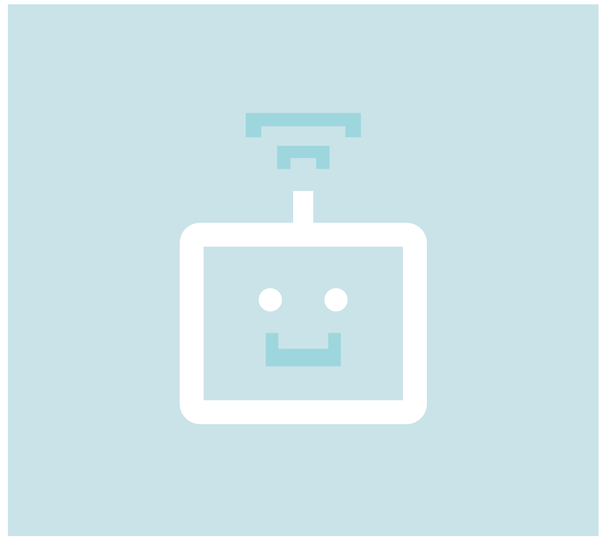
73% feel more confident figuring things out that they don't understand

69% know how to develop a plan to deal with a problem

Best practices

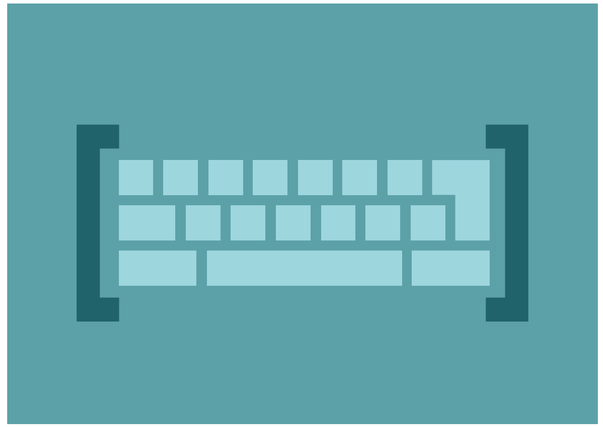
03

Chapter



Best practices in creating a CS curriculum

A truly impactful CS education unites nonprofits, community leaders, schools and businesses to bring life-changing learning to more kids. Here’s how we work together to do this.



Pillar 01

Build life and CS skills for the future

Core practices

ONE Empower teens as teachers

Train, equip and empower teenagers to teach CS skills to younger children.

- Teens cement CS and life skills
- Educators bring CS to their communities at greater scale
- Younger kids are more inspired to take an interest in CS

In 2020, 34 teen leaders reached **over 3,700 youth** through STEM Challenge activations

> We used teen leaders to collaborate with tech volunteers. Teens were able to translate the information to the youth." - **State 4-H professional**

> [Being a teen leader] gives me more opportunities when it comes to college and other jobs." - **2020 teen leader**

TWO Foster adult mentorship

Volunteer CS professionals and dedicated educators provide stability, guidance and ongoing coaching to young people.

- Youth feel comfortable, safe and supported by a caring adult
- Young people experiment with different approaches as they learn
- Industry professionals guide and inspire young people to cultivate an ongoing interest in CS

Over 90%

of youth reported that they felt safe, like they belonged, and like adults and other youth in 4-H CS cared about their well-being

> There are a variety of mentors that young people can really identify with." - **State 4-H county agent**

Pillar 01

Build life and CS skills for the future

Core practices

THREE Integrate life skills

Emphasize personal growth in skills like confidence, leadership, self efficacy, communication, collaboration and resilience.

- Young people find long-term success in school and careers
- Youth develop the emotional tools to learn challenging topics like CS

64%

of youth reported knowing how to adapt a plan in response to new information

54%

reported willingness to work harder at difficult tasks

FOUR Create career pathways

Students can achieve career goals with a four-step program that culminates in exposure to future opportunities.

- Explore: Appeal to young people with little-to-no CS exposure
- Learn: A focus on project based learning and exposure to real-world professionals to deepen interest in CS
- Practice: Youth engage in ongoing projects (or six or more hours of programming) that are dictated by each individual students' interests
- Experience: Older youth engage with CS mentors and get exposure to services like college counselling or internship matching

> Seeing [teen leaders] take their own interest and stretch out of their comfort zones to take that spark to others has been a joy to watch." - **4-H county agent**

Pillar 02

Design a program that's accessible, equitable and inclusive

Core practices

ONE Leverage existing programs and interests

Help make computer science tangible for all by creating activities that tap into existing interests and weave teachings into relevant topics.

- Educators reach kids who may not think they're interested in CS
- Young people see how CS impacts everything they do
- Students gain confidence
- Program is immediately scalable
- Young people make a connection between CS and their career
- Educators understand how CS concepts can be applied to any activity
- Educators evolve from teaching the Scientific Method and the engineering design process to teaching computational thinking

41%
of participants said this was the first time participating in hands-on CS activities

76%
said they now understand CS better

72%
are now interested in learning more about CS

> We were figuring out how to sprinkle computer science into everything." - **4-H county agent**

> If you enjoy music, why not go into controlling the sound board? If they enjoy something, why can't they enjoy it and also turn it into a STEM career?" - **4-H STEM specialist**

Pillar 02

Design a program that's accessible, equitable and inclusive

Core practices

TWO Develop a diversity, equity and inclusion strategy

To reach even more young people, 4-H has a **DEI strategy** and partners with community organizations.

- A diverse array of youth can access a CS education
- Youth development and other community organizations can collaborate at the local and national level
- Organizations are accountable to DEI success metrics

65%

of all youth were from rural communities

From 2018 to 2020, **55%** of in-depth participants were girls and **32%** were minority youth

From 2019 to 2020, minority youth participation increased from **11% to 50%** as a result of meeting people where they are

THREE Invest in technology lending infrastructure

Creating tech sharing hubs in communities, training educators to stretch resources, and designing tech-free lessons help 4-H collectively overcome technology limitations.

- Inequalities in the availability of high-speed broad-band internet are mitigated
- Communities that can't purchase their own equipment have resources
- Educators can make the most of limited resources

Nearly 40k

devices used by youth in 2018

Chromebooks helped with the overall success of CS programs, according to a 2019 teen survey

Pillar 03

Invest in professional development for staff and volunteers

Core practices

ONE Offer capacity building

In-person and virtual training early on in the program allows professionals, volunteers and teen leaders to build their local action plans together.

- Outcomes are prioritized over curriculum by blending context (PYD) with content (CS)
- CS is showcased in a variety of learning environments
- Professionals and volunteers share best practices and provide educator-to-educator support throughout program

Grew from presence in **25 states to 50**

> My sister taught us what she'd learned at the CS teen leader training, like applying algorithms to brushing a horse, and things you wouldn't think had anything to do with computer science." - **Massachusetts teen leader**

TWO Build a community of practice

Consistent coaching and monthly webinars help volunteers and staff continue gaining skills and building confidence.

- Professionals learn from and support each other
- Educators can access a range of lessons, from webinars that provide an introduction of new CS concepts, to more focused, smaller trainings that provide deeper learning
- Educators get continuous, on-demand coaching and support from leading experts

> It's been essential hearing what other people are doing and also hearing about new resources." - **4-H state professional**

> I always try to attend monthly webinars. These are very helpful and introduce me to new tools." - **4-H county agent**

Pillar 03

Invest in professional development for staff and volunteers

Core practices

THREE Provide dedicated staffing

Dedicated full-time staff with a background in content (CS) and context (Positive Youth Development) oversee the program to make sure it's successful.

- With more program capacity, learning experiences are sustained over time
- More youth are reached
- University-wide and local community connections increase access to resources, and provide program guidance

The 4-H programs that invested in full-time staff or program assistants experienced an increase in youth participation

They also provided more sustained experiences, with **47% of youth** engaged in **six hours** or more of lessons

48% of total youth reached by Five Land-Grant Universities with a full-time CS Innovator[1]

Most successful innovators had the support of a key STEM specialist[2] to make university-wide and local county faculty connections and give access to resources and program guidance

FOUR Evaluate program impact

Create a system of evaluation to provide a comprehensive understanding of the process of implementation and youth outcomes.

- Continuous quality improvement through evaluation and feedback from professionals, youth participants, parents and volunteers
- Outcomes are assessed by measuring knowledge and attitudes of CS and measures of Positive Youth Development (PYD)
- Advisory groups identify and share effective strategies and suggestions on what could be improved

Use our learnings to implement your own CS program

→ If you're creating your own curriculum as a nonprofit or education leader, **get in touch** for more details on best practices.

Good to know:

[1]A CS Innovator is someone who works with county agents to bring more CS programs to states around the country.

[2]Every local government has a STEM specialist who provides the state's STEM strategy for the year.

Real stories

02

Chapter

Their journey, in their words

Explore

After years watching her 4-H robotics club grow, Amanda recognized a need in her area for more classes. So she held a training class for local 4-H leaders.

“I am proud to have been in the first robotics class in my county.”

Amanda, CA

Thanks to his 4-H teachers and peers, Clyde got the support he needed to succeed in school and in life.

“4-H has created pathways for me when I thought I could not do anything.”

Clyde, NY

Belong

Roshini used to find presenting in front of others intimidating. Not anymore.

“Through my 4-H club, I learned that I have the potential to do much more than I originally thought.”

Roshini, NJ

A student with learning difficulties, Ana was looking for a place to belong. Now, she has her very own organization, See Me in STEM, to empower minority youth to get involved in science, technology, engineering and mathematics.

“4-H inspired me to be the change I wanted to see.”

Aja, IL

An aspiring environmental science major, Emily knows her CS skills will come in handy when it comes to manipulating and understanding data.

“I didn’t know if I was a science person. Then I went to the first meeting and thought, ‘Oh yes, I am a science person.’”

Emily, NJ

4-H changed Jeffery’s life by inspiring him to dream beyond his surroundings, and challenge himself socially and academically.

“I want to become a Computer Engineer and continue to create innovation that improves our daily lives.”

Jeffery, SC

The only time Aubree felt confident was while she was programming – until she found 4-H. She’s using her newfound voice to encourage educators to incorporate computer science in schools.

“I am only the beginning of a long list of students. My greatest hope is that I will never be the end.”

Aubree, UT

Titus has used his skills to design his own rockets, which have each qualified in his state fair.

“I have been able to try out many different STEM projects including rocketry, robotics, electrics and computer science.”

Titus, CO

he story isn’t over

With support from Google.org

1.4 million young people inspired. 55 million to go.

It’s not just their futures that depend on a computer science education, but also ours. So, we’re asking for your help.

As a nonprofit, you can use our CS education best practices in this document to help further this collective mission. If you’re an educator, you can help by connecting us with students in your area. As a business leader, we need your support to provide ongoing and widespread access to education.

Together, let’s make sure once upon tomorrow keeps coming true.

To get involved, contact Heather Elliott, VP Development at: 301-792-1023 | helliott@4-H.org or visit our website 4-h.org/computerscience