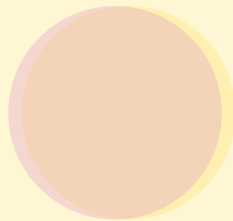




# Quantitative Civic Reasoning

A Guide for Centering Civic Innovation in  
Math and English Language Arts Classrooms

Emma Gargroetzi, Antero Garcia, Suzie Boss, Janelle Bence,  
Samantha Diego, Kia Turner, Gina Wei, Ethan Weker, Xi "CiCi" Yu



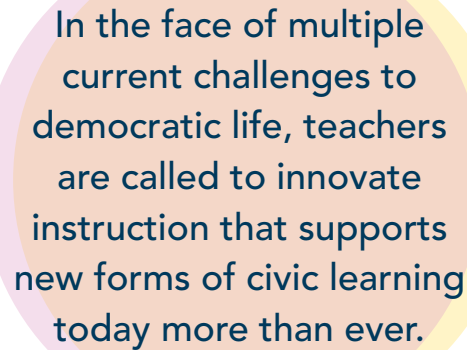
REIMAGINING CIVIC LITERACIES PROJECT

<https://rclp.sites.stanford.edu>

# Table of Contents

Executive Summary . . . . .	3
Rationale . . . . .	4
What Is Quantitative Civic Reasoning? . . . . .	6
About the Research . . . . .	7
The Benefits . . . . .	7
Six Core Components of Classroom Civic Learning Activity . . . . .	8
Choice . . . . .	9
Research . . . . .	10
Classroom Discourse . . . . .	11
Extension & Connection. . . . .	12
Authentic Audience . . . . .	13
Learning from Youth. . . . .	14
Possibilities for Quantitative Civic Reasoning Across the Curriculum . . . . .	15
Math Opportunities around QCR. . . . .	16
English Opportunities around QCR. . . . .	16
Collaboration across Disciplines. . . . .	16
Toward New Definitions of Civics across Subject Areas: The Role of Teachers . . . . .	17
Work on the Self. . . . .	18
Classroom Community Building. . . . .	19
Instructional Planning & Facilitation. . . . .	20
Relationship Building beyond the Classroom . . . . .	22
Conclusion: Envisioning Vibrant Civic Imagination for All Students and Teachers. . .	23
References. . . . .	24
Authors . . . . .	25
Acknowledgments. . . . .	27


# Executive Summary



In the face of multiple current challenges to democratic life, teachers are called to innovate instruction that supports new forms of civic learning today more than ever.

This guide explores quantitative civic reasoning in English and math classrooms. In the face of multiple current challenges to democratic life, teachers are called to innovate instruction that supports new forms of civic learning today more than ever. Quantitative civic reasoning speaks to the possibilities for building complex civic ideas and discourse through quantitative practices. With impetus from research on a national youth civic writing project and the instructional practices that supported it, we share this guide with the knowledge that supporting youth civic engagement has been transformative for many teachers, as it has been for us. Six core components of classroom civic instruction are discussed, offering multiple entry points to help teachers consider what is feasible with students right now: choice, research, classroom discourse, authentic audience, extension and connection, and learning from youth. We frame possibilities for quantitative civic reasoning across the curriculum, with attention to how diverse disciplinary strengths can support work within each discipline as well as through cross-disciplinary collaboration. Finally, we provide examples from our own civic work across domains: work on the self, building classroom community, planning and facilitating instruction, and building connections beyond the classroom. We hope you will join us in the challenging but exciting work of cultivating vibrant civic imaginations amongst teachers and youth across the nation.

# Rationale



Every classroom is a civics classroom.

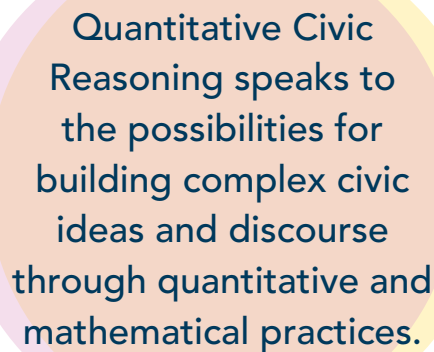
Supporting young people on their journeys to meaningfully participate and lead in a world beyond our classrooms is perhaps one of the greatest responsibilities that every teacher undertakes. And while civic lessons are typically seen as primarily the responsibility of social studies teachers, the possibilities for undertaking complex and creative civic learning in every subject area are too great to simply disregard. We share this guide in an attempt to help secondary English and math teachers integrate key instructional ideas for ensuring their classrooms support youth civic development. Particularly considering the unique intersection of math and English classes, we offer research-backed approaches to supporting quantitative civic reasoning (QCR) in both subjects' classrooms. As we describe below, quantitative civic reasoning refers to engagement in complex civic ideas and discourse through quantitative reasoning and mathematical practices. The ubiquity of data and quantification as a means of understanding contemporary phenomena is inescapable. From unpacking localized contexts of pandemic-related statistics to glancing at the scope and reach of a popular social media influencer, this guide illuminates what teachers across content areas (especially English and math) already do to support students in quantitative civic reasoning and discourse and provides ideas for what teachers can do.

This impetus for taking seriously the civic learning responsibilities in math and English classrooms could not come at a more urgent moment. Recent US elections and survey data (Pew, 2017) point to the deeply polarized nature of partisanship and limits of trust and dialogue amongst adults today. Likewise, the January 6th (2021) insurgency and false claims of a stolen election illuminate the fragile nature of a current, wounded democracy. These are complex moments that are testing our nation's ability to weather disinformation, and the role of schools in this effort is profound. In particular, how information may be manipulated and circulated in online contexts requires new forms of civic and media literacy instruction that are stretching the expectations of where and how schools support youth digital learning.

The National Council for the Social Studies's College, Career, and Civic Life (C3) Framework (National Council for the Social Studies, 2013) and the National Writing Project's Civically Engaged Writing Analysis Continuum (Friedrich & Strother, 2020) both illustrate recent ways that educators may be striving to support the complicated needs for preparing youth for contemporary civic life. At the same time, fortunately, these needs are not simply falling limply on the backs of teachers. New educational initiatives reflect renewed attention to educating for democracy (Educating for American Democracy, 2021), with a new focus on civic reasoning and discourse (Lee, 2021). These are challenging times, and we have rising interest and a collective need to pedagogically rise to meet them.

As a collective of classroom teachers and researchers balanced evenly between English and math, we spent the spring of 2021 engaged in collective inquiry about possibilities for supporting quantitative civic reasoning in diverse classroom settings. This guide is our attempt to begin a sustained conversation with teachers across subject areas.

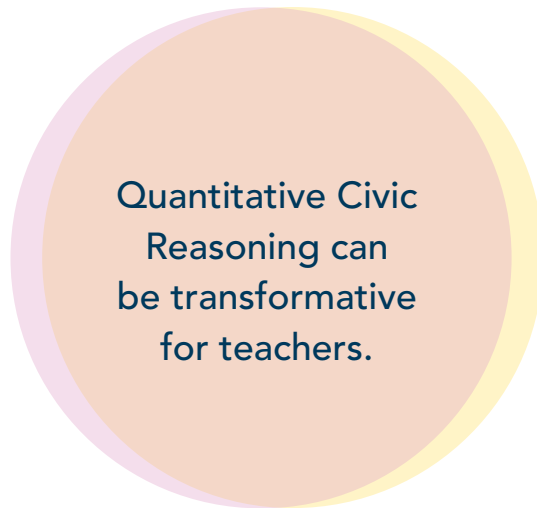
# What Is Quantitative Civic Reasoning?



Quantitative Civic Reasoning speaks to the possibilities for building complex civic ideas and discourse through quantitative and mathematical practices.

This approach invites the principles from math and English subject areas to build on existing expertise for meaningful and actionable learning experiences in classrooms and beyond. This approach includes the intersection of three key areas of focus:

- **Civic reasoning and discourse** refers to inquiry and conversation in response to the question, “What should we do?” (Stitzlein, 2021). This question is meant to remind us that civic activity is inherently agentic, collaborative, and embedded within a community. Civic education then “involves the process by which young people gain knowledge, skills, and identities that they use to understand and participate in forms of community life” (Mirra & Garcia, 2017).
- **Quantitative reasoning** refers to reasoning with numbers (e.g., about magnitude or quantity), reasoning around relationships and change (e.g., relations of proportion and ratio, or functional relationships and time), and reasoning with uncertainty (e.g., statistics and probability) (de Lange, 2006). Quantitative literacy refers to the application of these multiple forms of quantitative reasoning to the lived world, to solve real-life problems (Steen, 1997).
- **Mathematical practices** and processes focus on problem solving, making connections, and communication through quantification, pattern recognition, and modeling supported by diverse tools and representations (National Council of Teachers of Mathematics, 2000; National Governors Association Center for Best Practices, 2010).



## About the Research

The impetus for this guide began with a series of research studies of youth civic writing and the teaching practices that supported it. Studying the National Writing Project and KQED’s 2016 *Letters to the Next President* project and their 2020 followup, *Let’s Talk About Election 2020*, several academic publications illuminated the kinds of topics that young people write about, the role that teachers play in shaping youth communication, and the ways that youth mix quantitative reasoning with narrative in their civic composing (Garcia, 2020; Gargroetzi & Garcia, under review; Gargroetzi, 2021; Zummo, 2020; Zummo, under review). These studies offer powerful illustrations of how civic writing is supported in schools. At the same time, by bringing this work into sustained conversation with math and English teachers, this guide serves as a new opportunity for bringing existing practices and scholarship into the “real world” of classrooms across content areas.

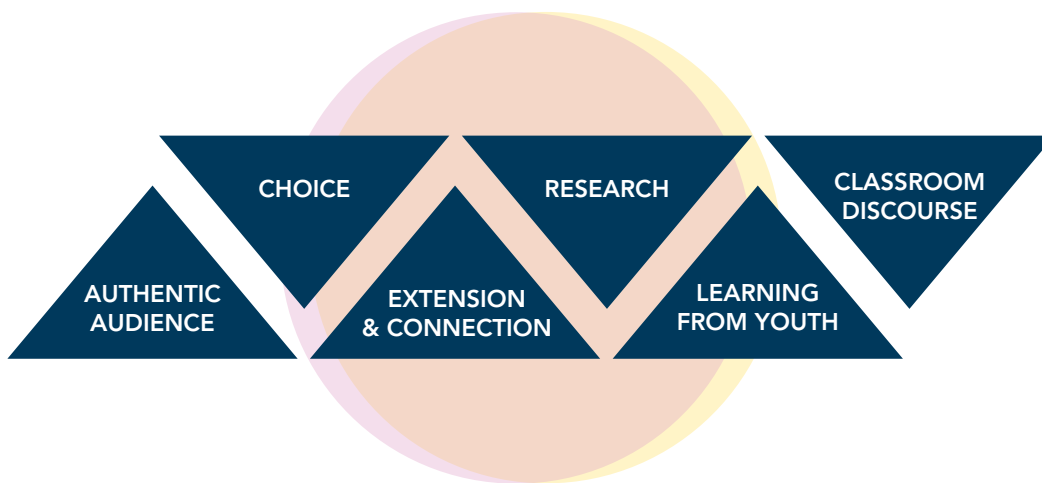
## The Benefits

We know that teachers already have a lot on their plates. We offer the ideas in this guide recognizing that the possibilities of centering authentic civic learning opportunities and—more specifically—quantitative civic reasoning can be transformative for many teachers. They have been for us, as the authors of this guide. From providing sustained professional growth opportunities for teachers to increasing student engagement and participation, quantitative civic reasoning offers benefits within the classroom and for the teaching profession. Rather than offering a substantial litany of how teachers are undertaking quantitative civic reasoning in the classrooms, we offer below six components of civic learning activities that can help you consider what is feasible with your students right now and guide your own classroom innovations.

# Six Core Components of Classroom Civic Learning Activity

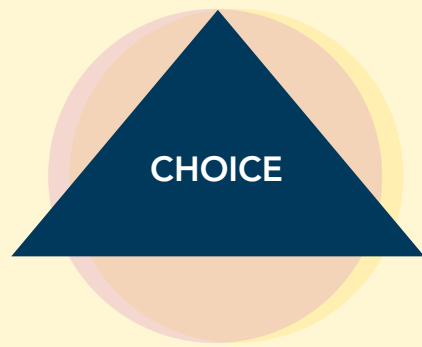
(adapted from Gargroetzi & Garcia, under review):

Many teachers understand civic engagement as the cultivation of youth voice to participate in democracy at different scales of community life. Teachers cultivate contexts for youth voice and provide authentic opportunities for youth to engage in community life through varied practices including, but not limited to, six core components of classroom civic learning activities:



Teachers likely will not always take on all six components at the same time, and we are encouraging you to address these at your own pace and comfort level. Some components may be easier or harder than others based on your discipline (math or English), and differences in how teachers create these opportunities for their students can depend on your local and unique classroom needs as well as geopolitical context. In addition, introducing some practices may require professional learning—such as getting comfortable with restorative practices or facilitating Socratic seminars. Care and attention to alignment from teacher beliefs to enactment is necessary for each teacher, with attention to local and national geopolitical context. Over time, we imagine that each teacher may build up their own approach to these components in different ways. Considering this, a brief description, multiple possible entry points, and examples of each are provided below.





Learners have choice in classroom activity and topics such that they are supported in cultivating their own interests and direction.

### Ideas for Incorporation

- Identify places where choice can be incorporated, for example:
  - ▲ Topic, text, or context
  - ▲ People to work with
  - ▲ Participation structure (solo, partner, or group)
  - ▲ Languages (spoken, written, read, and listened to)
  - ▲ Assessment format or product
- Guide students to consider the reasons for making a certain choice.
- When discussing potentially sensitive issues, provide options for participation.

“Kids will ask, ‘Can I do this? Can I do that? Can I do XYZ?’ And my response is always, ‘Of course, as long as you’re being purposeful about it.’ A specific example is kids are always able to write in whatever language they want to write in. So, if they want to write in Black English, they can write in Black English. If they want to write mainstream white English, they can. I have kids that turn in projects in Spanish. They have to be able to explain to me in their writer’s cover letter: Why did you make that choice?”

—Kia Turner

“I include choice from the smallest things to assigning essays. Before I make seating charts, I ask where they would like to sit and why. With writing prompts, I give four options instead of one. And I explain which is going to be easiest, which might be the best choice right now based on what’s going on at home. Or if you want to challenge yourself, there’s prompt B. I include choice in the most ridiculous things—I have 4 pencil sharpeners!”

—Samantha Diego



Learners extend their personal and classroom-based knowledge through research into the lives, experiences, and histories of others, of a particular issue, or of the discipline itself, through engagement with primary and secondary sources.

### Ideas for Incorporation

- Find out from students what kinds of research they have experience with.
- Use the internet to identify existing data sets that can be analyzed to explore an issue of interest.
- Use the internet to research beyond the traditional curriculum (learn about lesser-known mathematicians and authors; explore mathematical counting and problem-solving strategies, or composing and performance practices, not traditionally taught in the US).
- Generate your own data for analysis:
  - ▲ Track personal categorical and quantitative data from daily life.
  - ▲ Interview experts and community members.
  - ▲ Create and circulate surveys surrounding a topic of interest.

“ I do a ‘dismantling series.’ For instance, we’ll take the words ‘Pythagorean Theorem,’ and then have students look into, what are other cultures that have found the Pythagorean Theorem before the Europeans, and what are other ways to name the Pythagorean Theorem? We’ll also Google who Euclid is. Oh, the internet calls him the ‘Father of Geometry.’ What’s the problem with that? We’ll engage in a lot of tidbits of mathematical research and then question this together.”

—Xi “CiCi” Yu

“ On teaching research as a process to understand perspectives different from your own: The Step Out of the Echo Chamber assignment is the idea that we need to try to find things that don’t necessarily agree with us, to broaden our horizons and deepen our understanding. At the very least, you’ll have a deeper insight of what other people think and believe, and why.”

—Janelle Bence



Learners engage in peer conversation that supports empathy, problem solving, feedback, and revision cycles that reveals the value of multiple perspectives and multiple possible pathways or solutions for a “problem”—social, mathematical, or both.

### Ideas for Incorporation

- Prioritize collaborative discussions with the goal of deepening understanding over debates where people take opposing sides.
- Group students in flexible and changing ways to converse with different classmates.
- Facilitate process-focused debriefs: *Did anyone try something that didn't work? How did you start? What was your strategy? What connections can we make from one strategy of experience to the next?*
- Students plan and lead discussions about a topic of their choice, including preparing group norms, sources, and discussion questions (e.g., Harkness or Socratic Seminar).
- Reflect on patterns of participation and power in the classroom and incorporate data through student surveys (e.g., Whose ideas are most visible in this classroom? What changes should be made to support equitable participation?)
- Incorporate restorative circles to address tension or harm.

“When we’re doing a task that has multiple solutions, multiple pathways and ways of thinking about it, I really try to remove myself from that conversation as much as possible, and I really don’t try to privilege one way of looking at the problem more than another way. So I have students share out their solutions and have other students analyze and critique those solutions and find connections between different solutions. I try to really just ask questions rather than try to lead them in a particular method.”

—Gina Wei

“The Harkness [discussion] protocol is a collaborative strategy of, everyone needs to talk. If you’re speaking too much, then you’re actually not helping to construct meaning about the topic. It’s not a debate that people win or lose. It’s about actually listening and attending to each other’s responses. Everyone’s voice counts.”

—Janelle Bence



Civic learning activities are connected to course goals and to other curricular activities rather than being treated as singular or stand-alone activities.

### Ideas for Incorporation

- Include civic development as an explicit course goal along with content standards.
- Units can be organized around topics of social issues (along with or instead of content).
- Co-design projects with other content areas or grade levels.
- Connect with student-led clubs or other extracurricular spaces.

“The content for the course has to build a narrative arc. The thing we do today must appear again tomorrow. There must be a through line in the plot of the math content, and at the end it’ll wrap it up. ‘Did you notice on day one we did this? Here’s the same problem again, but now with these new tools.’ And then they’ll do a reflection portfolio at the end of the quarter that kind of captures what were the most important ideas from this quarter that stood out to them, and then how did they learn and grow from them? That’s my connection.”

—Xi “CiCi” Yu

“We build on previous experiences. I started out talking about the mathographies [students’ personal narratives of themselves as mathematicians]. I go back to those frequently, read them, just to kind of refresh my memory on, ‘Wait, what was the story that this student had?’ It’s helpful for me to be able to tie things back and be able to talk about those things, but that continues all the way through the year. We had this project in algebra about choices that the police chief should make. We were able to tie that back to the project we did in the first semester that was about police brutality, and is there a relationship between these? For the final, instead of a traditional exam, I give them the opportunity to go back and reflect on everything they’ve done.”

—Ethan Weker



Learners have a platform for sharing their newly refined perspectives with others beyond the classroom such that their learning becomes consequential.

### Ideas for Incorporation

- Create a classroom strengths inventory of ways students engage with various audiences effectively including tools, platforms, and genres of composing.
- Use data to examine locally relevant topics such as city or school budgets, and address letters to local officials or present at a city council or school board meeting.
- Social media can provide a powerful authentic audience with parental awareness and consent.
- Learn about the algorithms that drive traffic on social media such as search terms, captions, and hashtags.

“Kids are always writing to someone other than themselves. Sometimes the audience is just within our classroom, and often those are assignments that I think are going to be a little heavy. Other projects involve the broader community. For the Visiting Poets Program, we have contemporary poets come in, and they work with our students, and then kids actually put on a poetry slam. For another project, we work with the Classical Theater of Harlem. Our students work with a playwright to write their own plays. Then the theater company chooses their favorite one and stages it as a stage reading. Community is a huge part of how we express our work.”

—Kia Turner

“It happens occasionally. A few years ago, my Algebra I students did a project on looking at the minimum wage and whether it should be raised. They used systems of equations to kind of model things and make an argument for it. Their plan was to actually present this to the city, to the mayor’s office as an argument to raise the minimum wage in the town. Finals got in the way, so we ended up not being able to do it.”

—Ethan Weker



Learners have opportunities to engage with or learn from youth beyond their own classroom and to see youth as civic agents.

### Ideas for Incorporation

- Follow youth-led campaigns on social media.
- Connect with another classroom in your school to share or present.
- Build cross-school relationships for students to communicate, collaborate, or share learning products.
- Collaborate with local youth civics organizations.
- Help youth design presentations and hold workshops for other youth and community members.
- Connect youth with peer tutoring and mentoring opportunities inside and outside the school.

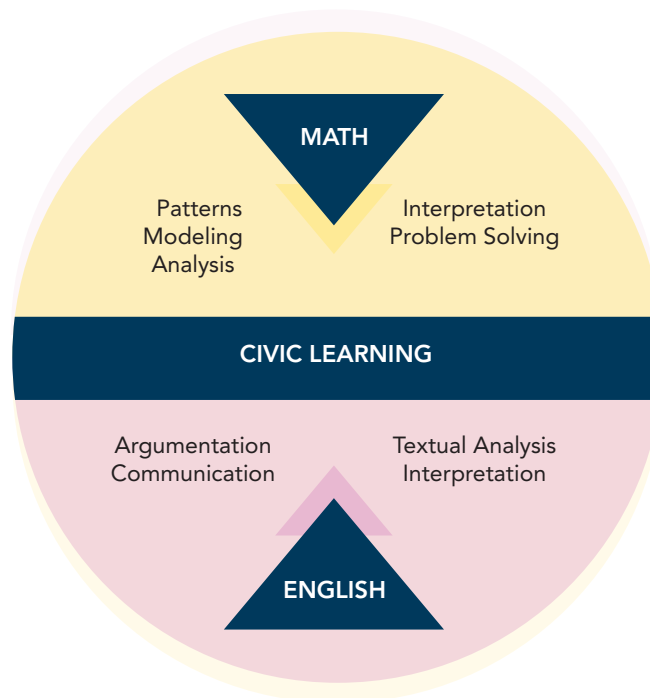
“A colleague of mine who is a math coach at an elementary school in our district asked me to co-plan a math circle for 3rd graders at her school. We brought in five high school mathematicians to serve as facilitators for the 3rd-grade math circle. As part of this gathering, the 3rd graders got to ask the high schoolers about high school and math.”

—Xi “CiCi” Yu

“In our literary analysis of *To Kill a Mockingbird*, I’m trying to teach kids how to situate their argument among the arguments that are already being made in scholarship. I didn’t know that you were supposed to do that until I got to college! And so I have them read the work that students before them have written and then that’s part of the research that they are using in order to write their own work.”

—Kia Turner

# Possibilities for Quantitative Civic Reasoning Across the Curriculum



In exploring quantitative civic reasoning, our collective conversations across math and English classrooms point to the powerful ways that each discipline can bolster and augment what might be happening in other subject areas. Where mathematics offers the practices of problem solving, patterns, modeling, analysis, and interpretation, English offers argumentation, communication, textual analysis, and interpretation. All of these, together, are fundamental to civic reasoning and discourse.

Through our discussions we wondered how, using analytic tools in each discipline, we could ask:

- What stories can a given set of data tell?
- Whose stories are being told?
- What could be missing?
- Given what we are now learning, what should we do next?

These questions are rooted in a recognition that data is never neutral. It is collected by individuals for particular purposes, from particular feelings of value, and—often—with expected outcomes of how a given set of data might be used or wielded for broader sociopolitical purposes. With this in mind, we briefly note a few ways that QCR might be leveraged in math and English classrooms today.



## Math Opportunities around QCR

Mathematics provides powerful ways to look at complex phenomena and model these phenomena through abstraction and generalization in order to identify potential avenues for change. Mathematical practices of pattern recognition, modeling, problem solving, and communication can all support civic reasoning. For example, mathematics lessons can explore and model changing CO<sub>2</sub> levels in the climate over time, intersectionality and the wage gap, proportionality of representation in honors classes, the geometry of gerrymandering, and more (Berry et al., 2020). When forms of mathematizing rely on abstraction and generalization, quantitative civic reasoning can help pair this work with narratives that illuminate the lived realities and particularities of the issues at hand.



## English Opportunities around QCR

Language arts centers the importance of story and focuses attention on questions of audience, perspective, and purpose. This is fundamental for digging into research. Where quantitative data can show large trends, stories can make singular voices cut through the sheer mass of data. Exploring quantitative data can add texture and perspective to a story, and storying data can provide multiple and multigenerational perspectives to build empathy. There are invitations everywhere in English asking us to look at different perspectives and speak to different audiences.



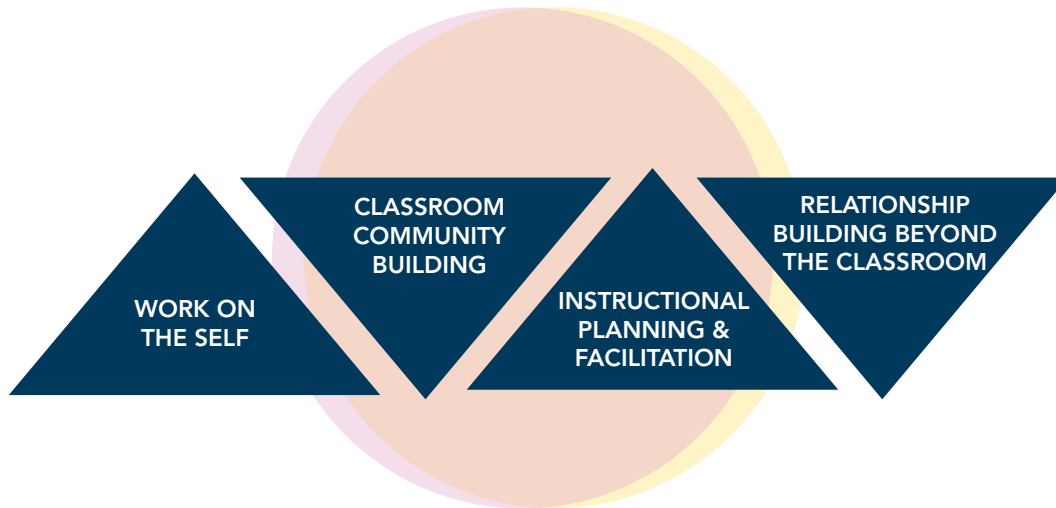
## Collaboration across Disciplines

Through our collective inquiry process, we found that conversations across disciplines supported the potential power of quantitative civic reasoning. Developing collaboration with teaching colleagues outside of your subject area could begin in varied ways.

- Discuss areas where each of you—teachers from diverse subject areas—can offer support, and areas where you would like support (e.g., English teacher wanting math colleague to explain weighted grading; math teacher wanting strategies to prepare students for a public presentation).
- Share curriculum maps to identify overlapping or complementary learning goals (e.g., research, argumentation supported by evidence, making predictions, or communicating to a specific audience).
- Collaboratively establish guidelines for the development of anti-oppression projects in civics education (e.g., Who am I serving with this activity? Who might I be hurting or neglecting?).



# Toward New Definitions of Civics across Subject Areas: The Role of Teachers



Teachers participate in civic learning at multiple levels. They work on their own clarity of purpose, build classroom communities, plan and facilitate classroom instruction, and build connections and relationships beyond the classroom community.

Looking at these practices, it is clear that teachers sit at the center of how new possibilities for civic learning are enacted in schools. Teachers prepare youth for participation in the future, provide historic grounding for contemporary civic action, and draw students into daily community where that participation happens in the here and now. All of this is done with the complex recognition that there are varied definitions and understandings of what civics means and how it should be supported (Garcia, 2020). The ideas in this guide are built from the recognition that schooling and education should not “prepare students for the real world.” Rather, schooling and education should sustain and further a better version of the “real” world, giving students the opportunity to build their ideal community and society right here in our classrooms.



## WORK ON THE SELF



*We must first understand ourselves to understand what changes we want to make in the world. After this awareness, we must understand how to navigate in order to truly transform. Finally, we must continue to revisit who we are to question what can be reimaged.*

To become more intentional about their civic work, some teachers have had to overcome their own reluctance to bring politics or controversies into the classroom. Ethan Weker says he used to think, “This is a math class, so this is math, math, math, math, math. I felt it was my responsibility to be impartial and not say anything that might be perceived as political.” The polarization that came with the 2016 election was a turning point for him, along with increased public attention on racial injustice, gun violence, and other challenging issues. His classroom has become a place to explore and discuss such issues, through the lens of quantitative reasoning. He explains: “A lot of big questions can be investigated through math. My desire for my students is that they see the world as a place with math in it. It can be a tool to understand and change the world, and a tool that they can wield.”

Although the civic work of teachers is grounded in their own beliefs and values, educators who embrace this role are thoughtful in supporting students to develop and articulate commitments that are their own, not the teacher’s.

Kia Turner, for example, became a teacher because she saw this profession “as the best way into racial justice work. Everything that I do in teaching is political. I’m very honest with my students about what my personal values are.” At the same time, she adds, “I always try to reiterate with them, this is what I believe, and I want to engage with you on what you believe. I don’t want you to just regurgitate what I’m saying.”

Samantha Diego believes that the role of schools “should be really honing student voice—not only having a voice, but exercising your voice and knowing that your voice matters. Giving students the safe space to voice concerns or to voice opinions is key in structuring that voice for them. Not everybody’s going to agree. And that’s okay. This is what learning looks like. This is what democracy looks like.”



## CLASSROOM COMMUNITY BUILDING



*The goal of education is not to prepare students for the real world. School should be a better version of the real world and give students the opportunity to build their ideal community and society right here in the classroom.*

—Gina Wei

Building a safe, welcoming classroom community is core to the civic work of teachers. They are intentional about how they co-create community with students so that everyone has a voice, the space to explore challenging topics, and tools to navigate controversies and build consensus.

Shared norms make explicit how members of the community treat each other and reinforce democratic values. “Through our participation structures and discussion structures, through our group work norms, we practice citizenship in the [math] classroom,” according to Gina Wei.

Teachers deepen community with protocols and classroom routines that create space for respectful dialogue and disagreement. Here’s how Kia describes her English classroom: “How do I have a conversation in a way that both respects myself and my values but also holds empathy for other people and where they’re at? We practice things like that daily,” with daily openers, fishbowls, and practices like restorative circles. “We can’t have good dialogue,” Kia adds, “if we don’t know how to be in community with each other.”

To build community with her math students, CiCi Yu has developed a protocol for problem solving. In teams of four, students work on solving a nonroutine math problem. After a few minutes of discussion at their whiteboards, each team sends a representative to report on their progress and share strategies. This process repeats, with different representatives reporting out each time. Teams continue generating and discussing a variety of solutions until every student can step up to the whiteboard and solve the problem. Then CiCi leads a debrief about the power dynamics of the experience, asking: “Who was first to step up to the whiteboard and share a solution? Why? Who asked for help? Did anyone actually help you?” She repeats the protocol with a different problem, four Fridays in a row. “By the fourth week, they’ve caught on to the social norms,” she says. She hears students asking, “Who doesn’t understand? Are you sure, because I can explain it again.” She invests this time with students “because it helps them question, what does it mean to be a student in a mathematics classroom? Where is the balance between gathering resources only for myself, in a competitive way, and stopping to help a neighbor?”



## INSTRUCTIONAL PLANNING & FACILITATION



*Of course I'm trying to build my students' reading and writing and grammar skills. I also want them to be good humans, active community members, so let's talk about real-life issues. You can do one without giving up the other."*

—Samantha Diego

Across content areas, teachers plan and facilitate instruction so that students' learning experiences activate and deepen the skills and dispositions of engaged citizens.

Math teachers, for example, often leverage current events as context for introducing math concepts. From the mathematics of gerrymandering to the rates of COVID-19 infections among different populations, the news is filled with what Cici describes as "mathematical dilemmas." She offers this example: "At the beginning of the pandemic, when Governor Cuomo had New York State make its own hand sanitizer to combat price gouging, we talked about whether it was ethical to use prison labor to do that. These issues are all mathematically related, because they all have a cost efficiency, cost effect analysis related to them, and also an ethical component. The way society puts values on things is to put numbers to them. So just understanding that there's so much more to mathematical decision making than just computing multiplication and division—there's actually a social aspect to it."

Such activities build students' quantitative reasoning. As Ethan Weker explains, "One of the things that often comes up are the statistics and graphs that we see in the media, and how to interpret those, and how frequently they are misinterpreted. There is an enormous gap between what most people think they understand in statistics and what they actually do. When people are confronted with statistics and they don't have a strong background in it, it can lead them to make really poor decisions, and it also means that data and graphs and the way that information is presented can be easily manipulated."

Similarly, Gina Wei plans units and lessons "that give students an opportunity to see the problems that they are living in and to use quantitative reasoning and problem solving and creative thinking. How can they use their skills to interrogate and learn more about the problems that they see in their communities and the problems that they face, and also come up with solutions and be able to take more actions even outside of the classroom?"



## INSTRUCTIONAL PLANNING & FACILITATION

*continued*

Longer-term and interdisciplinary projects can activate students' sense of agency by inviting them to take action in their own community or the wider world.

With her grade 9 English students, Janelle Bence collaborates with colleagues who teach digital media and geography for an ambitious project called Slamming for a Cause. In geography, students learn about different cultural regions around the world. They investigate and research major social issues within these regions. "From there," Janelle explains, "they choose which social issues they want to compose about and speak about."

As they begin to compose, students engage in research, analyze data, and consider how an individual story connects to larger issues. Once students have composed rough drafts, they perform for a world champion slam poet who critiques their work. He also models for them by performing his own piece of spoken word. Students are motivated to continue revising and polishing because they know they will compete to perform for a large community event.

The final event is entirely orchestrated by students, including the selection of a local nonprofit organization that will receive proceeds of ticket sales and a silent auction. The experience has become a school tradition. Janelle adds, "Even those who are not performing see that their learning really is making a difference. It's something they will never forget because they find that voice."



## RELATIONSHIP BUILDING BEYOND THE CLASSROOM



*We talk about, what is race? What is class? What is gender? How do these different identifiers relate to my life? Kids need a space where the goal is actually just to talk about these things.”*

—Kia Turner

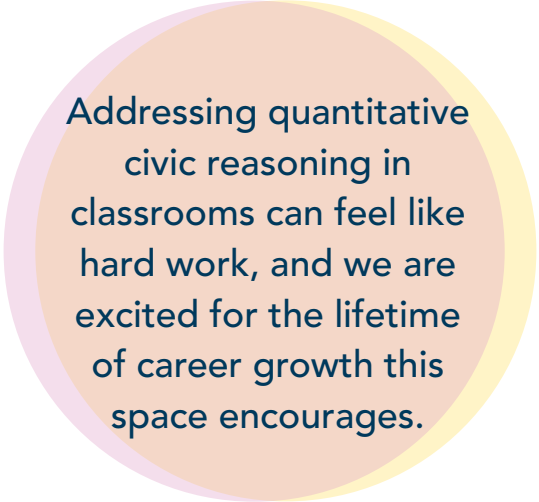
In order to support civic learning with students, teachers cultivate relationships and build trust with colleagues, school administrators, families, community members (like the champion slam poet described by Janelle) and community organizations. These connections are crucial for sustained support for ongoing work, and allow for cross-curricular collaboration as well as engagement in community activity beyond the school building.

With her middle school colleagues, Kia has developed a program called Tools for Liberation that happens during advisory from grades 6–8. It begins with building the vocabulary and understanding to explore social issues. Explains Kia, “We talk about, what is race? What is class? What is gender? How do these different identifiers relate to my life? Kids need a space where the goal is actually just to talk about these things. So that, when you’re in math class or in science class, and you’re talking about genes or genetics, how does that actually affect things along racial lines? Because you’ve dug into those things outside of the subject areas, you have the vocabulary to talk about tough issues that kids want to tackle.” The school year concludes with a student-driven social action project focused on an issue that affects their community.

Building relationships beyond the classroom takes time and effort. Facilitating the Slamming for a Cause project, for example, “has opened my eyes to what could happen [with more collaboration],” Janelle says, “but it’s difficult for teachers to do in isolation—and a lot of people feel like they’re working in isolation.”

Support from school administrators is essential for the civic work of teaching. Gina, for example, knows that her principal values her approach to instruction. “She puts what I’m doing out as a model for other teachers, showing the structures I’m using and the projects my students are doing. The message from leadership is: This is exactly the vision we want for the school. Understanding your own power, caring about others, collaborating to build something together—that’s what democracy is.”

# Conclusion: Envisioning Vibrant Civic Imagination for All Students and Teachers



Addressing quantitative civic reasoning in classrooms can feel like hard work, and we are excited for the lifetime of career growth this space encourages.

The options for examining and participating in contemporary civic life through English and math classrooms are vast. Frankly, we recognize that the possibilities in this guide might feel a little overwhelming. We reiterate our earlier point that teachers should feel comfortable starting with small pedagogical moves and expanding to broader approaches based on their specific classroom contexts and needs. Addressing quantitative civic reasoning in classrooms can feel like hard work, and we are excited for the lifetime of career growth this space encourages. Wherever you enter this civic conversation, the demand for your teaching identity is more important than ever. By creating space in your curriculum to center youth ingenuity and to rise to the societal needs for youth civic leadership, we hope this guide helps propel action across our subject areas.

# References

- Berry III, R. Q., Conway IV, B. M., Lawler, B. R., & Staley, J. W. (2020). *High school mathematics lessons to explore, understand, and respond to social injustice*. Corwin Press.
- Educating for American Democracy. (2021). *Educating for American democracy: Excellence in history and civics for all learners*. iCivics.
- Friedrich, L., & Strother, S. (2020). Measuring civic writing: The development and validation of the civically engaged writing analysis continuum. *The Journal of Writing Assessment, 13*(1).
- Garcia, A., Levinson, A.M., & Gargroetzi, E.C. (2019). "Dear Future President of the United States": Analyzing youth civic writing within the 2016 Letters to the Next President project. *American Educational Research Journal, 57*(3), 1159–1202.
- Gargroetzi, E., & Garcia, A. (Under review). "I don't think kids nowadays feel like they have a lot of power": Exploring teacher civic commitments in a national online letter writing project.
- Gargroetzi, E., Zummo, L., Garcia, A., & Bene, E. (2021). "Let's Talk About Election 2020": Quantitative civic literacies of solidarity and critique in an online digital network. 15th International Conference of the Learning Sciences Proceedings. Eds. E. de Vries, Y. Hod, & J. Ahn., pp. 573–576.
- Lee, C.D., White, G, & Dong, D. (Eds.) (2021). *Education for civic reasoning & discourse*. National Academy of Education.
- Mirra, N., & Garcia, A. (2017). Civic participation reimaged: Youth interrogation and innovation in the multimodal public sphere. *Review of Research in Education, 41*, 136–158.
- National Council for the Social Studies. (2013). *The college, career, and civic life (C3) framework for social studies state standards: Guidance for enhancing the rigor of K–12 civics, economics, geography, and history*.
- National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*.
- National Governors Association Center for Best Practices, Council of Chief State School Officers. (2010). *Common Core State Standards for English language arts and literacy in history/social studies, science, and technical subjects*.
- Pew Research Center. (2017). *The partisan divide on political values grows even wider*.
- Steen, L. A. (1997). *Why numbers count: Quantitative literacy for tomorrow's America*. College Entrance Examination Board.
- Stitzlein, S. (2021). Defining and implementing civic reasoning and discourse: Philosophical and moral foundations for research and practice. In C.D. Lee, G. White, & D. Dong (Eds.), *Education for civic reasoning & discourse* (pp. 23–52). National Academy of Education.
- Zummo, L., Gargroetzi, E., & Garcia, A. (Under review). How youth use scientific argumentation in civic participation on climate change: Polar bears, the Great Barrier Reef, and "your job as president."
- Zummo, L., Gargroetzi, E., & Garcia, A. (2020). Youth voice on climate change: Using factor analysis to understand the intersection of science, politics, and emotion. *Environmental Education Research, 26*(8), 1207–1226.



# Authors

**Emma Gargroetzi** is a postdoctoral fellow of STEM Education and assistant professor of instruction at the University of Texas at Austin. Her research focuses on identity, power, and educational justice in the mathematical lives of children and youth. Previously she was a special educator and math teacher in Brooklyn, NY. Emma received her PhD from Stanford University with a dual focus in race, inequality, and language in education and in mathematics education. She also holds an MA from Columbia University Teachers College in peace education and an MS from Brooklyn College in teaching students with disabilities.

**Antero Garcia** is an assistant professor in the Graduate School of Education at Stanford University. Prior to completing his PhD., Antero was an English teacher at a public high school in South Central Los Angeles. His work explores how technology and gaming shape learning, literacy practices, and civic identities. His recent books include *Everyday Advocacy: Teachers Who Change the Literacy Narrative*, *Good Reception: Teens, Teachers, and Mobile Media in a Los Angeles High School*, and *Compose Our World: Project-Based Learning in Secondary English Language Arts*.

**Suzie Boss** is an author, educational consultant, and former teacher who has worked with educators around the globe who are shifting from traditional instruction to real-world project-based learning. She is the author of 10 books, a longtime contributor to Edutopia, and PBLWorks National Faculty emerita. Her next book, *Redefining Student Success* focuses on how educators are designing learning experiences that emphasize community problem solving and civic engagement.

**Janelle Bence** is a 9th-grade English facilitator in her 22nd year of teaching in the state of Texas. Her passions are teaching writing, civic engagement, and amplifying learner voice. Janelle includes mindful practices from teaching yoga (500 Hour RYT) to promote sustainable teaching and learning. She believes constantly feeding the maker within all of us is one strategy to maintain a healthy, purposeful life.

**Samantha Diego** is a 9th-grade English teacher in South Los Angeles with a Master of Education from UCLA. Her focus has been on amplifying Black and Brown voices in the community she grew up in with the hopes of encouraging students to pursue their own passions and goals with an understanding that success is not heavily dependent on “getting out” of the community they grew up in.

# Authors

**Kia Turner** is pursuing a PhD in race, inequality, and language in education at Stanford Graduate School of Education. She hopes to use abolitionist theory to explore how the understanding and practice of community informs Black and Brown students' experiences of punishment and justice in schools. Kia taught middle school English in Harlem for five years, where she instituted a culturally relevant "Tools for Liberation" advisory curriculum.

**Gina Wei** is a secondary math teacher at Constitution High School, a history-themed public school in Philadelphia. Before living in Philadelphia, she taught at a public high school in San Jose, CA. She received her master of education at Stanford University.

**Ethan Weker** has been teaching since 2001 in public, charter, and independent schools in the San Francisco Bay Area. Much of his focus has been on working with students with learning differences and helping them to develop positive mathematical identities. He speaks regularly at state and national conferences about learning disabilities, equity and justice, and pedagogy in the mathematics classroom.

**Xi "CiCi" Yu** taught high school math in public schools in the Greater Boston Area (unceded land of the Massa-adchu-es-et and Pawtucket Peoples) for eight years. She is starting a PhD. program in Math Education at Boston University in Fall 2021. Her research interests are in race, identity, and power in a mathematics classroom. She co-created [PlayWithYourMath.com](https://www.playwithyourmath.com) and tries to blog at [DismantlingMathematics.com](https://www.dismantlingmathematics.com).

# Acknowledgments

We gratefully acknowledge that funding and mentorship for this resource was supported by the Spencer Foundation and their research communication outreach program. We are thankful for ongoing support and collaboration from the National Council of Teachers of English, the National Council of Teachers of Mathematics, the National Writing Project, and KQED. We also thank Amber Levinson and Lynne Zummo for collaboration on the research that led to this project, and Nicole Mirra for her charge to our group to reconsider what civics can be.

