The Roots of Inequity in K-12 CS Education

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University of Washington
Seattle

A 2nd grade class in Kent City, Michigan. *Credit: Billie Freeland*

I bring many perspectives to this conversation...

I'm drawing upon my experiences as:

- A **higher education CS teacher**
- A **high school CS teacher**
- A **CS education researcher**
- A higher education **administrator**
- A state advocate for K-12 CS education **policy**
- A co-founder of a venture-backed CS startup
- A **trans**, **biracial**, **queer** person who mentors marginalized faculty, staff, and students in CS.
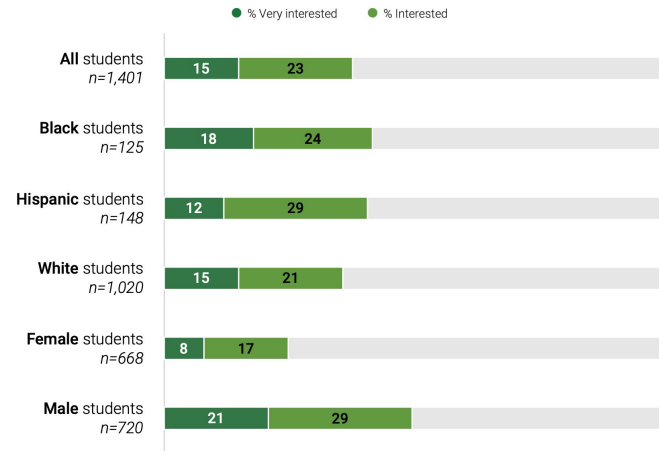
The *inequities* in K-12 CS are clear

In the U.S., inequity is a story of scarcity:

- Few classes
- Few teachers
- Little gender diversity
- Little racial diversity
- Limited professional development

What resources and attention we have generally go to non-disabled White and Asian boys, and White teachers in wealthier districts.

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How interested are you in learning computer science?

● % Very interested   ● % Interested

	% Very interested	% Interested
All students n=1,401	15	23
Black students n=125	18	24
Hispanic students n=148	12	29
White students n=1,020	15	21
Female students n=668	8	17
Male students n=720	21	29

Interest isn't equally distributed because opportunity isn't equitable. *Credit: Gallup.*

The *consequences* of K-12 CS inequities are clear

- Black, Hispanic, Native, disabled students and girls are **marginalized** and **minoritized** in CS
- Higher education CS is dominated by White and Asian boys, and White and Asian faculty
- These graduates shape the software products and services that the world relies on, creating things that reflect their heterogeneous experiences, often reinforcing and amplifying **systems of oppression**.


The University of Washington's introduction to programming course is mostly White and Asian men. *Credit: GeekWire.*

But *why* these do these inequities exist? The answer is a complicated one.

Inequity isn't just one thing.

There are many layers to inequity that interact to shape the experiences that youth have with CS.

I'd like to talk about each of these, and our role as teachers in shaping each of them.

Individual

Family

Classroom

School

Community

Policy
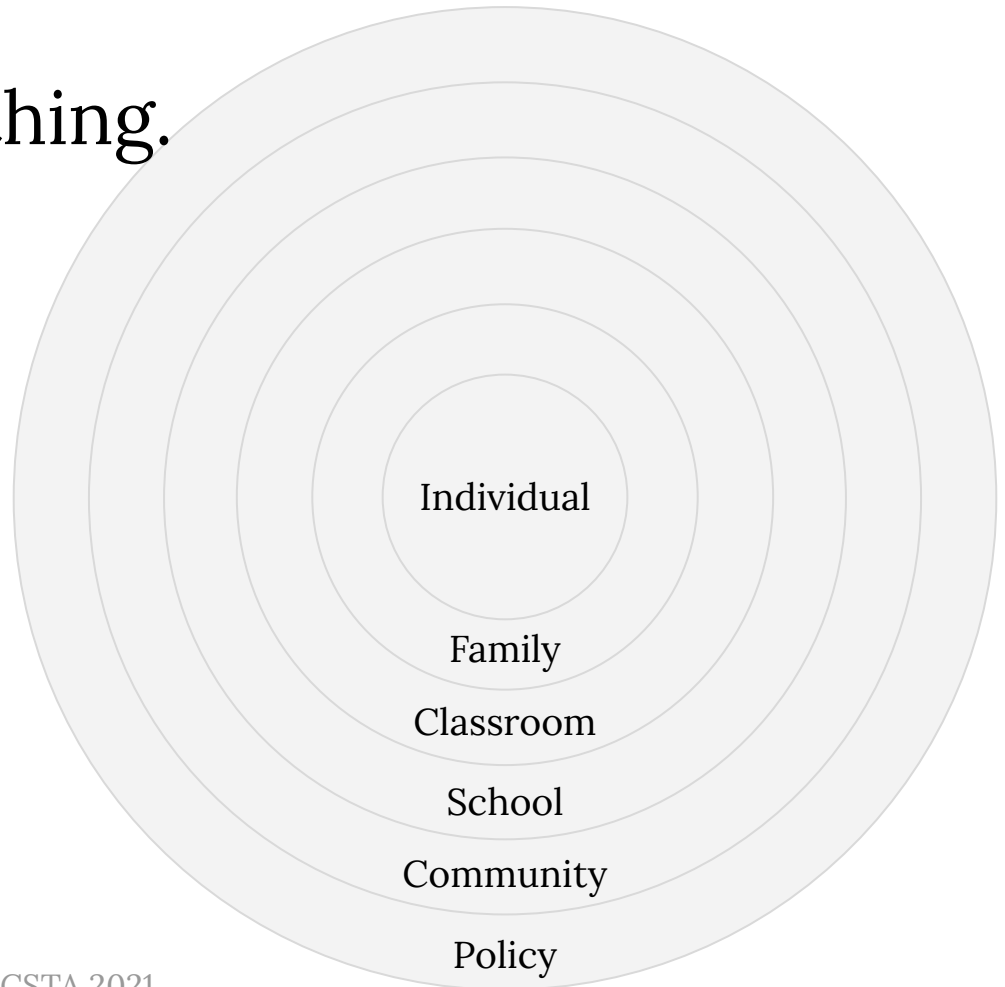
Students internalize inequity

Students have varying CS **self-efficacy**, which is their belief in their capacity to do CS, whatever they believe CS to be.

- Self-efficacy is shaped by **culture**, which offers stereotypes, norms, and expectations around gender, race, ability, and more.
- Self-efficacy is shaped by **teachers**, who can erode through their teaching and attitudes (e.g., a Hispanic teacher saying, "*I'm no good at computers*" can erode student self-efficacy).
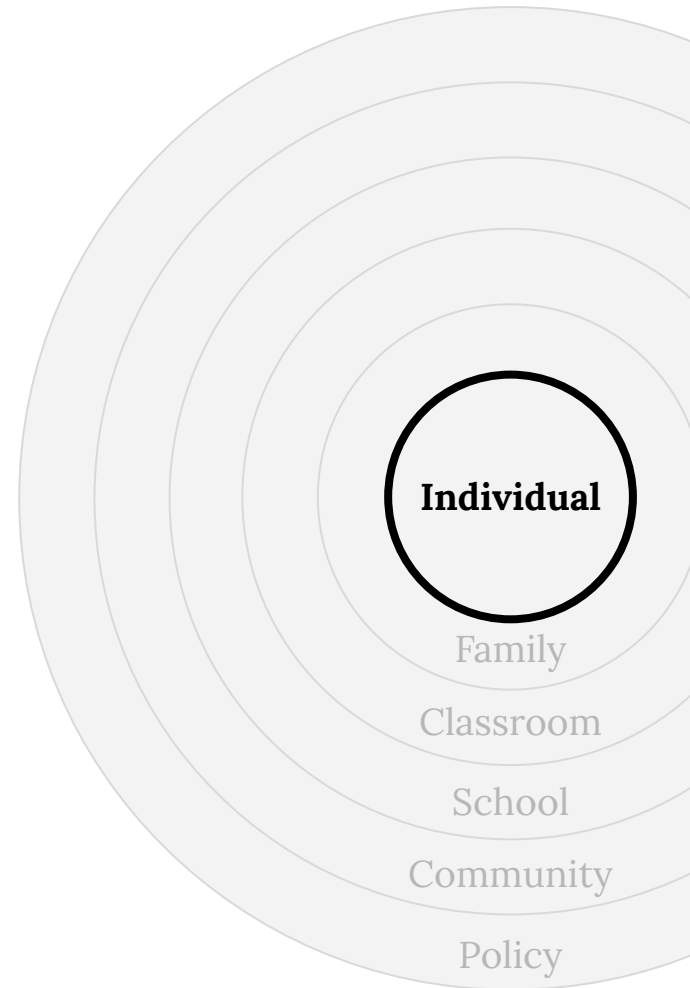
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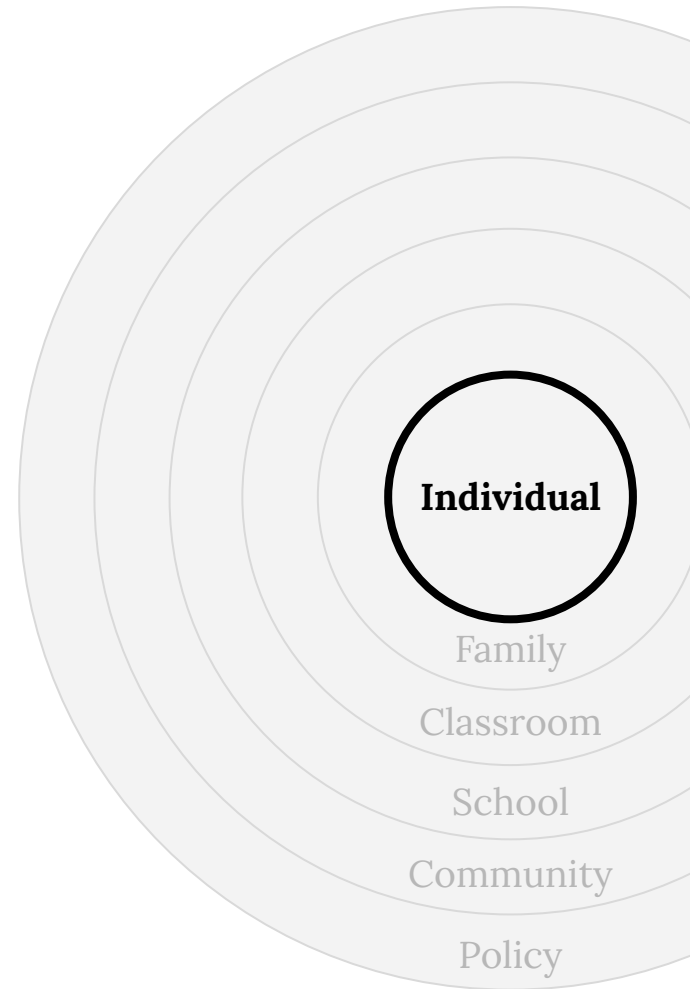
Students internalize inequity

The effects of low CS self-efficacy are numerous:

- Avoiding CS electives in school
- Avoiding CS informal learning out of school
- Disengaging in mandatory CS learning
- Self-fulfilling poor CS learning outcomes

Many students with low CS self-efficacy are girls, non-Asian students of color, and students with disabilities, because their social world tells them they aren't capable and shouldn't be interested.

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Families shape expectations, opportunities

Parents, guardians, siblings, cousins, etc. can:

- Inspire, motivate, and compel youth to study CS *or* deter them for a lifetime
- Reinforce norms about who "does" CS, creating gendered and racialized expectations about CS learning
- Set conditions on emotional and financial support tied to studying or *not* studying CS
- Offer personal computers and internet *or* not, due to limited financial resources

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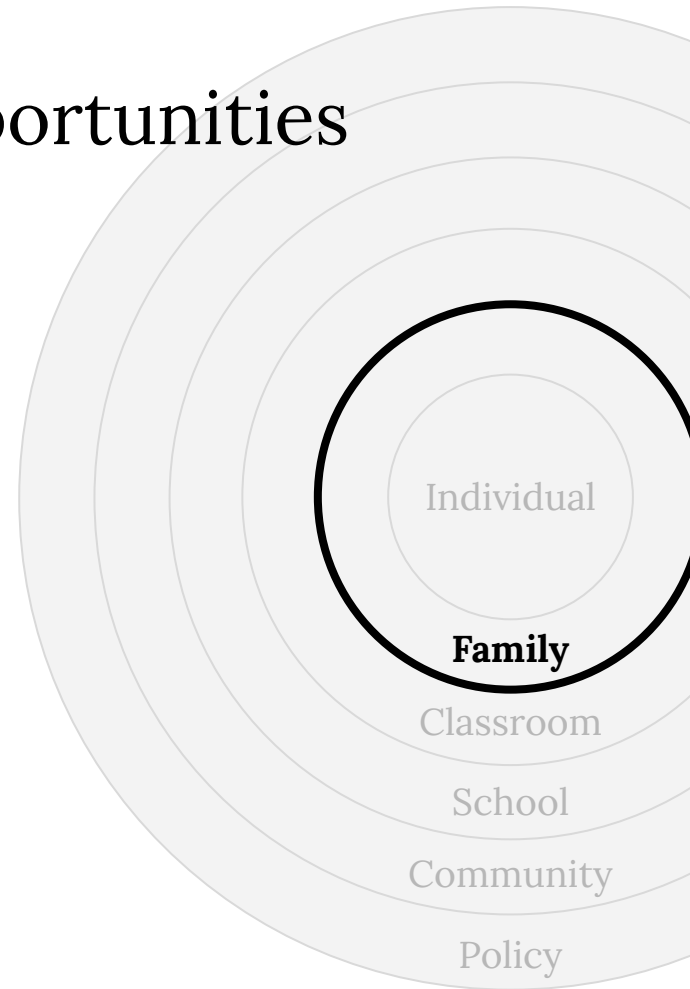
Families shape expectations, opportunities

Family norms and rules can cause:

- Classrooms, camps, and after school programs fill with White and Asian boys whose parents expect them to study and excel in CS, and pursue it in college
- Youth to choose non-CS electives that better align with their friends' and families' gendered and racialized expectations
- Youth to struggle in CS classes due to lack of home computers and internet access

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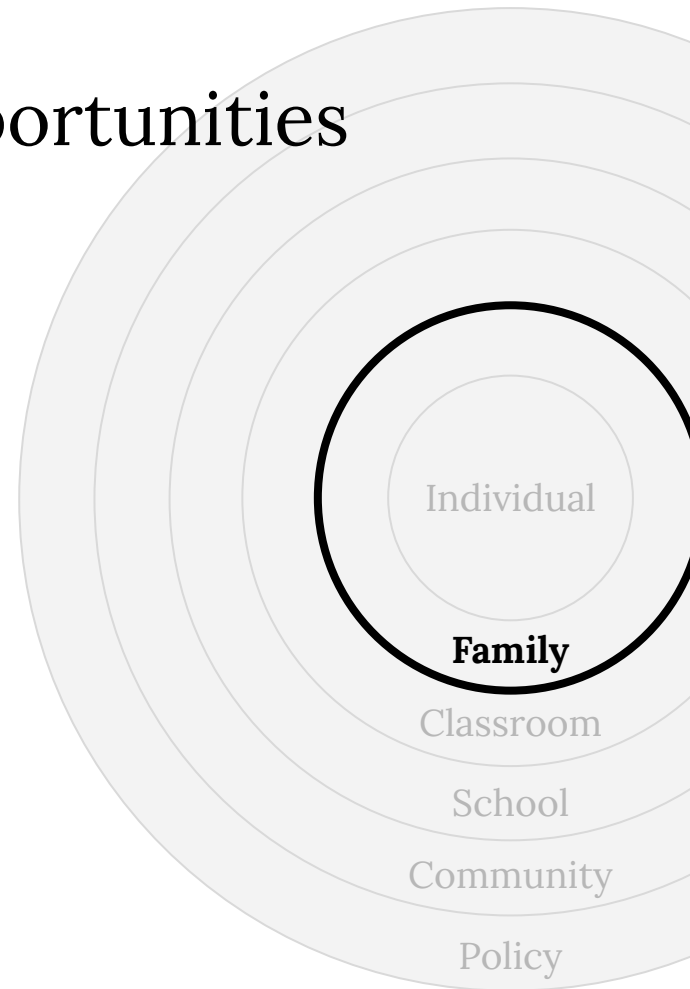
Classrooms shape identity

Those that **ignore** diversity, equity, inclusion can:

- Erode youth self-efficacy
- Reinforce exclusionary cultural ideas about who does and doesn't do CS
- Create a sense of shame and failure, permanently deterring youth from future CS learning
- Create toxic hierarchies between students, increasing self-efficacy for some at the expense of others'

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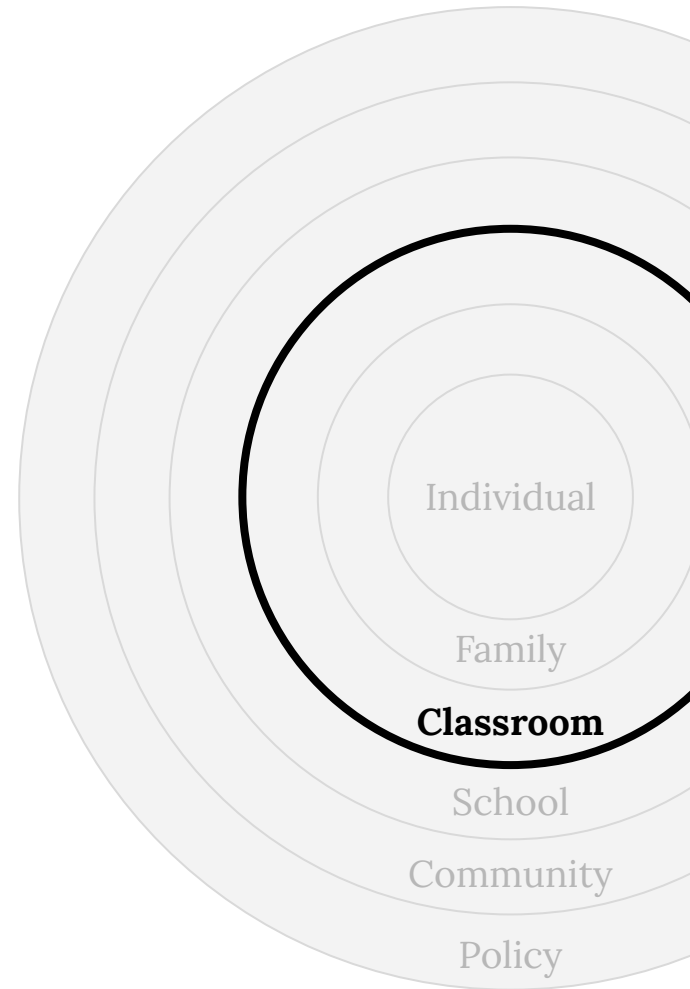
Classrooms shape identity

Those that **center** diversity, equity, inclusion can:

- Overcome family expectations by building self-efficacy and inspiring interest that inspires future learning and careers
- Create micro-cultures with different norms and expectations, creating space for youth to explore their identities in relation to CS
- Connect youth with peer communities that mutually support CS self-efficacy, interest, and identity.

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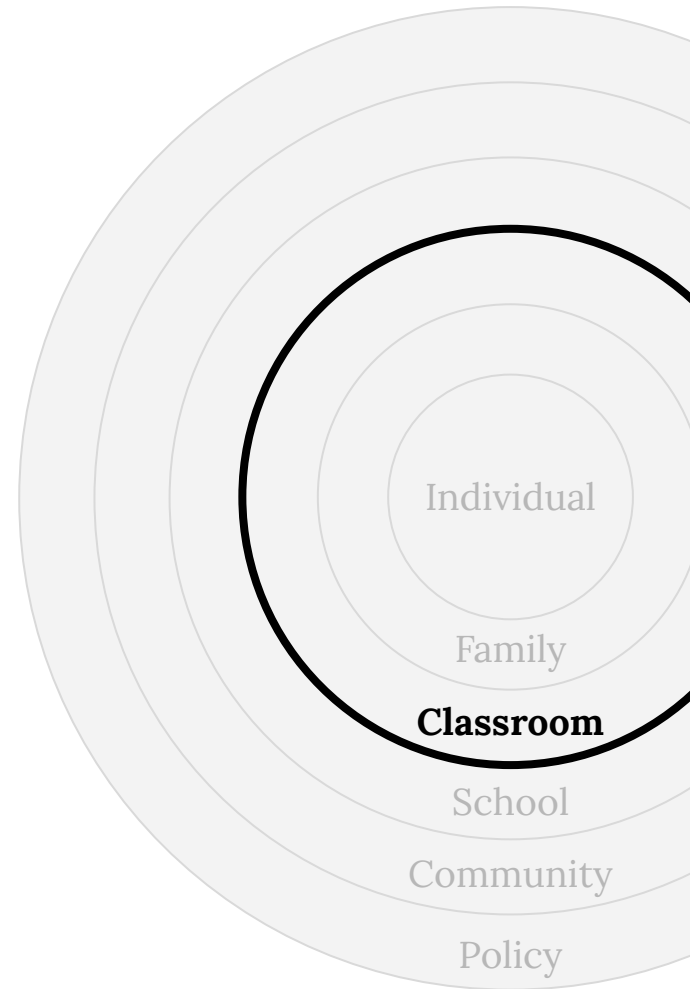
Schools shape resources

Those that **ignore** diversity, equity, inclusion can:

- Limit opportunities for CS learning
- Retain CS teachers that ignore diversity
- Allow academic advisors to use gendered, racialized stereotypes to shape who is encouraged into CS learning
- Foster sexist and racist student beliefs about who is and isn't in CS classes
- Create ableist barriers to learning CS, deterring students with disabilities.

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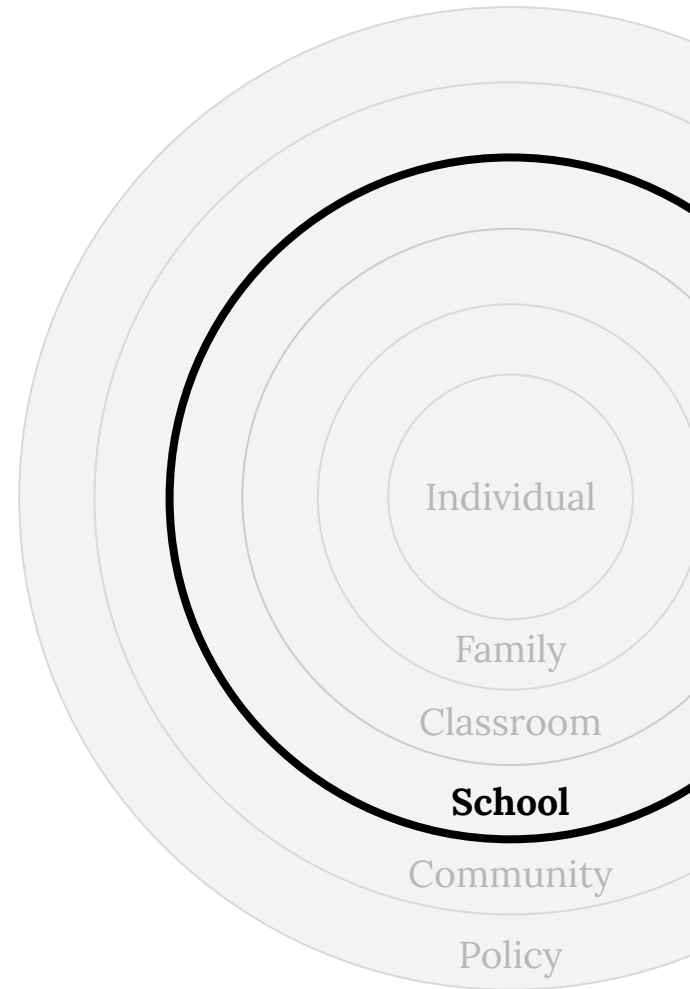
Schools shape resources

Centering diversity, equity, inclusion means:

- Creating an abundance of learning opportunities, led by inspiring, inclusive teachers who teach CS across subject areas
- Educating or dismissing CS teachers that fail to teach CS inclusively
- Training academic advisors about how to resist CS stereotypes
- Ensuring accessible CS learning for all students of all abilities

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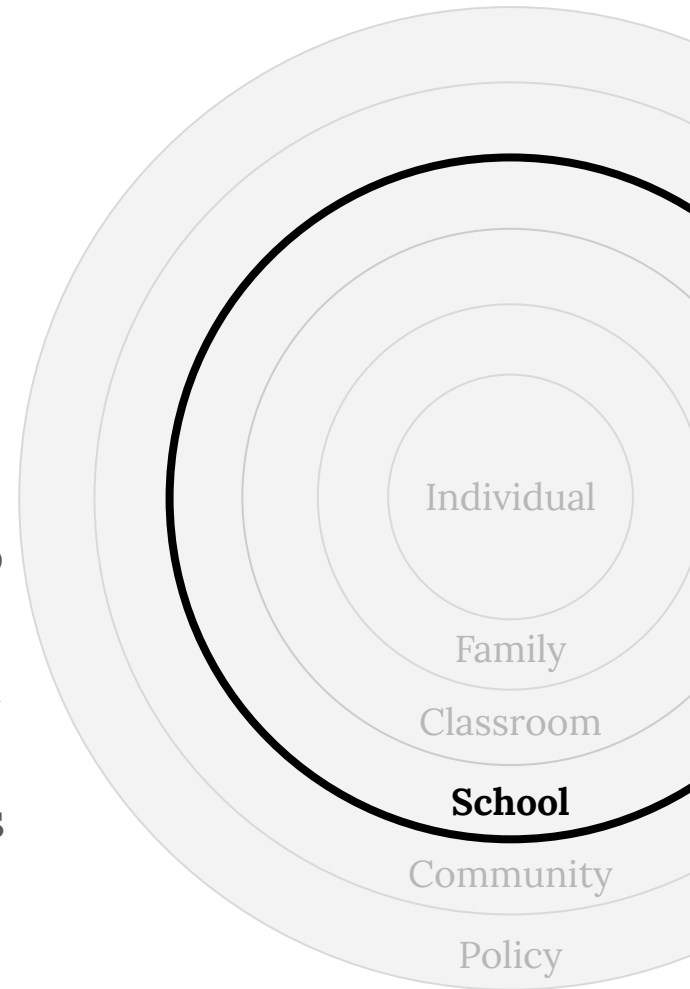
Communities shape opportunities

Those that **ignore** diversity, equity, inclusion can:

- Focus resources on youth who already have an abundance of opportunities and resources
- Disregard youth who lack encouragement and family awareness about CS
- Create structural barriers to informal learning: high fees, location, transit gaps

Industry plays a large role in shaping all of the above, as they are often the source of resources in revenue-starved states, counties, and districts.

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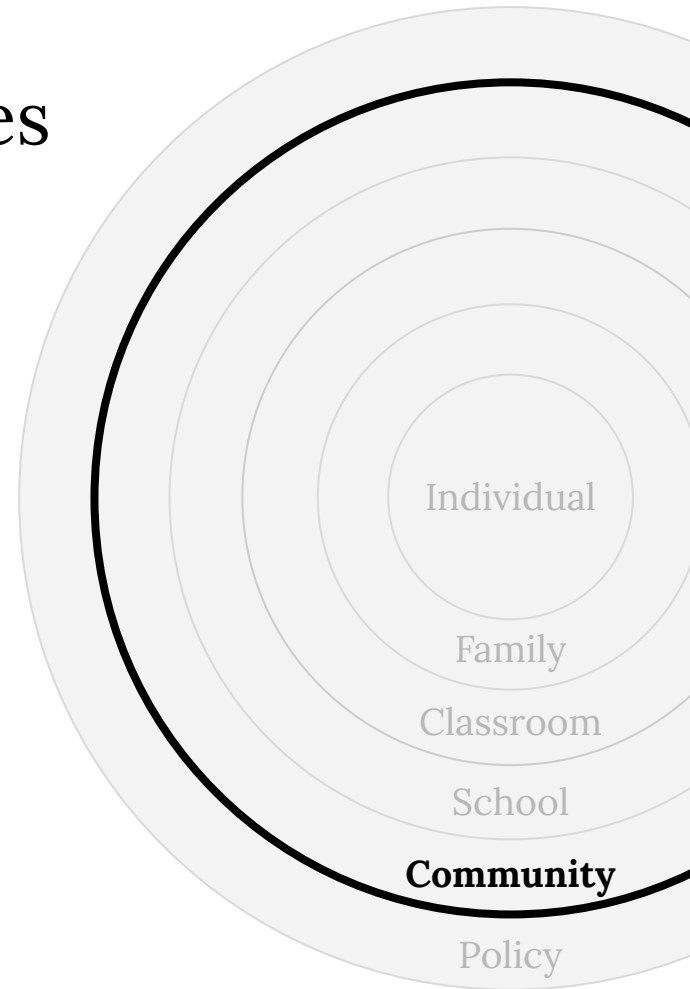
Communities shape opportunities

We **center** diversity, equity, inclusion by:

- Focusing community resources on youth and families that lack support, encouragement, and opportunities
- Actively resisting structural barriers to formal and informal learning, and investing in the removal of barriers.
- Demanding that industry centers equity in its hiring, outreach, and school support, not profit.

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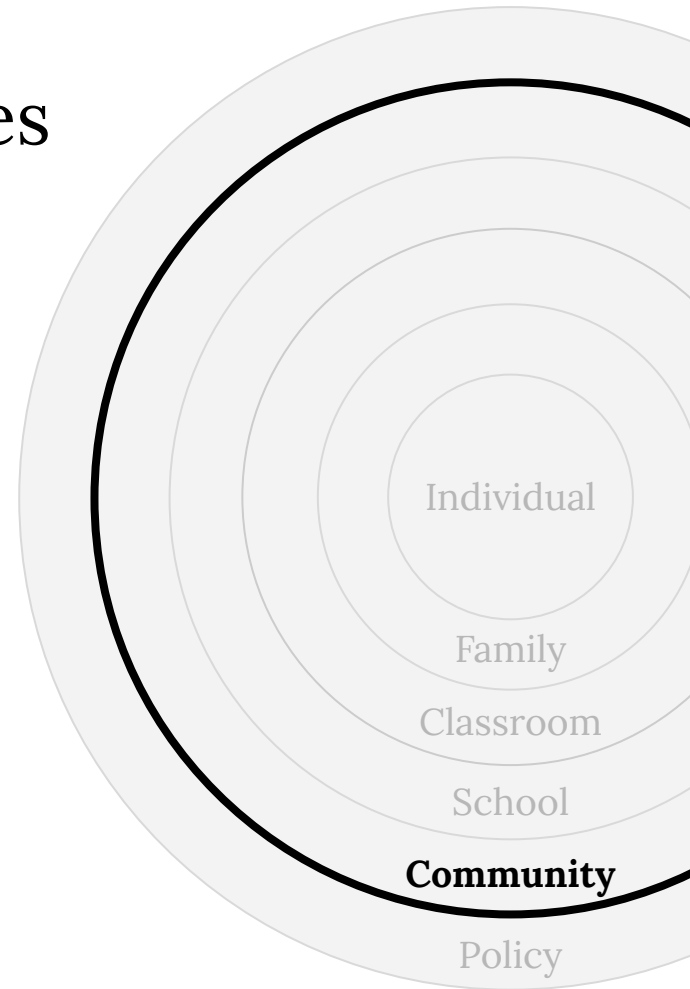
Policy

Policy shapes everything

Policies that **ignore** diversity, equity, inclusion:

- Amplify and reinforce existing resource allocations, which often ignore poverty
- Deter CS teachers with complex certification pathways that do little to develop CS pedagogical content knowledge
- Disincentivize CS learning by shaping graduation requirements
- Warp curriculum to serve industry alone rather than all aspects of society

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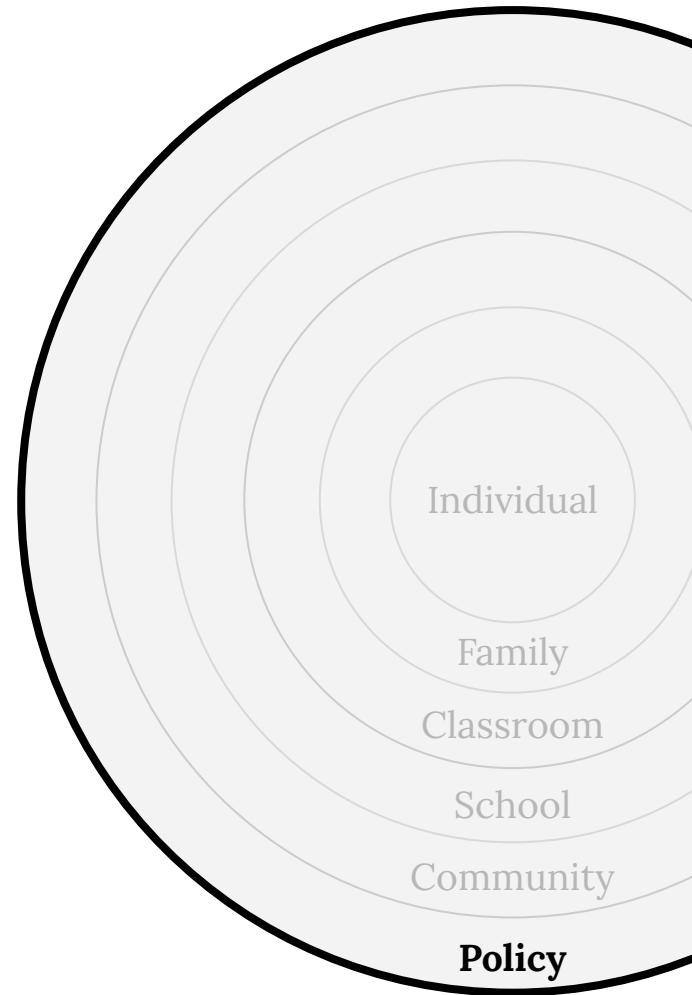
Policy

Policy shapes everything

We **center** diversity, equity, inclusion by:

- Offering resources for expanding capacity, access, participation, and engagement in CS
- Simplifying CS certification pathways and ensuring they incentivize teacher CS pedagogical content knowledge in culturally sustaining pedagogy
- Subsidizing CS teacher education pathways
- Creating new pathways to studying CS by changing graduation requirements

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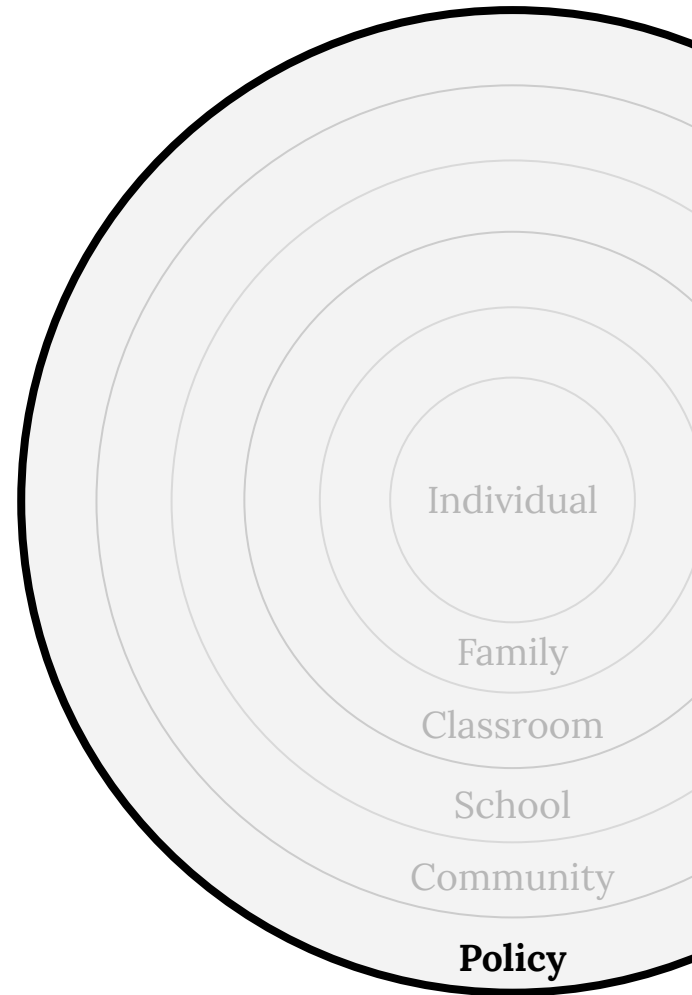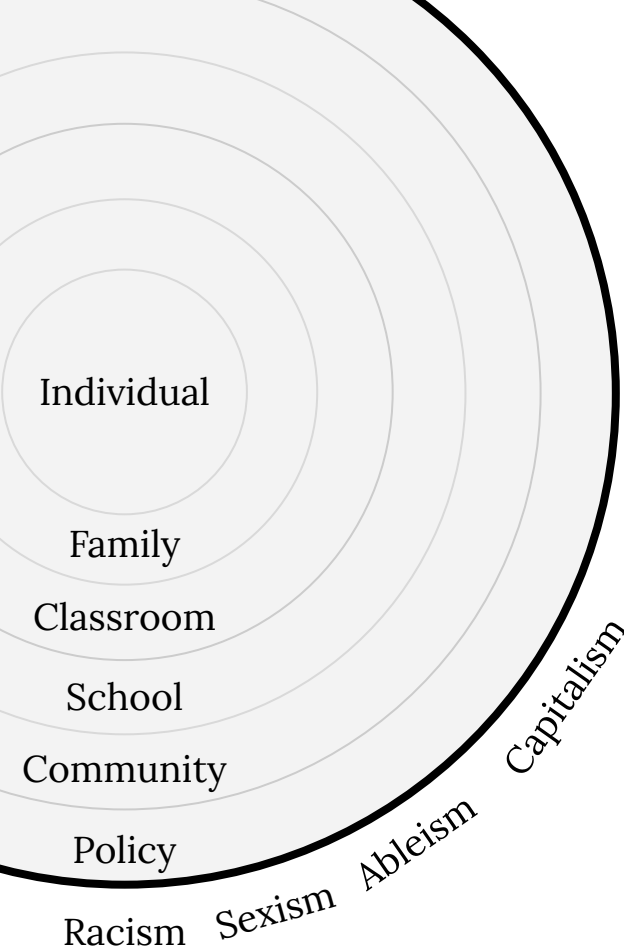
Systems of oppression

Underlying all of these choices are systems of oppression in broader society:

- **Racist** decisions about who gets resources
- **Sexist** ideas about women's abilities
- **Ableist** ideas that exclude people with disabilities
- **Capitalist** decisions that prioritize wealth, power, and industry over equity, equality, and justice.

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Racism Sexism Ableism Capitalism
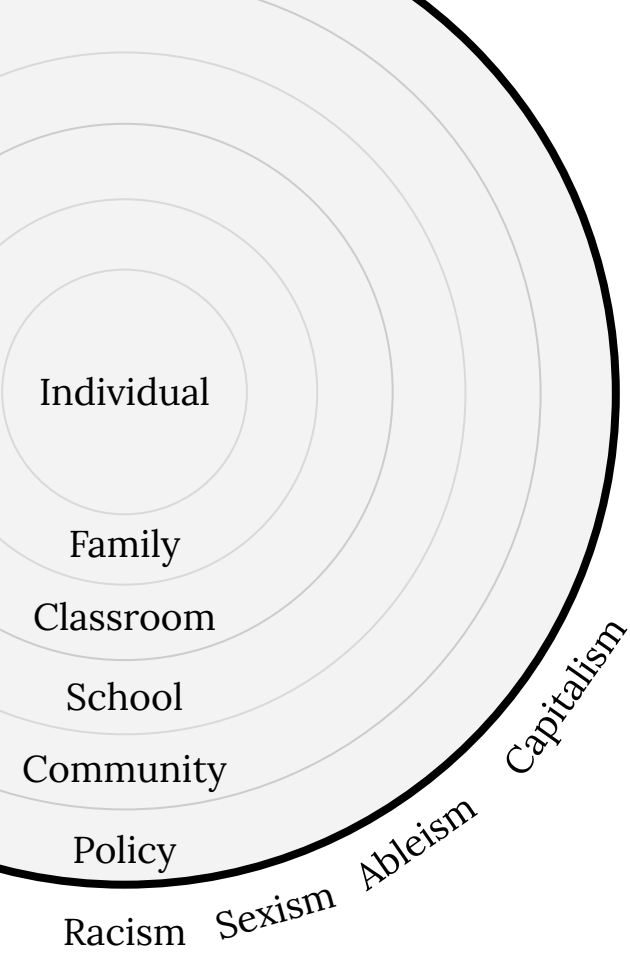
Deeply embedded roots

These are systems that have been with us for centuries, and are embedded in our broader culture and public education systems. They are not specific to CS.

However, in bringing CS to public education, we have an opportunity to disrupt these systems of oppression, creating a part of public education that thinks differently about equity. Maybe CS, being the newest part of K-12, can lead.

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Racism   Sexism   Ableism   Capitalism
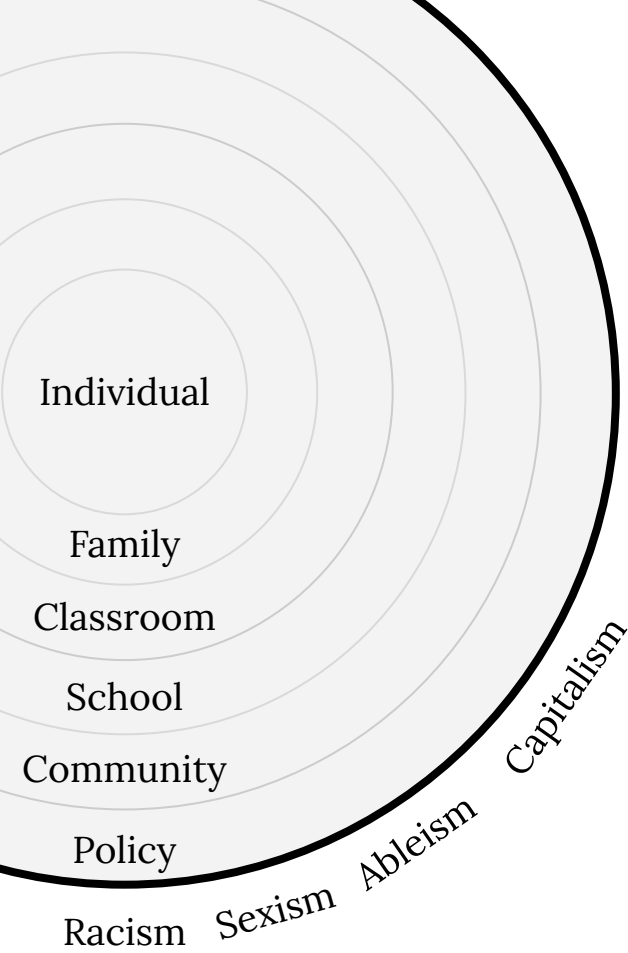
Teachers can uproot

We have the power and position to influence these many of these layers of inequity:

- We can shape individual students' **identities**
- We can influence **family** knowledge
- We can determine **classroom** culture
- We can influence decisions and practices of our school **leaders** and **academic advisors**
- We can advocate in our communities and states for equitable **policies** and **practices**

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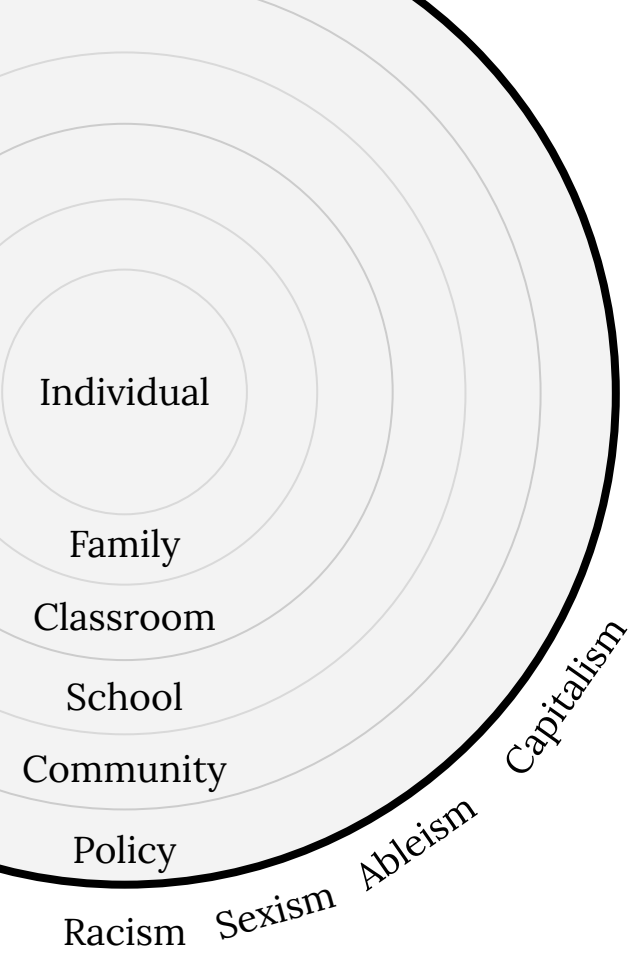
We can't do it all

Some of you might focus on the inequities in your classroom and in your students' beliefs; others might invest in policy advocacy.

We each have to figure out what role we want to have in making CS education work for every student.

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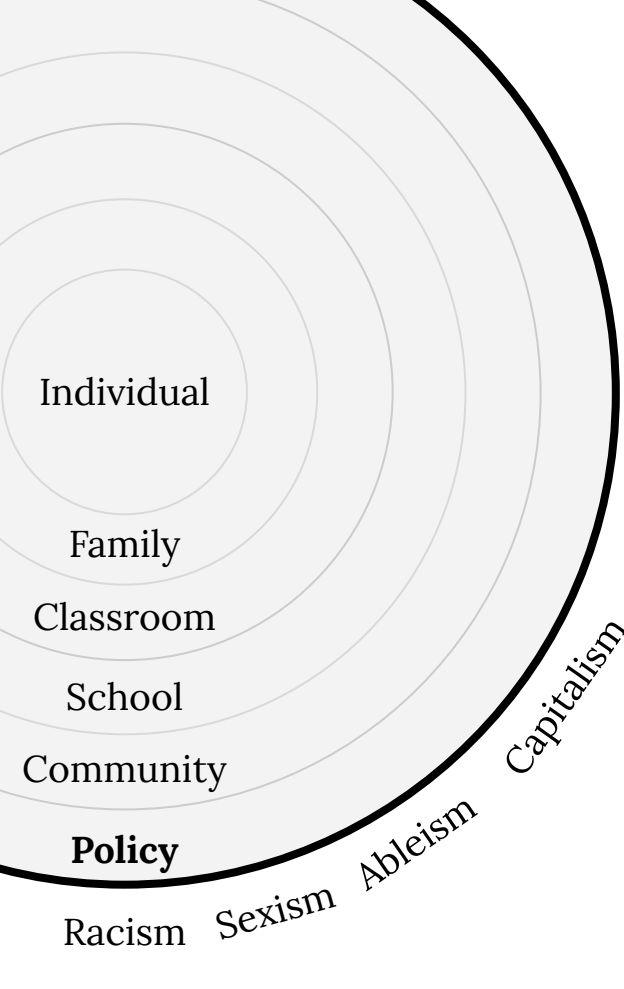
I commit to work on **policy**

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Racism Sexism Ableism Capitalism

I'm going to be that annoying advocate, constantly challenging our state senators and representatives to center equity in budgets and laws.

I do this work with an outstanding team of leaders across Washington state, each bringing knowledge of their communities to our advocacy.
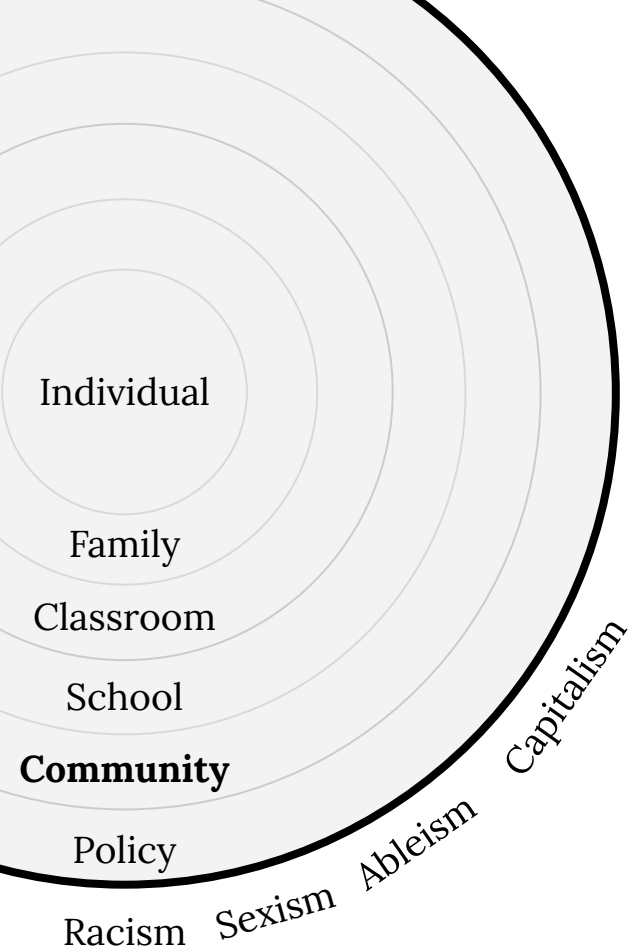
EVERY STUDENT AT EVERY K-12 LEVEL IN WASHINGTON STATE SHOULD LEARN ABOUT COMPUTING.

https://www.csforallwa.org

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I commit to work on **community**

I'm trying to bring together the CS education advocates across Puget Sound, to develop shared culture and values around what we want public CS education to be.

We have 200+ people across K-12 schools, 2-year colleges, higher education, industry, not-for-profits, and government.

Sound CS Ed   Home   People   Meetups

MEETUPS

NEXT MEETUP

- Spring 2021 — April 15th, 5-6 pm, TBD
  - Amy is thinking of creating an Ohyay space to network.

We have quarterly social gatherings to welcome new people, strengthen relationships, and find opportunities. Here's the typical agenda:
- Welcome (5 min)
  - Reminder of purpose of meeting people across contexts
  - Reminder of state, national, and international efforts in CS education
  - Reminder about this website and Slack
- Introductions (15 min)
  - Name, affiliation, and how the community can help you
- Network
  - Try to meet 5+ people outside your context
- After the meet up, gather informally for dinner if you like!

PAST MEETUPS

- **Winter 2021** — *February 24th, 5-6 pm, CSEd Connect WA Slack*

https://www.soundcsed.org
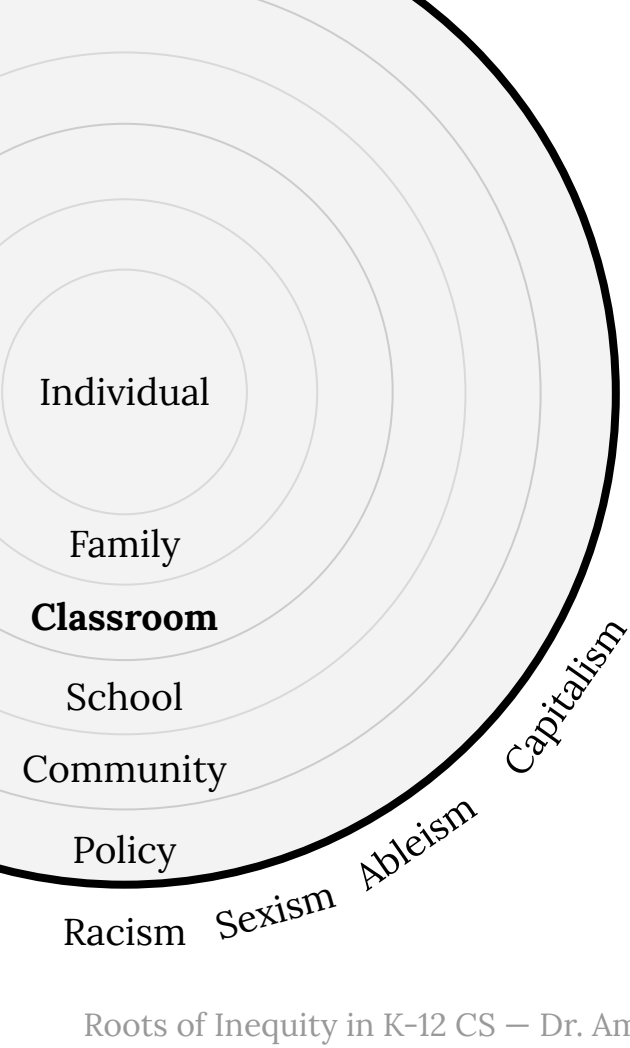
I commit to work on **pre-service**

Individual

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Racism   Sexism   Ableism   Capitalism

I'm in a unique position to help create a pre-service CS teacher education program at the University of Washington that not only centers diversity, equity, and inclusion in teaching, but also in content.

We're writing a book, launching a program, and preparing CS teachers that center justice in their teaching.

STEP CS

Interested in becoming a middle or high school CS teacher in Washington state?

We're creating a pathway for aspiring teachers to do exactly that. And it couldn't be more needed: fewer than half of middle and high schools in Washington state teach any CS, and when they do, only a fraction of students engage. Less than 1% of students in Washington state learn anything about CS. Additionally, 90% of CS teachers in Washington state are White men or women, even though only 75% of Washington youth are White. Schools desperately need teachers of color in the classroom, across the state.
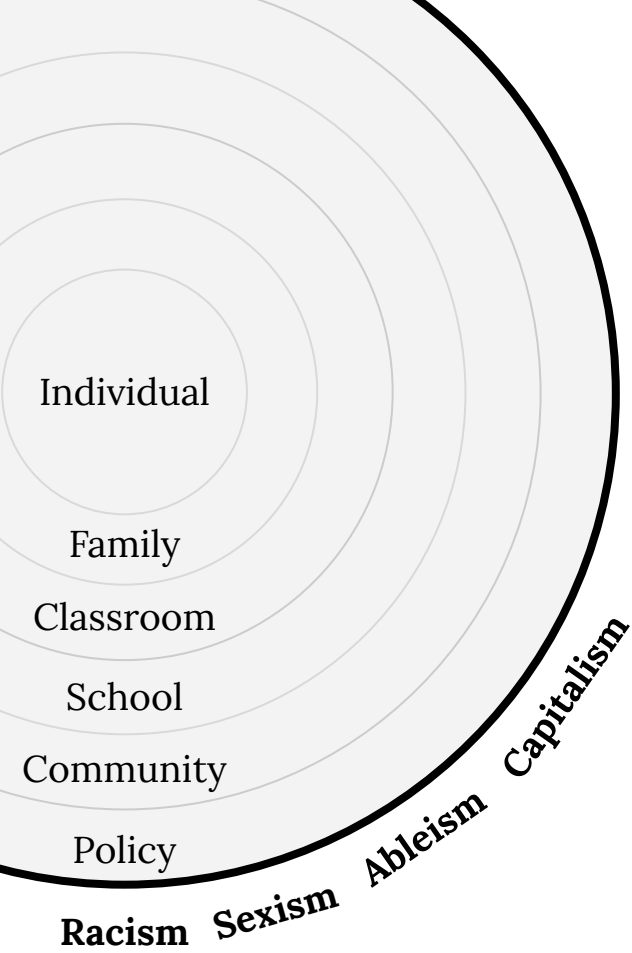
The new program is part of the University of Washington's existing top-ranked 1-year Masters in Teaching (called STEP, short for Secondary Teacher Education Program, which starts in Spring each year. We're creating a 5th quarter add-on endorsement, which means that teacher candidates enroll in the 1-year degree, earn a first endorsement in math, science, social students, language arts, or world languages, then stay for an additional quarter to earn a second endorsement in CS.

This dual-endorsement structure not only makes you a competitive candidate for teaching positions, but positions you well to teach both standalone CS courses, as well as integrate CS into other subject areas that you teach.

Don't see your question below? Write Professor Amy J. Ko and she'll answer it!

Do I have to have a CS background to enroll?

https://www.criticalcsed.org

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I commit to being anti-racist, anti-sexist, anti-ableist

Individual

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Racism *Sexism* *Ableism* *Capitalism*

These systems of oppression are often the key barriers to making progress on this work, and so systematically uprooting them is key.

I'm not explicitly anti-capitalist, but I do believe that profit really has no place in any educational reform decision. Education isn't only about jobs, is about society as a whole.

Why Black trans lives? If Black trans girls can thrive in CS in the United States, anyone can.

What will you commit to?

Thank you for your time, your advocacy, and your leadership!

Key ideas:

- Equity in K-12 CS requires changes in the **classroom**, but also **families**, **schools**, **communities**, and **policy**
- **Racism**, **sexism**, and **ableism** shape all of these inequities, and are at play at every level
- We each have to decide at **which levels** we can personally make change

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Racism Sexism Ableism