Exploring Ethics, Values, and Impacts in CS Classrooms: A Sociotechnical Approach

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Introducing A Sociotechnical Approach

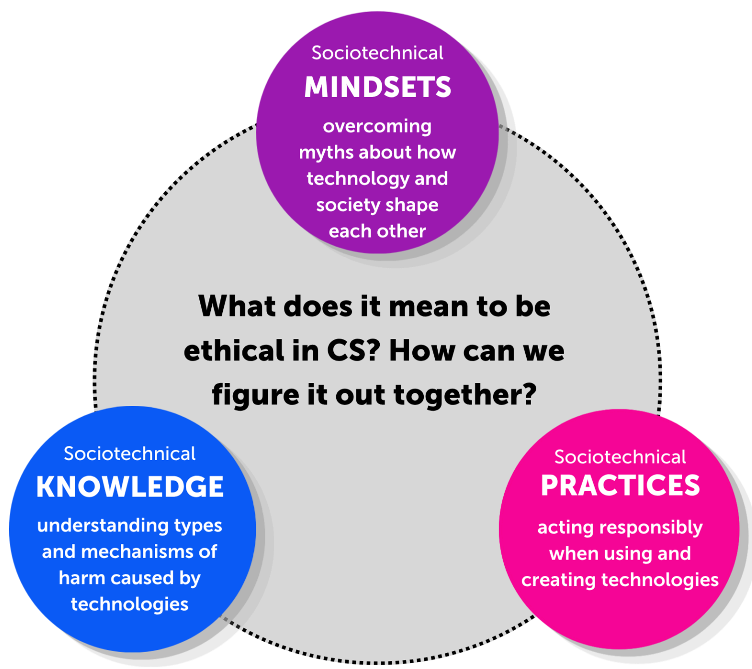
A student finds herself scrolling until all hours of the morning, struggling to put her phone down despite knowing she has a test the next day. A family applies for a small business loan online and is denied, quickly, automatically, without explanation. A community learns that a new data center will be built nearby, drawing heavily on the local water supply, with no public input. These examples are ordinary experiences of living in a world shaped by computing, and they are happening to students, families, and communities right now.

For many people, the systems behind these experiences feel invisible and inevitable, as though computing simply unfolds according to its own logic, beyond anyone's control or accountability. But that feeling is not inevitable. It is the result of how computing has been developed, deployed, and taught, including the persistent idea that technology is neutral, that it is just a tool, that its consequences are nobody's fault in particular. We call these techno-myths, and we argue that countering them is one of the most important things computer science education can do.

The 2026 CSTA PK-12 Standards adopt a *sociotechnical* vision that treats technology as inseparable from economic, political, social, and cultural issues.

We organize this sociotechnical vision into three interconnected dimensions:

1. **Sociotechnical mindsets**: Developing students' understanding that computing and culture continuously shape each other.
2. **Sociotechnical knowledge**: Developing students' knowledge of harms, the mechanisms driving those harms, and what can be done about them.
3. **Sociotechnical practices**: Developing students' ability to act through ethical and responsible design, critical inquiry, hopeful reimagining, advocacy, and responsible use.



For each of the three dimensions, we offer a brief explanation of the core ideas, real-world examples, aligned standards, and concrete classroom implementation examples across elementary, middle, and high school. Our goal is to help teachers both understand the sociotechnical vision behind the 2026 CSTA PK-12 Standards and bring it into their classrooms.

No One Right Answer: Exploring Values and Ethics in CS Classrooms

Our hope is that students who engage with this sociotechnical approach will be empowered to collectively shape our world. That they'll ask questions, debate, and imagine together what we call "the sociotechnical good," what it means for technology to reflect what's just, what's fair, and what's humane. That they'll see human judgment as central to how computing systems get designed and used. And that they'll enter adulthood prepared to participate as informed members of a democratic society, a long-standing goal of public education.

What this means for computer science teachers is that our work goes beyond loops and variables. It moves into the thornier space where the technological meets the social, political, environmental, and economic. And one of the hardest parts of teaching in that space is resisting the urge to take a "should" stance by telling students that the world should look a particular way, or that a given technology should or shouldn't exist. Our role is not to tell students how things should be or what counts as "ethical." Rather, it's to equip them to work through those questions themselves, in community with others, and as the world continues to change.

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Two things make this work especially hard. Determining what's ethical is deeply contextual, shaped by circumstance, history, and the specifics of a given situation. It's also always a question of values. Different values can lead to different answers about what is right to do. There is no single right answer to how computing should look in society, only competing answers, all open to critique and revision as conditions change and new problems emerge.

Recognizing competing answers is not the same as treating them all as equally valid. Our responsibility in the classroom is to help students recognize the moments where technology and ethics intersect, to examine the values at play—their own, others', and those built into the computing technologies around them—and to develop their own thinking about what the sociotechnical good looks like. Students won't always end up where we are, or where others are. What matters is that they can work through those differences together, constructively, and keep adapting as the world keeps changing.

Sociotechnical Mindsets

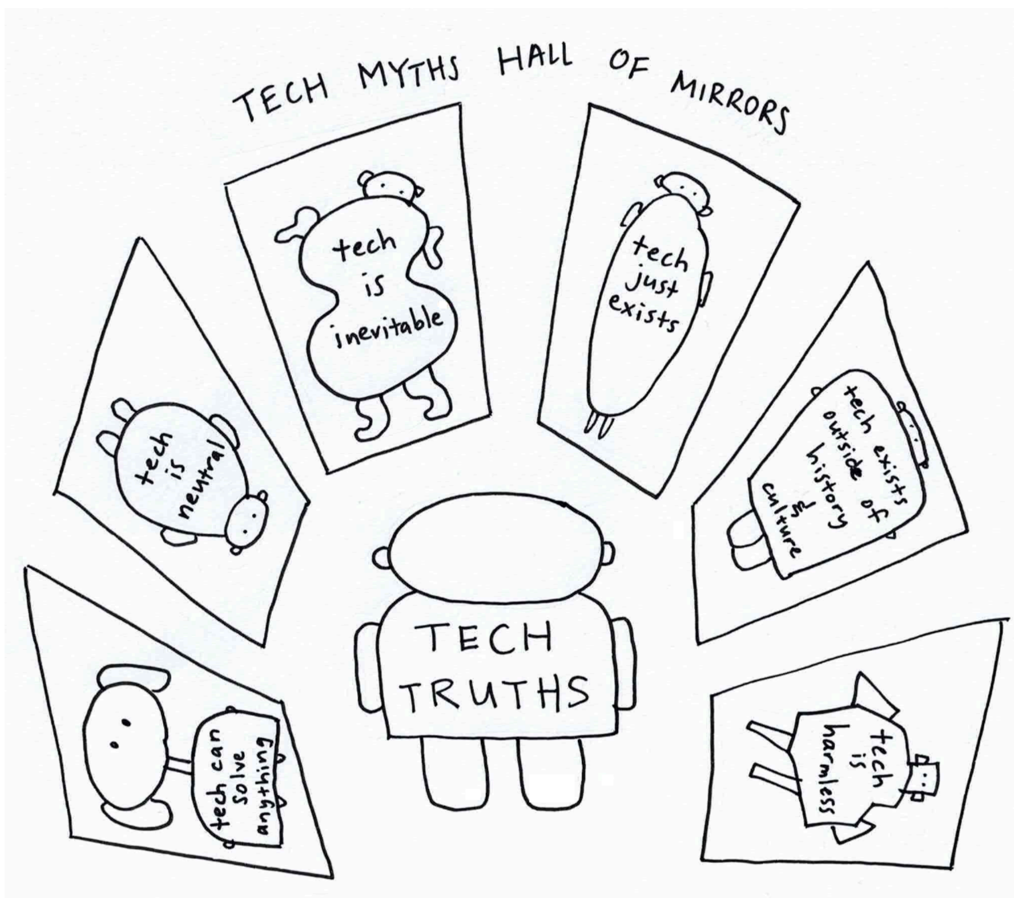
How computing technologies are shaped by and shape our social world

Students often enter computer science classes carrying widely held cultural narratives about technology: that it is just a tool, that it is neutral, that it simply exists, somehow outside the social and political world rather than part of it. A sociotechnical approach challenges these assumptions. **Every computing system is the result of diverse and often competing human decisions, such as what problem to solve, which data to use, what to prioritize, and what to ignore. Social, cultural, economic, and political institutions shape what gets built, and the resulting technologies feed back into and reshape those same forces.** As a result, technologies do not affect everyone in the same way. Some groups benefit more, some are excluded, and some face consequences that were neither intended nor anticipated.

Sociotechnical mindsets help students see technology in context, as intertwined with society. This means recognizing the multi-directional relationships between people, technologies, institutions, and the natural world, where each affects the others in ways that resist simple cause-and-effect explanations.

Countering Techno-Myths in the Classroom

Sociotechnical mindsets act as a key foundation in computer science classrooms that take questions of ethics, responsibility, and critical analysis of computing's impacts seriously. Understanding computing as intertwined with humanity, rather than separate from it, positions students to counter **techno-myths**—widely held assumptions that portray computing as fixed, neutral, and beyond human control.



Common assumptions to watch for and address are summarized in the following table.

Techno-Myth	Sociotechnical Mindset
Technology is neutral	Every technology is shaped by the values, priorities, and assumptions of its makers, and those values get negotiated, contested, and reshaped as the technology moves through different communities and contexts.
Technology just exists	Computing systems are designed by particular people with particular resources and goals. Those who have the funding, the expertise, and the platform to build technology shape what gets built and what does not.
Technology is harmless	Technologies are not inherently good or safe. They can cause harm through both unintended consequences and deliberate design and implementation choices that serve some people at the expense of others.
Technology can solve anything	Technology can address certain kinds of problems well, but not all problems should be addressed with technological innovations. Treating social challenges like inequality or lack of access as engineering problems can lead to solutions that miss the root cause entirely.
Technology is inevitable	Outcomes are shaped by ongoing decisions about how technologies are designed, deployed, and regulated. Communities, policymakers, and users all play a role in determining how a technology develops and what effects it has.
Technology exists outside of history and culture	Computing systems are often treated as brand new, but they are socially produced, built on top of existing economic arrangements, cultural norms, and political decisions that shape what gets built, who funds it, and who it serves.

These techno-myths are reinforced when students explain a biased result by saying "the computer just did what it was told," or respond to an emerging technology with "there's nothing we can do about it." When students can see computing as something humans make and shape, they are positioned to think critically about it and not just passively use it.

Examples of CSTA Standards in Action

Techno-myth: Technology is neutral **Grade(s):** High School

HS-ALG-IM-11: Articulate the values embedded in the design of an algorithmic system.

Implementation example (computer-based): Students use a digital mapping tool to compare Fastest Route, Avoid Tolls, and Eco-Friendly options. They articulate how the Fastest Route algorithm embeds the value of efficiency, and the Eco-Friendly algorithm embeds the value of environmental sustainability. Students then write a short Value Statement for a hypothetical Scenic Route algorithm, explaining the human values that it would prioritize (e.g., beauty, local business support) over saving time.

Techno-myth: Technology just exists **Grade(s):** Elementary (PK/K)

EK-SOC-HU-15: Explain that people design and develop computing technologies.

Implementation example (Unplugged): Students participate in a whole-class discussion and a large sorting activity on a wall or chart. The teacher provides a collection of picture cards. Some cards show computing technologies (e.g., tablet, app, video game) and some show natural objects (e.g., rock, flower, cloud). The teacher also displays photos of diverse people (different ages, genders, backgrounds) labeled "Creators." Students describe which pictures in the first set were "Made by People" versus "Not Made by People." When students identify a technology, the teacher places it under the "Creators" photos. Students then describe that a person (not magic) designed the app or built the computer, demonstrating their understanding that people are the creators. Some of the creator cards include a technology creator from history along with the technology they created. After the sorting activity, the teacher shares some specific details about one of the creators and why they created their technology.

Techno-myth: Technology is harmless **Grade(s):** Middle School

MS-SOC-HI-39: Analyze intended and unintended impacts of a historical computing technology on society and the environment.

Implementation example (Unplugged): Students in small groups are given an example technology from history and use a large poster to visually map out the technology's intended societal impacts alongside any unintended social and environmental impacts that it had.

Techno-myth: Technology can solve anything **Grade(s):** Middle School

MS-SOC-ET-40: Evaluate when it is appropriate to use AI and other emerging technologies to solve a problem based on their capabilities, limitations, and environmental impacts.

Implementation example (Unplugged): Students work in small groups to analyze a set of problem scenarios (e.g., monitoring crop health, improving classroom security, creating immersive historical tours, prioritizing job applications). For each scenario, students evaluate whether an emerging technology (e.g., AI, robotics, virtual reality) is appropriate by considering its current capabilities, limitations, infrastructure needs, and potential environmental impacts. Groups document their decision and reasoning, noting why a technology is suitable, unsuitable, or unnecessary for the task. To demonstrate understanding, students present a brief justification explaining their choice and identifying at least one constraint that influenced their evaluation.

Techno-myth: Technology is inevitable **Grade(s):** High School

HS-SOC-HU-43: Evaluate how human choices in using, designing, deploying, and regulating computing technologies have risks, benefits, and long-term impacts.

Implementation example (Computer-based): Students research the engagement-based design of a popular app. They evaluate how the human choice to prioritize "Time Spent on App" (design) led to the long-term impact of increased polarization or mental health issues. They then propose a regulatory choice (e.g., require an independent risk assessment before deployment, limit personalization and targeted advertising for minors) that could have led to a different benefit-risk outcome and consider the steps necessary to implement their regulation.

Techno-myth: Technology exists outside of history and culture **Grade(s):** Elementary (Grade 2)

E2-SOC-HI-14: Analyze the ways that people from different cultures, backgrounds, and time periods have designed computing technologies to help them solve problems and express ideas.

Implementation example (Unplugged): Students explore how people in different times and places have used technologies to communicate and express ideas. The teacher shares picture cards or short read-aloud examples of communication tools, such as handwritten letters, telephones, email, text messages, video calls, translation apps, or messaging apps. Students discuss who might have used each technology, what problem it helped solve, and why it may have been important in that time or community. In small groups, students sort the examples into a simple timeline or “near and far communication” chart and explain how each technology helped people connect, share information, or express themselves. As an extension, students interview a family or community member about a communication technology that person used when they were younger and compare it with one students use today.

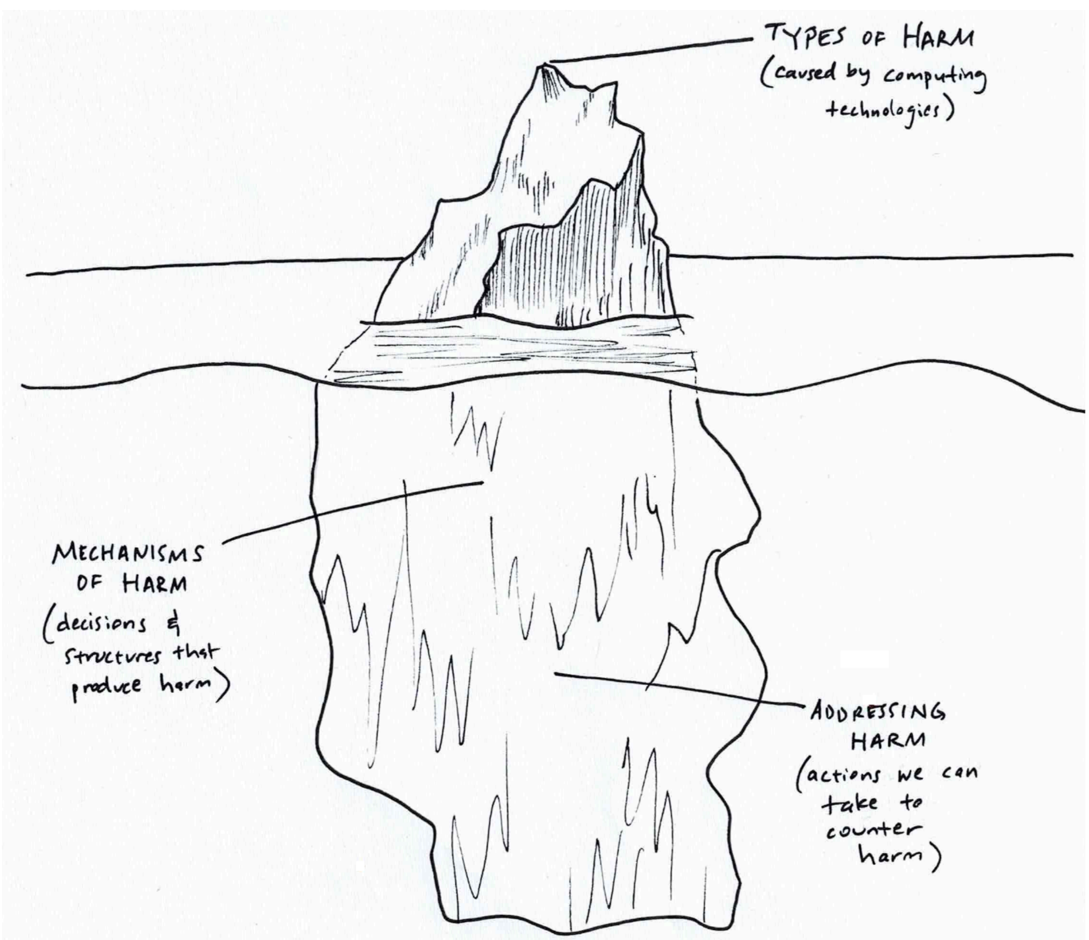
Sociotechnical Knowledge

How computing technologies cause harm and what can be done about it

Discussions of computing's impacts often fall into binary terms (e.g., privacy is important, bias is bad). Many students believe negative impacts are inevitable side effects or isolated bad decisions by individual actors. However, both views are too narrow, and they leave students feeling like there's nothing to be done. **We believe students should develop a more analytical understanding of how those impacts come about and what can actually be done about them.**

Sociotechnical knowledge gives students a foundation for nuanced thinking about the ethics and impacts of computing. It covers three areas:

- **Types of harm:** The kinds of harm computing technologies can have on people, communities, and the broader world
- **Mechanisms of harm:** How computing technologies and the social structures around them produce those harms
- **Addressing harm:** The technical, social, legal, and political means that can prevent, remedy, or resist sociotechnical harms



What Kinds of Sociotechnical Harms Exist?

Computing's harms are often discussed as a single category, like privacy violations, biased algorithms, or whatever issue is currently in the headlines. A sociotechnical lens reveals a wider and more varied landscape, where harms are possible at every stage of a technology's existence: in the materials and labor used to produce it, in the design decisions made about it, in how it is deployed, in how it is disposed of, and in the long-term effects it produces in the world. Naming the different kinds of harm gives students a vocabulary for moving beyond vague discomfort toward specific analysis.

Type of Harm	Definition	Examples
Discrimination	Technologies treat people unequally based on aspects of identity such as race, gender, language, and ability	Hiring algorithms screening out applicants based on names associated with race or ethnicity; Software designed without accessibility features
Loss of privacy	Software collects and shares information about people in ways they don't choose	Social media platforms tracking location; Abusive partners installing spyware on their partner's phone
Loss of autonomy	Computing systems shape user behaviors in ways that are counter to their values	Apps using nudges and other manipulative designs in order to collect data, sell products, or keep users scrolling
Health harms	Technology development or use damages mental or physical health	Social media algorithms amplifying content linked to teen anxiety; Automated claims systems unfairly
Political harms	Technologies distort the information that democratic participation depends on	AI-generated content misrepresenting political issues, candidates' positions, and the integrity of elections
Cultural harms	Technologies erode cultural practices and variation	Recommendation algorithms reducing the visibility of less-common languages and cultural practices online
Educational harms	Technologies negatively impact learning environments and educational opportunities	Educational technologies limiting teacher agency or reducing rigor; Use of generative AI damaging teachers' trust in student work
Economic harms	Technologies shift economic power or opportunity in damaging ways	Automation displacing workers without transition support; Generative AI training on artists' work without compensation
Environmental harms	Resources used to build, run, and dispose of technologies degrade the environment	Data centers negatively impacting fresh water supplies; E-waste leading to contamination of local ecosystems

How Do Computing Technologies and the Social Structures Around Them Cause Those Harms?

Harms rarely arise from technology alone; they are produced through specific mechanisms. These include training datasets that carry historical inequities forward, surveillance infrastructure that enables targeting and manipulation, and automated decision-making systems applied to high-stakes judgments without adequate oversight.

For example, as Joy Buolamwini documents in *Unmasking AI*, facial recognition systems have been shown to perform accurately for users who fit a narrow default, typically white, male, and able-bodied, while misidentifying or failing entirely for users who fall outside it, a disparity that traces directly back to which faces were used to train them. In each case, human decisions about what to measure, what to build, and what to tolerate are embedded in the technology and amplified by it.

What Technical, Social, Legal, or Political Means Can Prevent or Address Sociotechnical Harms?

Once students understand how harms come about, they can start thinking about how to mitigate them. One approach, often called responsible design or ethical design, involves building particular values into technologies from the start (see call-out box). However, mitigation is not only a technical problem. While design choices such as auditing datasets for bias, building in transparency, and applying fairness constraints to automated systems can reduce certain harms, they cannot address all of them. **Many sociotechnical harms are produced by structural conditions that design alone cannot fix.**

Design Values as a Technical Approach to Addressing Harms

Design values are the principles that guide how people responsibly build and deploy computing technologies. Common design values include:

- **Trustworthiness & Safety:** Technologies that function reliably and do not cause harm to users or the environment.
- **Transparency & Explainability:** Technologies whose creators are open about how they work, and whose decisions and outcomes can be explained.
- **Fairness & Justice:** Technologies that treat users equitably, reduce bias and discrimination, and actively counter unjust conditions.
- **Accessibility & Inclusivity:** Technologies that work for a wide range of users, including people with disabilities and people from diverse cultural, social, and linguistic backgrounds.
- **Accountability:** Technologies designed so that the people and institutions producing them can be held responsible for their impacts.
- **Sustainability:** Technologies designed to minimize environmental and ecological harm.

Addressing them requires social, legal, and political action as well, such as labor organizing, municipal campaigns against facial recognition, data privacy legislation, and community advocacy around algorithmic accountability. Mitigation operates at multiple scales—individual, institutional, and collective—with the most consequential responses often happening beyond the level of any single designer or user. This counters the tendency to place the full burden of preventing harm on individuals and points students toward the broader systems of corporate, governmental, and civic accountability that shape how technologies are built and deployed.

When students can trace a harm back to specific decisions and structures, they stop seeing computing's consequences as natural or inevitable and start seeing them as things that could have been, and still could be, otherwise. Most students will not become software engineers, but all of them will live inside systems shaped by decisions about computing. Understanding how those decisions produce harm and what can be done about it is a form of civic literacy that CS education is uniquely positioned to build.

Examples of CSTA Standards in Action

Types of Harm	**Grade(s):** Elementary (Grade 2)
E2-SYS-IM-13: Describe the benefits and harms that arise from an individual's use of computing systems and digital tools.	
Implementation example (Unplugged): Students work individually or in pairs to review a set of short scenarios about using technology (e.g., "You video chat with your cousin." "You play a game for a long time and feel tired."). Using either physical cards with smiley and frowny faces or a digital drag-and-drop activity, students categorize each scenario as a benefit or a harm. They then explain to a partner or record a short sentence describing why it affects their feelings or well-being. Students demonstrate understanding by correctly identifying benefits and harms and explaining the personal impact of each scenario.	

Types of Harm	**Grade(s):** High School
HS-DAT-IM-27: Evaluate the societal, environmental, and ethical implications of large-scale data collection and processing, including within AI applications.	
Implementation example (Unplugged): Students hold a mock town hall meeting regarding the construction of a new hyper-scale data center in their community. Different students represent different interests: a local farmer concerned about water use (environmental harm), a tech or trade worker focused on job opportunities (economic benefit), a privacy advocate concerned about the data being stored (loss of privacy), and a community member concerned about rising energy costs (economic harm). Students must evaluate the proposal and suggest modifications, surfacing the reality that large-scale computing infrastructure distributes its costs and benefits unevenly across a community.	

Mechanisms of Harm **Grade(s):** Elementary (Grade 4)

E4-ALG-ML-02: Analyze relationships between the properties of training data and a machine learning model's output.

Implementation example (Computer-based): Students work in pairs using a visual machine learning platform to train a model that classifies two types of objects (e.g., apples and oranges). They begin with an imbalanced dataset (20 apple images, five orange images) and test how accurately the model classifies new, unlabeled images. Students then add more orange images to balance the dataset, retrain the model, and observe how its accuracy and fairness improve. Students demonstrate understanding by presenting before-and-after results, explaining how balancing the dataset affected the model's performance and why diverse data improves reliability and mitigates bias.

Mechanisms of Harm **Grade(s):** Middle School

MS-DAT-IM-29: Analyze how decisions made at different stages of working with data can lead to biased data, misleading conclusions, and compromised AI models.

Implementation example (Computer-based): Students examine two graphs created from the same dataset, one with a consistent scale and one with a manipulated scale that exaggerates differences. They analyze how presentation choices influence interpretation and discuss how misleading visualizations could affect decision-making.

Addressing Harm **Grade(s):** Middle School

MS-ALG-IM-11: Modify an algorithm to address a specific societal impact, ethical issue, or bias.

Implementation example (Unplugged): Students work in pairs with printed flowcharts of a familiar recommendation algorithm (e.g., a playlist generator that predominantly suggests popular artists). Partners identify a specific bias such as lack of genre diversity and sketch a modification to the flowchart (e.g., inserting a step to include at least one underrepresented genre or language). Each pair then presents their revised flowchart and explains what the bias is, why the bias is an issue, and how the proposed change could reduce bias and improve recommendations.

Addressing Harm **Grade(s):** High School

HS-SOC-HI-39: Propose modifications to an existing policy or piece of legislation that encourages ethical innovation and minimizes societal risks associated with technology.

Implementation example (Unplugged): Students read a summary of a company's policy that allows AI to screen job resumes and review data that shows AI is biased against people from certain ZIP codes. Students propose a modification to the policy (e.g., "An annual bias audit by an independent third party is required.") and explain how this minimizes the societal risk of discrimination.

Sociotechnical Practices

How students can act ethically, critically, and responsibly in relation to computing

Understanding how technologies are shaped by human decisions, and how those decisions can produce harm, positions students to do something with that understanding. But knowledge alone does not produce agency. **Sociotechnical practices integrate knowledge and action; students are simultaneously informed observers and active participants in shaping computing's impacts.**

Sociotechnical practices matter beyond those who build computing technologies. Most students will not enter the technology sector, where they could shape products from the inside. But all of them will be members of the broader public, where laws, norms, and collective action determine technology's place in society. They will also navigate daily decisions about how, when, and whether to use computing technologies in their own lives. Sociotechnical practices prepare students for both: shaping the world around them, and shaping their own relationship to computing within it.

Building on Morales-Navarro and Kafai's (2023) framework for critical computing education, five sociotechnical practices give students concrete ways to engage:

Practice	What it looks like	Examples
Ethical and responsible design	Bringing ethical questions into every stage of technology design: before, during, and after development.	Anticipating who might be harmed by a tool before building it, examining whose needs are centered in the design process, and creating plans to track impacts after deployment.
Critical inquiry	Asking structured questions about the values, assumptions, and impacts embedded in computing systems.	Auditing an algorithm for bias, examining a dataset for what it leaves out, or analyzing a case of "computing gone wrong" to trace its root causes.
Hopeful reimagining	Imagining computing futures grounded in equity and justice, informed by what we know about the past and present.	Redesigning a familiar platform around different values, or imagining what a community-owned alternative to a commercial technology might look like.
Advocacy, resistance, and refusal	Engaging in individual and collective action to challenge harmful technologies and push for more just alternatives.	Debating school policies on AI in classrooms, weighing in on local proposals for facial recognition, or organizing around platform accountability.
Responsible use	Using technology carefully and reflectively, with awareness of personal and social consequences.	Thinking through what to share on social media, deciding when to repair a device rather than replace it, or weighing the tradeoffs of using generative AI for schoolwork.

These practices overlap and reinforce each other: critical inquiry feeds reimagining, reimagining sharpens advocacy, and all of them inform responsible use. Together, they move ethical computing education from passive learning to active participation in shaping our sociotechnical world.

Examples of CSTA Standards in Action

Ethical and responsible design **Grade(s):** Elementary (Grade 5)

E5-ALG-IM-03: Articulate how human-centered design principles are incorporated into the development of a computing technology.

Implementation example (Teacher choice): In groups, students brainstorm ideas for a "Homework Helper" app on paper or digitally. Each group presents their idea to the class, clearly explaining how they would use human-centered design practices when designing their app. For example, they might understand and involve diverse users in design decisions by 1) interviewing students who find a subject difficult, as well as those who like particular subjects the most and 2) gather input throughout the development process to identify key features that need to be added.

Ethical and responsible design **Grade(s):** Middle School

MS-PRO-TR-20: Refine a computing technology based on user feedback to improve its usability and accessibility.

Implementation example (Teacher choice): Students conduct a quick usability test of a prototype for a simple app (e.g., a homework tracker, GPS app that monitors school bus locations) by running classmates through two short tasks while using a think-aloud script. Testers note barriers related to readability and access (e.g., tiny text, low contrast, unclear labels, no keyboard-only path) on sticky notes and a one-page checklist. Designers revise their prototype to address the top feedback items and annotate the changes directly on the mockup. Groups then demo before and after task flows and explain how revisions improved usability and accessibility for more users.

Critical inquiry **Grade(s):** Elementary (Grade 5)

E5-DAT-IM-11: Analyze the benefits and risks of a computing technology that uses collected data.

Implementation example (Unplugged): Working in small groups, students analyze printed scenario cards describing how everyday technologies (e.g., voice assistants, recommendation systems, school apps) use collected data. Using a T-chart, each group sorts examples of data use into benefits (e.g., personalization, convenience) and risks (e.g., privacy concerns, bias, errors). Groups share their charts and explain how the technology's use of data could help or harm individuals or groups. Students demonstrate understanding by justifying one benefit and one risk using evidence from the scenario.

Critical inquiry **Grade(s):** Middle School

MS-ALG-IM-09: Evaluate which human-centered design principles are present or missing in an existing computing technology.

Implementation example (Unplugged): Students analyze an existing self-service kiosk system (e.g., pizza-ordering kiosk, grocery store checkout). Students consider the question "who does this system work well for, and who bears the cost when it doesn't?" They evaluate how well the system supports those impacted by it (e.g., customers, workers), identifying human-centered design principles that are present or missing. Students then propose specific improvements for different user groups, keeping in mind that improvements based on one user group's perspective may make another group's situation worse.

Hopeful reimagining **Grade(s):** Elementary (Grade 3)

E1-SOC-CE-16: Describe how computing is used by people at home, at school, and in the community.

Implementation example (Teacher choice): Students discuss examples of computers they use at home, at school, and in the community, including those embedded in smartwatches, cars, or appliances. In small groups, they discuss things they like and don't like about the ways that computers show up in their lives in these different spaces. Each group shares one idea for a change that they'd want to make to the ways that computers are present in their lives, and why they think it could be beneficial.

Hopeful reimagining **Grade(s):** High School

HS-ALG-IM-09: Design a computing technology using human-centered design principles.

Implementation example (Teacher choice): Students look at the big picture of how technology and computing shows up in their school (e.g., grading systems, lunch ordering, attendance apps). After interviewing or surveying students, families, teachers, or staff about their experience with these systems, students choose one to redesign based on a justice-oriented design goal. They then create a prototype that centers different values. For example, students might redesign a grade portal so it supports reflection and help-seeking rather than only ranking performance, or redesign a lunch ordering system so it better supports dietary needs, language access, and family input. Students test their prototype with users, revise it based on feedback, and explain how their design reflects a different vision for how people and technology could work together in school.

Advocacy, resistance, and refusal **Grade(s):** High School

HS-DAT-IM-28: Debate the efficacy of a policy or regulation to ensure responsible data use.

Implementation example (Computer-based): Students use a site like Terms of Service; Didn't Read (tosdr.org) to compare the data policies of two major apps. They then debate whether the current "self-regulation" of these companies is enough to protect teens or if a government-mandated age verification law would be more efficacious, discussing the privacy trade-offs of such a law.

Advocacy, resistance, and refusal	**Grade(s):** Elementary (Grade 5)

E5-SOC-HU-18: Evaluate when it is appropriate to use or not use computing technologies to solve a problem.

Implementation example (Unplugged): Students work in small groups to evaluate several teacher-provided problem scenarios (e.g., counting the votes for class president, picking out clothes for school, writing a letter to a sad friend). For each scenario, the group must decide and justify whether a computing technology (e.g., word processor, generative AI chatbot) would be appropriate and helpful. They might decide that counting votes is appropriate for a computer because it offers speed and accuracy, but that comforting a friend is not because the computer has no empathy or emotion. They present their findings in a class discussion, demonstrating their evaluative judgment.

Responsible use	**Grade(s):** Elementary (Grade 3)

E3-SYS-SE-13: Evaluate how sharing information online might reveal personally identifiable information and other details.

Implementation example (Unplugged): Students work in small groups to analyze printed scenario cards describing common online situations, such as creating a gamer tag or sharing a practice schedule in a chat. Groups sort information cards (e.g., name, city, school mascot, favorite book, team name) into "safe to share" and "reveals PII" categories for each scenario. Students record their decisions on chart paper and explain how seemingly harmless details could combine to reveal personal information. Students demonstrate understanding through their group explanations and completed charts.

Responsible use	**Grade(s):** High School

HS-PRO-PD-14: Apply appropriate attribution of intellectual property when developing a computing technology.

Implementation example (Unplugged): Students are given Artist Cards and Asset Cards (drawings). They are asked to create a collage (artifact) using other students' assets. For every asset they use, they must fill out an Attribution Tag that includes the artist's name and what they changed. If an asset is marked "No Derivatives," the student must use it exactly as is or choose a different one, demonstrating respect for intellectual property constraints.

Conclusion

Standards for the World Students Already Live In

Most computer science education today focuses on the technical aspects: how to read and write code, how to build systems, and how to solve problems with computation. These aspects of computing matter, and the 2026 CSTA PK-12 Standards keep them central. However, the standards also expand them through a sociotechnical approach organized around three dimensions: mindsets, knowledge, and practices. This expansion matters because computing power is not evenly distributed across society. What technologies get built, whose values and interests those technologies serve, and who bears their costs and impacts all depend on political, economic, and cultural power. A purely technical CS education leaves students unprepared for that reality. **A sociotechnical approach prepares them to answer the pragmatic questions they will face in their personal, public, and professional lives:**

- How do I understand and analyze the computational systems shaping the world I already live in?
- How are the values of technology creators different from my own, and from those of the people I care about?
- Who benefits, and who bears the costs, when AI automation comes into my workplace?

There is a long history of individuals and communities figuring out how to intentionally shape, and be shaped by technology. The Scandinavian participatory design tradition gave workers a voice in shopfloor technology decisions. The open-source movement built collaborative methods of innovation outside the corporate model. Today, local communities across the United States are coming together to shape the future of data centers in their towns, cities, and states. These examples show that the way computing develops is not inevitable. People have shaped it before and can shape it again, and teachers and students can find many more examples in their own communities.

These examples make something visible that techno-myths obscure: a practical basis for hope that the world can change for the better. CS education that includes this work opens futures for students that are more than careers in the tech industry. Together, we can prepare students as computationally empowered community members who not only understand computing's impacts on their lives and others, but actively shape and contribute to the systems that define them. That is what the 2026 CSTA PK-12 Standards make possible, and what this resource is designed to support.

> **Together, we can prepare students as computationally empowered community members who not only understand computing's impacts on their lives and others, but actively shape and contribute to the systems that define them.**

References

Computer Science Teachers Association. (2026). *2026 CSTA PK–12 computer science standards.* https://csteachers.org/pk12standards/

Morales-Navarro, L., & Kafai, Y. B. (2023). Conceptualizing approaches to critical computing education: Inquiry, design, and reimagination. In M. Apiola, S. López-Pernas, & M. Saqr (Eds.), *Past, present and future of computing education research* (pp. 521–538). Springer. https://doi.org/10.1007/978-3-031-25336-2_21

Santo, R., Ryoo, J. J., Phelps, D., Starks, B., & Lachney, M. (2026). A Sociotechnical Vision for Ethical, Responsible, and Critical PK-12 Computing Education. *ACM Inroads, 17*(1), 18–26. https://doi.org/10.1145/3793910

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