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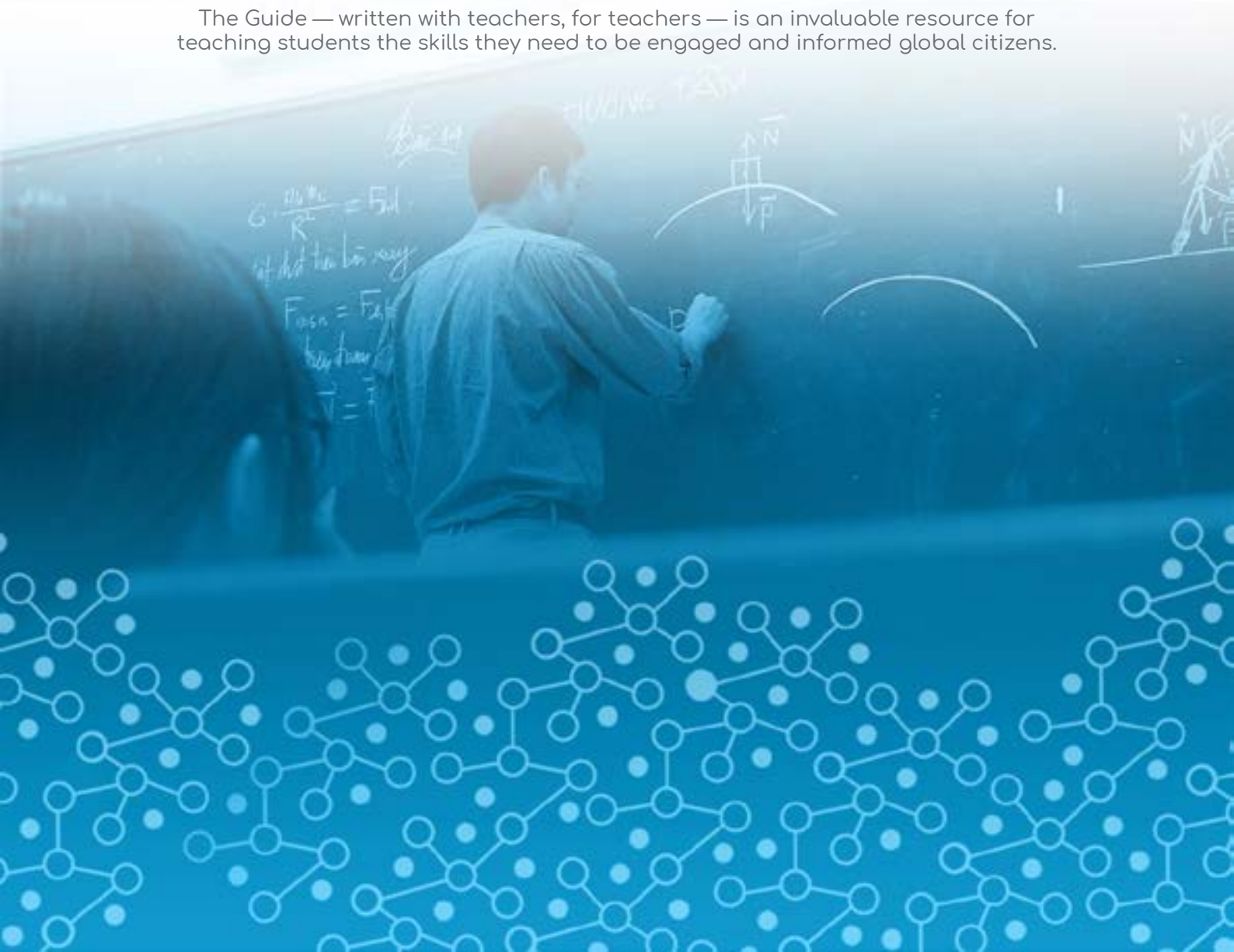
How to Teach Critical Thinking

Every minute of life in the modern world, we are confronted with information and misinformation, advertising and distractions, complexity and ambiguity. Making sense of it all — distilling it, separating the important from the trivial — requires skill, patience, and practice. It requires, in brief, critical thinking. Yet we largely do not teach our children how to do it.

Reboot's new guide contains, among other things, resources for teaching critical thinking to students of all ages, in any subject, including math, science, literature, civics, writing, and philosophy.

The Guide — written with teachers, for teachers — is an invaluable resource for teaching students the skills they need to be engaged and informed global citizens.



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Teaching Critical Thinking: How to Inspire Better Reasoning

Teaching critical thinking, as most teachers know, is a challenge. Classroom time is always at a premium and teaching thinking and reasoning can fall by the wayside, especially when testing goals and state requirements take precedence. But for a growing number of educators, critical thinking has become a priority.

This is because, for many reasons, young people simply need critical thinking instruction:

- They are faced with myriad crises — many real and some imagined or exaggerated by unreliable news sources and overstimulated social media users.
- They spend more and more of their time in internet-connected environments where advertisers and interest groups hold previously unimaginable powers of manipulation over them.
- Technology, politics, and society in general all seem to be changing faster than ever before, and the future seems more uncertain than ever.

These changes don't only complicate the world itself; they affect our powers of understanding at the same time. There's evidence suggesting social media use can damage attention spans, have an outsized impact on emotions and mental health, and even affect memory. Psychologically addictive reward systems are built into many of these platforms.

Even generally reliable news sources, which increasingly orient themselves to their own fragmented segment of the journalism market, can overwhelm our powers of judgment with sensationalistic headlines, misleading framing, and the sheer volume of information at our fingertips.

The kind of thinking and attention required to engage with complicated issues becomes harder to foster and harder to maintain than it might be in a less saturated information ecosystem. Under these conditions, critical thinking, which has long been a buzzword in education, takes on a new and more urgent significance. New opportunities and methods for teaching critical thinking are needed.

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Critical thinking, which has long been a buzzword in education, takes on a new and more urgent significance.

Being able to think critically — with rigor, depth, patience, emotional intelligence, and humility — can have wide-ranging impacts on every aspect of students' lives: their contributions to civic life, their professional success, their ability to build and maintain healthy relationships, their mental health, and even their physical well-being.

What are the key strategies for teaching critical thinking skills? In many ways, we are still at square one when it comes to teaching our students how to think critically. There are a number of obstacles here:

- Teachers are not given the time, freedom, materials, or professional development tools to teach their students how to think critically.
- Mainstream education priorities — too focused on test results and narrowly defined skills — don't leave room for critical thinking.
- The best education research, which strongly suggests that critical thinking instruction must be embedded in specific domain instruction, is not well-known or widely put into practice.
- Traditional curricula have not evolved quickly enough to adapt to the new challenges students face in analyzing information and media.

What Is Critical Thinking?

For all the talk about critical thinking, there remains a lot of confusion about what exactly it is. So what does critical thinking mean? This is key to teaching critical thinking, of course.

The Reboot Foundation defines critical thinking quite simply as high-level skills in reasoning, coming to judgments, and making decisions. Even more simply: critical thinking is thinking well.

To get a little more specific, critical thinking is reflective, objective, and analytical in

To get a little more specific, critical thinkers are regularly reflective, objective, and analytical in their thinking:

To get a little more specific, critical thinkers are regularly reflective, objective, and analytical in their thinking:

- They step back to reflect on their own thinking, taking time to plan, strategize, and reform their thinking when necessary.
- They do their best to overcome subjective biases. While they know that pure objectivity is an ideal we can never reach, they draw on the perspectives of others, especially those with opposing views, in order to expand their own horizons.
- They use the analytical tools of logic and effective argumentation to evaluate evidence, make judgments, and discuss issues with others.

How to Teach Critical Thinking

As part of the Reboot Foundation's efforts to create this guide on how to teach critical thinking we consulted with a group of leading teachers from around the country, teaching in different types of schools, at different grade levels, and in different geographic areas.

When it came to teaching critical thinking skills the same kinds of obstacles cropped up over and over again such as a focus on testing and teacher accountability, which has put pressure on administrators and teachers to deliver testing results through more uniform and rigid curriculums.

Given this and numerous other challenges, this guide provides teachers subject-oriented advice for integrating critical thinking into their curricula. Different teachers, of course, face very different challenges and circumstances to teaching critical thinking. For this reason, instead of setting out rigid lesson plans, we have offered short research synopses and ideas for critical thinking lessons and activities. We expect teachers will modify these to their needs, or that these will spark new ideas and experiments in their classrooms.

The Importance of Domain Knowledge to Teaching Critical Thinking

Despite a great deal of rhetoric about critical thinking, not enough time is actually spent teaching critical thinking. One major reason is a misconception about its nature. Critical thinking is not a single skill that can be taught, like playing the cello, or content that can be memorized, like the history of the French Revolution. What critical thinking entails often depends on the content and discipline.

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Although there is overlap, good thinking habits and strategies in physics don't look the same as those in literary interpretation. We must keep this in mind when we seek to teach thinking. As cognitive scientist Daniel Willingham puts it, "Thought processes are intertwined with what is being thought about."

What does that mean for teachers? There is good and bad news. The bad news is that critical thinking, as a generic skill, is challenging to teach. Critical thinking skills learned in one area aren't guaranteed to transfer to other areas. The good news is that specific critical thinking instruction can, in many cases, be integrated into existing classroom practices. The key is to understand what constitutes deeper thinking in particular domains and implement classroom practices that leads students toward that kind of thinking. That's what we've set out to do in this guide.

Instilling Critical Thinking Habits

That said, there are some habits and virtues that cut across domains when it comes to teaching critical thinking. Teachers can make an impact by modeling these intellectual virtues, when possible, for their students.

Sparking Curiosity. Young students are eager to know about the world and ask questions tirelessly. Why is the grass green? Why do zebras have stripes? Even adolescents are prone to constant questioning — though their questions sometimes have a more cynical slant.

In the classroom, it's not always possible to indulge every last question, and some of these questions can be disruptive. But it is still absolutely vital that educators make time to indulge and encourage the curiosity of students. Curiosity, if it's developed and refined, is crucial to being an informed and engaged citizen of the world.

Open-ended discussions are an excellent way to spark curiosity. We model this kind of discussion in our article on critical thinking and reading. There you'll find tips on how to prompt students to ask deeper moral and philosophical texts about literary texts. With practice in refining their curiosity, students will begin to develop what's called "metacognition," or thinking about thinking. This is a foundational part of critical thinking, in which students turn their curiosity on themselves, and begin to ask why they think and believe what they do.

Managing Emotions. Emotions may seem far afield from the ability to reason but critical thinking is emotionally difficult. Critical thinkers have to exhibit the humility to admit that they don't know everything and they may be wrong. At the same time, they have to be confident enough to ask tough questions and challenge authority when appropriate. And, perhaps most crucially, they have to be able to consider and analyze arguments on their merits, instead of judging the person making them.

When emotions run high in the classroom, for example in a discussion of a controversial topic, it's a great time for teachers to model these virtues. We offer tips on how to do so in our article on civics education. The goal is to give students civic competence and confidence, ultimately, contribute positively to their communities and society as a whole.

Checking for Bias. Emotional arguments can make it especially difficult to recognize and overcome biases. When we're emotional, we usually fail to step back and look for misinterpretations, hasty conclusions, and assumptions we may have made about the people we're arguing against.

Instruction in logic and philosophy can help students recognize biased thinking in themselves and, especially, in some of the weak reasoning they all inevitably come across online. Too often, especially in the United States, we've considered these topics too advanced for K-12 learners.

Check out our articles on media literacy and philosophy for more on how to help students navigate emotional appeals and understand biases.

Critical Reading: Developing Critical Thinking Through Reading

When people think of high-level reasoning skills, they often think of mathematicians and scientists, who are seen as drawing strict conclusions that follow logically from dry analysis of statistical evidence.

To be sure, mechanical, purely logical thought is a vital part of reasoning and critical thinking. But it is not everything. Critical thinking involves skills in interpretation in contexts that are multi-layered and ambiguous.

Close and critical reading is one of the best ways for students to develop skills in this kind of interpretation. As teachers think about developing critical thinking through literature they should focus on interpretive skills. Through their discussions, reflections, and reading and writing on fiction and literature, students ideally learn to develop critical thinking skills like the following:

- how to empathize with multiple perspectives;
- how to interrogate and interpret the author's perspective;
- how to ask and engage with complex moral and philosophical questions;
- how to recognize and reckon with ambiguity.

This kind of reflection can start young — younger than we might ordinarily think. There's a lot teachers can do to develop skills in critical thinking and reading.

Critical Reading Through Open-Ended Discussion

To facilitate growth in critical reading, teachers can build in time for open-ended discussion and resist the urge to steer students toward "correct" answers.

A good literary text is rarely able to be captured by a single interpretation. It is, of course, important to ensure students are progressing in basic comprehension skills and reading at grade level.

But when it comes to critical reading — delving into the meaning of a particular text — teachers should be open to students' initial reflections and encourage them to express and develop their views no matter how rudimentary they might be at first.

Before engaging in more well-defined exercises and discussion, therefore, instructors can give students practice with more open-ended reflection. This will help them gain comfort and experience articulating their immediate reactions and beginning to question texts in a more structured way.

Many teachers will begin a discussion of a text with a set of questions like:

- What's the author's point of view or argument?
- What's the intended audience?
- What's the author's purpose?
- How do they use rhetorical devices or figurative language?

This kind of questioning is, of course, important, but it can be more powerful and worthwhile to students if it comes organically out of their immediate reactions, rather than being experienced as something imposed from the outside. Otherwise, these can seem like simple questions with right or wrong answers that preclude deeper critical engagement, instead of starting points for that engagement.

For example, if a teacher wants to talk about rhetorical devices, they might begin by asking students more simply:

- What jumped out at them in the reading?
- What did it make them feel?
- What do you think produced that feeling?

A teacher can move from there to the devices that might be at work producing that effect.

Similarly, before initiating a conversation about point of view, teachers might ask:

- Did you feel able to identify with the author?
- What questions did the passage raise about the author's identity and perspective?

Eventually, if this is well-modeled and scaffolded, the practice of interrogating point of view or rhetoric will become natural to students. They will practice critical reading organically, instead of a kind of algorithm that they are meant to apply to the text.

Critical Reading and Interpretation

Just because a text is open to interpretation doesn't mean that there are not better and worse interpretations to offer or questions to raise. But a good interpretation cannot be measured by simply applying a preconceived standard. It shows its value in the manner in which it is backed up by evidence from the text and convincing argument.

A combination of written and spoken exercises can be useful here. Sometimes it can lead to improved contributions if students think over their views while writing before convening in small or large groups to discuss the issue. In particular, writing can help with what's called metacognition, or thinking about thinking. Being forced to write down their views can help students step back and think about why they think what they think.

Engagement with the text should serve to broaden students' horizons and get them to examine their own thinking and beliefs. Students have to, to a certain extent, drive this process. But teachers must facilitate discussion and exploration, and make sure it doesn't go off the rails.

This takes skill and experience, of course, as well as confidence. Teachers must be willing to let the reins go a little bit and see where the conversation takes students. They must also be adept at facilitating: resisting the urge to intervene too forcefully or reinterpret students' comments and, instead, encouraging other students to enter the conversation and begin responding to each other.

Finally, developing critical thinking through reading involves fostering an ability to draw connections between disparate fields. This means examining the significance of texts for one's own experience and for broader issues in history and everyday life.

When students learn to do this, they extend some of the habits of thinking they learn through the study of literature into their daily lives. The goal is more reflective thoughtful people, who develop problem-solving skills, make better decisions and, ultimately, live more meaningful lives.

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An Example of a Discussion Around Fantastic Mr. Fox

What follows is an example of a critical thinking oriented discussion and close reading exercise around Roald Dahl's Fantastic Mr. Fox. It's geared toward younger grades, but teachers of all levels may find ideas for how to build discussion around appropriate texts.

Toward the middle of Dahl's story, Mr. Fox is hiding out in his foxhole with his family from three farmers (Boggis, Bunce, and Bean), who wait with guns outside the hole, attempting to starve the Foxes out.

Mr. Fox comes up with a plan to outlast them. Along with his children, he digs into the farmers' storehouses from underneath and steals food so his family can survive. As he's in the process of stealing he meets up with Badger, who has reservations about stealing.

As researcher Judith Langer puts it, when it comes to critical thinking and literature, "musing itself is the goal."

Remember, again, that students shouldn't be pushed toward any right answers, but instead prompted to dig deeper. As researcher Judith Langer puts it, when it comes to critical thinking and literature, "musing itself is the goal."
Text from Fantastic Mr. Fox

Suddenly Badger said, "Doesn't this worry you just a tiny bit, Foxy?"

"Worry me?" said Mr Fox. "What?"

"All this… this stealing."

Mr. Fox stopped digging and stared at Badger as though he had gone completely dotty. "My dear old furry friend, he said, "Do you know anyone in the whole world who can refuse to steal a few chickens if his children are starving to death?"

There was a short silence while Badger thought deeply about this.

"You are far too respectable," said Mr. Fox.

"There's nothing wrong with being respectable," Badger said.

"Look," said Mr. Fox, "Boggis and Bunce and Ben are out to kill us. You realize that, I hope?"

"I do, Foxy, I do indeed," said the gentle Badger.

"But we're not going to be like them. We don't want to kill them."

"I hope not," said Badger.

"We shall never do it," said Mr. Fox. "We shall simply take a little food here and there to keep us and our families alive. Right?"

"I think we'll have to," said Badger.

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Opening Discussion

After soliciting students immediate reactions, teachers might proceed by introducing more structured questions like:

- How does Mr. Fox justify stealing? Does his justification seem right to you? Why?

Many students will find Mr. Fox's justification perfectly sound. Educators can push the conversation forward, though, by making sure that they're giving reasons they believe his justification, however. The teacher can also complicate things by introducing new questions like the following:

- Was Mr. Fox's stealing justified in the beginning of the book before Boggis, Bunce, and Bean attacked his foxhole? If not, what conditions would make the stealing unjustified?

Consider Perspectives

The next stage is to begin broadening perspective, and pushing students to consider more general and abstract questions:

- Why does Badger have reservations? What do you think "being respectable" means to Badger? What does it mean to Mr. Fox?
-
- What about the perspectives of the farmers? Should we have any sympathy for them in this situation?

Teachers can also ask students to consider their own experiences and perspectives, as well as those of their classmates.

- Have you ever been in a situation where you felt doing something that is ordinarily wrong was justified? What made it right or wrong?

Deepen

Finally, teachers can use the discussion of texts like Fantastic Mr. Fox as a launch point for more abstract discussions:

- Is being "respectable" always right? When might it not be?
- What does it mean that a moral rule (like "you shouldn't steal") seems like it can be broken for special circumstances?
- Should we live according to principles or based on the particular context we face? Is there such a thing as being "too principled"?

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Critical Thinking in Science: How to Foster Scientific Reasoning Skills

Critical thinking in science is important largely because a lot of students have developed expectations about science that can prove to be counter-productive.

After various experiences — both in school and out — students often perceive science to be primarily about learning “authoritative” content knowledge: this is how the solar system works; that is how diffusion works; this is the right answer and that is not.

This perception allows little room for critical thinking in science, in spite of the fact that argument, reasoning, and critical thinking lie at the very core of scientific practice.

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In this article, we outline two of the best approaches to be most effective in fostering scientific reasoning. Both try to put students in a scientist’s frame of mind more than is typical in science education:

- First, we look at small-group inquiry, where students formulate questions and investigate them in small groups. This approach is geared more toward younger students but has applications at higher levels too.
- We also look at science labs. Too often, science labs too often involve students simply following recipes or replicating standard results. Here, we offer tips to turn labs into spaces for independent inquiry and scientific reasoning.

I. Scientific Inquiry and Critical Thinking

Even very young students can "think scientifically" under the right instructional support. A series of experiments, for instance, established that preschoolers can make statistically valid inferences about unknown variables. Through observation they are also capable of distinguishing actions that cause certain outcomes from actions that don't. These innate capacities, however, have to be developed for students to grow up into rigorous scientific critical thinkers.

Even very young students can "think scientifically" under the right instructional support.

Although there are many techniques to get young children involved in scientific inquiry — encouraging them to ask and answer "why" questions, for instance — teachers can provide structured scientific inquiry experiences that are deeper than students can experience on their own.

Goals for Teaching Critical Thinking Through Scientific Inquiry

When it comes to teaching critical thinking via science, the learning goals may vary, but students should learn that:

- Failure to agree is okay, as long as you have reasons for why you disagree about something.
- The logic of scientific inquiry is iterative. Scientists always have to consider how they might improve your methods next time. This includes addressing sources of uncertainty.
- Claims to knowledge usually require multiple lines of evidence and a "match" or "fit" between our explanations and the evidence we have.
- Collaboration, argument, and discussion are central features of scientific reasoning.
- Visualization, analysis, and presentation are central features of scientific reasoning.
- Overarching concepts in scientific practice — such as uncertainty, measurement, and meaningful experimental contrasts — manifest themselves somewhat differently in different scientific domains.

How to Teaching Critical Thinking in Science Via Inquiry

Sometimes we think of science education as being either a "direct" approach, where we tell students about a concept, or an "inquiry-based" approach, where students explore a concept themselves.

But, especially, at the earliest grades, integrating both approaches can inform students of their options (i.e., generate and extend their ideas), while also letting students make decisions about what to do.

Like a lot of projects targeting critical thinking, limited classroom time is a challenge. Although the latest content standards, such as the Next Generation Science Standards, emphasize teaching scientific practices, many standardized tests still emphasize assessing scientific content knowledge.

The concept of uncertainty comes up in every scientific domain.

Creating a lesson that targets the right content is also an important aspect of developing authentic scientific experiences. It's now more widely acknowledged that effective science instruction involves the interaction between domain-specific knowledge and domain-general knowledge, and that linking an inquiry experience to appropriate target content is vital.

For instance, the concept of uncertainty comes up in every scientific domain. But the sources of uncertainty coming from any given measurement vary tremendously by discipline. It requires content knowledge to know how to wisely apply the concept of uncertainty.

Further Tips and Challenges

Teachers need to grapple with student misconceptions. Student intuition about how the world works — the way living things grow and behave, the way that objects fall and interact — often conflicts with scientific explanations. As part of the inquiry experience, teachers can help students to articulate these intuitions and revise them through argument and evidence.

Group composition is another challenge. Teachers will want to avoid situations where one member of the group will simply "take charge" of the decision-making, while other member(s) disengage. In some cases, grouping students by current ability level can make the group work more productive.

Another approach is to establish group norms that help prevent unproductive group interactions. A third tactic is to have each group member learn an essential piece of the puzzle prior to the group work, so that each member is bringing something valuable to the table (which other group members don't yet know).

It's critical to ask students about how certain they are in their observations and explanations and what they could do better next time. When disagreements arise about what to do next or how to interpret evidence, the instructor should model good scientific practice by, for instance, getting students to think about what kind of evidence would help resolve the disagreement or whether there's a compromise that might satisfy both groups.

The subjects of the inquiry experience and the tools at students' disposal will depend upon the class and the grade level. Older students may be asked to create mathematical models, more sophisticated visualizations, and give fuller presentations of their results.

Lesson Plan Outline

This lesson plan takes a small-group inquiry approach to critical thinking in science. It asks students to collaboratively explore a scientific question, or perhaps a series of related questions, within a scientific domain.

Suppose students are exploring insect behavior. Groups may decide what questions to ask about insect behavior; how to observe, define, and record insect behavior; how to design an experiment that generates evidence related to their research questions; and how to interpret and present their results.

An in-depth inquiry experience usually takes place over the course of several classroom sessions, and includes classroom-wide instruction, small-group work, and potentially some individual work as well.

Students, especially younger students, will typically need some background knowledge that can inform more independent decision-making. So providing classroom-wide instruction and discussion before individual group work is a good idea.

For instance, Kathleen Metz had students observe insect behavior, explore the anatomy of insects, draw habitat maps, and collaboratively formulate (and categorize) research questions before students began to work more independently.

The subjects of a science inquiry experience can vary tremendously: local weather patterns, plant growth, pollution, bridge-building. The point is to engage students in multiple aspects of scientific practice: observing, formulating research questions, making predictions, gathering data, analyzing and interpreting data, refining and iterating the process.

As student groups take responsibility for their own investigation, teachers act as facilitators. They can circulate around the room, providing advice and guidance to individual groups. If classroom-wide misconceptions arise, they can pause group work to address those misconceptions directly and re-orient the class toward a more productive way of thinking.

Throughout the process, teachers can also ask questions like:

- What are your assumptions about what's going on? How can you check your assumptions?
- Suppose that your results show X, what would you conclude?
- If you had to do the process over again, what would you change? Why?

II. Rethinking Science Labs

Beyond changing how students approach scientific inquiry, we also need to rethink science labs. After all, science lab activities are ubiquitous in science classrooms and they are a great opportunity to teach critical thinking skills.

Often, however, science labs are merely recipes that students follow to verify standard values (such as the force of acceleration due to gravity) or relationships between variables (such as the relationship between force, mass, and acceleration) known to the students beforehand.

This approach does not usually involve critical thinking: students are not making many decisions during the process, and they do not reflect on what they've done except to see whether their experimental data matches the expected values.

With some small tweaks, however, science labs can involve more critical thinking. Science lab activities that give students not only the opportunity to design, analyze, and interpret the experiment, but re-design, re-analyze, and re-interpret the experiment provides ample opportunity for grappling with evidence and evidence-model relationships, particularly if students don't know what answer they should be expecting beforehand.

Such activities improve scientific reasoning skills, such as:

- Evaluating quantitative data
- Plausible scientific explanations for observed patterns

And also broader critical thinking skills, like:

- Comparing models to data, and comparing models to each other
- Thinking about what kind of evidence supports one model or another
- Being open to changing your beliefs based on evidence

Traditional science lab experiences bear little resemblance to actual scientific practice. Actual practice involves decision-making under uncertainty, trial-and-error, tweaking experimental methods over time, testing instruments, and resolving conflicts among different kinds of evidence. Traditional in-school science labs rarely involve these things.

When teachers use science labs as opportunities to engage students in the kinds of dilemmas that scientists actually face during research, students make more decisions and exhibit more sophisticated reasoning.

Traditional science lab experiences bear little resemblance to actual scientific practice.

Lesson Plan Outline

In the lesson plan below, students are asked to evaluate two models of drag forces on a falling object. One model assumes that drag increases linearly with the velocity of the falling object. Another model assumes that drag increases quadratically (e.g., with the square of the velocity).

Students use a motion detector and computer software to create a plot of the position of a disposable paper coffee filter as it falls to the ground. Among other variables, students can vary the number of coffee filters they drop at once, the height at which they drop them, how they drop them, and how they clean their data.

This is an approach to scaffolding critical thinking: a way to get students to ask the right kinds of questions and think in the way that scientists tend to think.

Design an experiment to test which model best characterizes the motion of the coffee filters.

Things to think about in your design:

- What are the relevant variables to control and which ones do you need to explore?
- What are some logistical issues associated with the data collection that may cause unnecessary variability (either random or systematic) or mistakes?
- How can you control or measure these?
- What ways can you graph your data and which ones will help you figure out which model better describes your data?
- Discuss your design with other groups and modify as you see fit.

Initial data collection

Conduct a quick trial-run of your experiment so that you can evaluate your methods.

Do your graphs provide evidence of which model is the best?
What ways can you improve your methods, data, or graphs to make your case more convincing?

- Do you need to change how you're collecting data?
- Do you need to take data at different regions?
- Do you just need more data?
- Do you need to reduce your uncertainty?

After this initial evaluation of your data and methods, conduct the desired improvements, changes, or additions and re-evaluate at the end.

In your lab notes, make sure to keep track of your progress and process as you go. As always, your final product is less important than how you get there.

How to Make Science Labs Run Smoothly

Managing student expectations. As with many other lesson plans that incorporate critical thinking, students are not used to having so much freedom. As with the example lesson plan above, it's important to scaffold student decision-making by pointing out what decisions have to be made, especially as students are transitioning to this approach.

Supporting student reasoning. Another challenge is to provide guidance to student groups without telling them how to do something. Too much "telling" diminishes student decision-making, but not enough support may leave students simply not knowing what to do.

There are several key strategies teachers can try out here:

Point out an issue with their data collection process without specifying exactly how to solve it.

- Ask a lab group how they would improve their approach.
- Ask two groups with conflicting results to compare their results, methods, and analyses.

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Teaching Argumentative Writing: Tips To Teaching Critical Thinking Through Writing

Writing is a cornerstone of critical thinking — particularly the practice of argumentative writing.

Critical thinkers and writers must be able to adjust their views in light of new evidence; hone their arguments by considering criticism from those with opposing views; and be curious about ideas that can strengthen and deepen their thinking. A good critical thinker, like a good writer, recognizes that the thinking process is never-ending.

This parallel between thinking and writing is no accident, since writing is, as the National Commision on Writing puts it, "thought on paper." As such, teaching critical thinking in writing assignments is a natural fit. The writing process gives students an important and unique opportunity to build their critical thinking skills. This is particularly true for argumentative writing and the teaching for argumentative writing.

Thinking and Writing

The connection between thinking and writing is very strong. Most of our thinking takes place in a fleeting, internal manner — whether in conversation or trying to solve a problem by ourselves. We have thoughts and then put them into action, and then they are, by and large, gone.

Writing, on the other hand, automatically turns thinking into a longer-term and external process. Writing is not just produced by thought, but, because writing persists on paper and doesn't disappear, it can be subsequently changed and improved by further thinking.

As one philosophy professor writes, "writing transforms our cognitive abilities."

This means writing can involve different, more complex, and more sustained kinds of thinking than other kinds of learning activities. The habits of mind one develops through the writing process can also stay with us when we are thinking through issues and arguments outside of the context of writing. As one philosophy professor writes, "writing transforms our cognitive abilities."

Revision is not merely an addition to the writing process, nor to the thinking process; it is at the core of what thinking and writing, especially argumentative writing, are all about.

reboot
elevating critical thinking

How to Teach Argumentative Writing

The argumentative essay is a powerful way to get students started on critical thinking and writing. It gives students a chance to outline their arguments in a reflective way.

One way to go about teaching argumentative writing and critical thinking is through the following three-part approach with this sample assignment:

Sample Assignment

This two-part assignment encourages students to work with multiple sources, outline an argument, and develop a clear thesis.

This prompt comes from the 2011 AP English Language and Literature Exam:

Prompt: The following passage is from Rights of Man, a book written by the pamphleteer Thomas Paine in 1791. Born in England, Paine was an intellectual, a revolutionary, and a supporter of American independence from England. Read the passage carefully. Then write an essay that examines the extent to which Paine's characterization of America holds true today. Use appropriate evidence to support your argument.

"If there is a country in the world, where concord, according to common calculation, would be least expected, it is America. Made up, as it is, of people from different nations, accustomed to different forms and habits of government, speaking different languages, and more different in their modes of worship, it would appear that the union of such a people was impracticable; but by the simple operation of constructing government on the principles of society and the rights of man, every difficulty retires, and all the parts are brought into cordial unison. There, the poor are not oppressed, the rich are not privileged….Their taxes are few, because their government is just; and as there is nothing to render them wretched, there is nothing to engender riots and tumults."

Part One: Outline

The purpose of the first part of the assignment is to make sure students pay attention to how to structure an argument before they begin writing. This is particularly true for teaching critical thinking and writing. Teachers might want to work before the assignment on analyzing professionally written essays, like argumentative op-eds, and outlining them, so that students have a model, and so they begin analyzing writing in terms of its claims, arguments, and support.

Teachers might want to work before the assignment on analyzing professionally written essays, like argumentative op-eds.

Outlines can be short to begin with but should:

- contain an explicit one-sentence thesis statement on the topic: the extent to which students think that Paine's characterization of America holds true today.
- bring in supporting claims that use outside evidence that clearly blacks up the claim.
- organize the supporting claims into discrete blocks that clearly refer back to some element of the thesis.
- include (abbreviated) analysis of the both text and the outside evidence cited.
- include ideas for how to introduce and conclude the paper in a compelling and interesting way.

Class time should be spent discussing individual student outlines, and working in small groups to revise outlines with peers. As the outlining process progresses, teachers can also have students spend time, informally and/or formally, reflecting on the process as they go, asking questions like, for example:

- Do you see any weak spots in your argument?
- What have you learned about how to build an argument?
- How has the outlining process changed your approach to the topic?

Part Two: Draft

Once their outlines have been drafted and revised, students can begin the writing process. Again, if possible, teachers should think about building in opportunities for drafting and feedback as much as possible. During the writing process, students should also have an opportunity to present their ideas and arguments orally, in discussion either with the whole class in small groups.

This will give their peers further practice analyzing arguments, and give the writers further ideas for how to improve their arguments. These discussions can prove especially helpful in integrating opposing viewpoints into their argumentative writing. (Some teachers even go so far as to assign students' to write or argue from a point of view completely opposed to their original point of view.)

During the process of oral discussion, teachers can emphasize that argumentative writing is, in many ways, a formalization of the kind of conversational debate we engage in everyday and that is typical in a healthy democratic society.

Part Three: Feedback

For educators, it can be difficult to find the right tone to strike with writing feedback, as well as whether to prioritize deep feedback (on content and argument) or surface feedback (on things like sentence structure and grammar). Time constraints obviously play a role here too, and teachers must adjust their feedback according to their knowledge of individual student needs.

But, by and large, the best feedback achieves two key objectives:

- Good feedback models good writing and revising skills by explaining exactly how a student's writing can be improved, why it should be improved, and suggesting concrete improvements.
- Good feedback helps students begin to reflect on how their writing communicates to the reader.
- When it comes to good feedback, reflection on opposing viewpoints is especially important. The best feedback pushes writers to consider opposing viewpoints and integrating them into their argument. Whether the writer then tempers their argument by giving some credence to the other side or is able to successfully argue against it, the result is more nuanced argumentation and more persuasive writing. Papers that only advance a hypothesis without considering counter-arguments will remain limited in their argumentative power.

Other important things to consider about writing feedback is when, how, and how much to give:

- An overwhelming amount of feedback, especially on surface-level issues, can overwhelm students and prevent them from devoting time to reflection, so it might be best to focus on one or two problem areas at a time.
- When grades and comments are given simultaneously, students can consider comments to be simply a way of justifying a grade. Educators can consider ways to separate feedback and grading — formative and summative assessment — in order to ensure that the former is considered seriously by students. The mere presence of a grade can interfere with deeper thinking.

Peer review can be enormously beneficial. It not only helps students understand how their prose reads to an outside reader, but the practice of reviewing can reveal problems and highlight effective techniques they might find when rereading their own argumentative writing. But focus, again, is key. The peer review process can go off the rails if students are not working on a particular issue: for example, finding clear links between supporting paragraphs and the thesis statement. Providing students with feedback checklists as they examine their peers' work can work well. Here are some ideas from the University of Wisconsin.

Parting Thoughts: Argumentative Writing and Critical Thinking

In formative feedback on paper drafts, instructors should be sure to set up clear examples of good writing and provide exemplars. Discussing successful models from past or current students' papers can be a great way to do that as well.

Teachers should build in time for journaling and reflection on the writing process. This can help consolidate the thinking and writing lessons learned during the process. It can also help students reflect on how their own ideas changed during the writing process. Did they learn something new, change their position, come to take on outside view more seriously than before, etc.?

In other words, did they revise their thinking as they revised their words?

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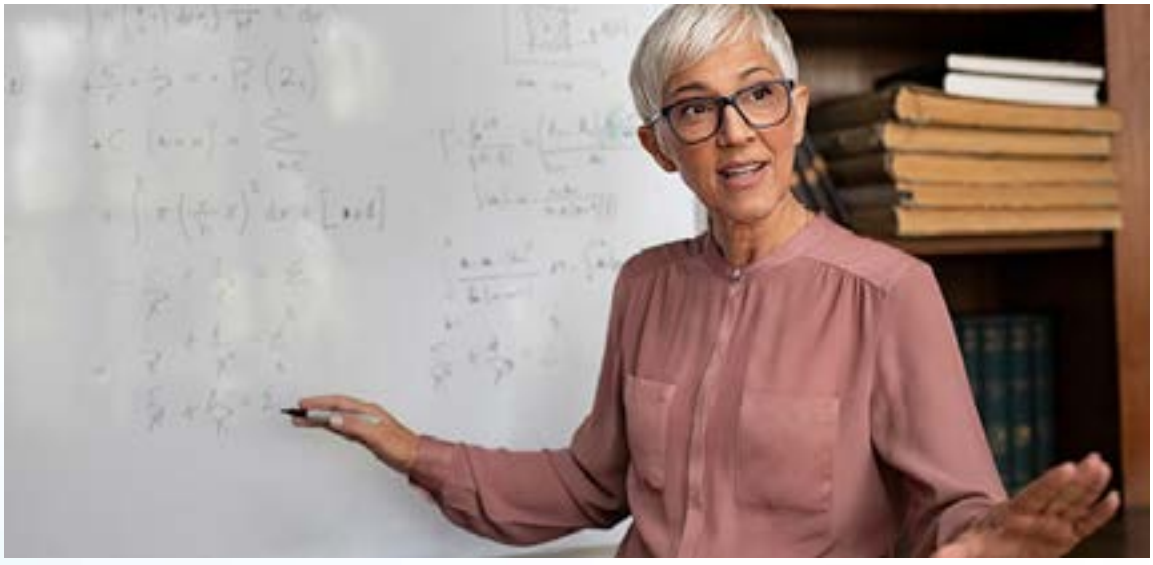
Teaching Mathematical Reasoning: Critical Math Thinking Through Problem-Solving and Modeling

What is mathematical reasoning? The short answer is that is that is reasoning with math, and in a sense, it's the skill that underlies all other math skills. Math reasoning is not just skill in completing math worksheets or the math section on a standardized test. It involves skill in integrating math knowledge into real-life and everyday problems and using math to conceptualize complex problems that aren't inherently mathematical themselves.

Developing skills in mathematical reasoning can contribute significantly to students' overall critical thinking skills. It's also central to being proficient in math and being able to solve math problems.

In this article, we outline two approaches to fostering mathematical reasoning skills and improved critical thinking in math:

- **Mathematical problem-solving:** This approach makes students think conceptually about problems before applying tools they've learned.
- **Mathematical modeling:** Modeling projects give students experience in weighing several factors against one another and using mathematical knowledge to make decisions.



I. Mathematical Problem-Solving

An emphasis on open-ended mathematical problem-solving can help develop mathematical reasoning skills and address a problem teachers have long been concerned about: too much "rote" learning in math.

Too often students spend time in math class memorizing procedures and applying them mindlessly to problems. This leads to errors when students are confronted with unfamiliar problems. It also contributes to a widespread misperception of math as boring and lacking relevance to everyday life.

On the other hand, attempting to remedy this problem by giving students open-ended problems has its own drawbacks. Without the conceptual and methodological tools to solve these problems students become frustrated and disengaged. It can end up being an inefficient way to spend class time.

Although learning fundamental math skills like algorithms for adding, subtracting, multiplying, and dividing is absolutely critical for students in the early grades, the deeper mathematical problem-solving skills are the ones we really want students to graduate with. How can we ensure they do?

The deeper mathematical problem-solving skills are the ones we really want students to graduate with.

Evidence suggests that skills in mathematical problem-solving lead to more general improvements in outcomes related to math. They help students acquire a deeper understanding of mathematical reasoning and concepts.

For instance, the commutative property, which most students learn applies to addition and multiplication problems (changing the order of the operations doesn't affect the outcome), also applies to other logical and practical situations. A familiarity with some of these situations fosters deeper conceptual understanding, and deeper conceptual understanding leads to better critical thinking.

And learning these skills helps students improve outcomes related to critical thinking more generally. For example, students who become skilled in mathematical problem-solving tend to also:

- Create beneficial habits of mind — persistence, thoroughness, creativity in solution-finding, and improved self-monitoring.
- Break down hard problems into easier parts or reframing problems so that they can think about them more clearly.
- Some problem solving tactics are applicable to situations well beyond math: making a visualization of a situation to understand it more clearly; creating a simplified version of the problem to more easily address the essence of the problem; creating branches of possibilities to solve the problem; creating "what if" example cases to test key assumptions, etc.
- Elevate the value of discussion and argumentation over simple appeals to authority.

Small-group mathematical problem solving targets skills that traditional mathematics instruction doesn't. Instead of just finding a match between an algorithm and a question, students must: adapt or create an algorithm; evaluate and debate the merits of different solution paths; and verify their solution through additional evidence.

Small-group mathematical problem solving targets skills that traditional mathematics instruction doesn't.

This process continues until the class has thoroughly explored the problem space, revealing multiple solution paths and exploring variations on the problem or contrasting problem-types.

Of course, the usefulness of a question like this depends on what students already know. If students don't already know that chickens have two legs and pigs have four, they're just going to be confused by the problem (and the explanation of the solution). It also requires some other basic skills—for instance, that if one chicken has two legs, four chickens would have eight.

As a way of evaluating student growth, teachers could also include some of these open-ended problems in homework assignments or as extra credit assignments.

Lesson Plan Outline

An example that might be appropriate for fifth grade is something like the following:

A farmer has some pigs and some chickens. He finds that together they have 70 heads and 200 legs. How many pigs and how many chickens does he have?

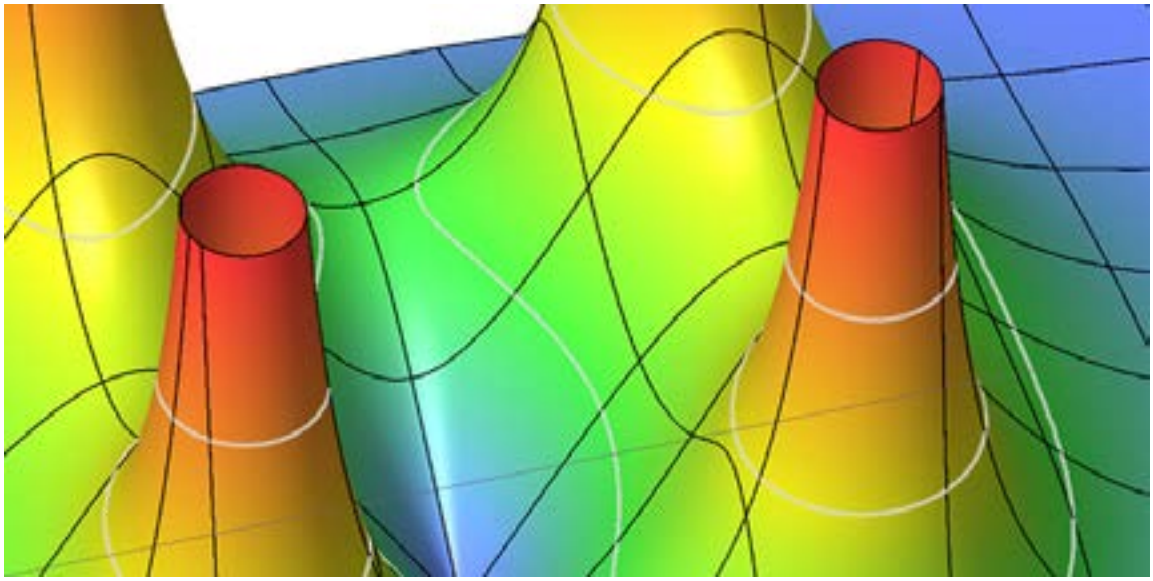
Divide the class into student groups of three to four. Have students spend a few minutes reading over the problem individually. Then let student groups discuss possible solution paths. The teacher walks around the classroom, monitoring the groups. Then the teacher leads a whole-class discussion about the problem.

- So how did you go about thinking about the problem?
- Show us how you got your answer and why you think it's right. This might mean that a student goes up to the board to illustrate something if a verbal explanation is inadequate.
- And what was the answer you got?
- Does anyone else have a different way of thinking about the problem? If there are other ways of solving the problem that students didn't come up with, teachers can introduce these other ways themselves.

Developing Math Problem-Solving Skills

Teachers should keep in mind the following as they bring mathematical problem-solving activities into their classrooms:

- Problem selection. Teachers have to select grade-appropriate problems. A question like "John is taller than Mary. Mary is taller than Peter. Who is the shortest of the three children?" may be considered an exercise to older students — that is, a question where the solutions steps are already known — but a genuine problem to younger students. It's also helpful when problems can be extended in various ways. Adding variation and complexity to a problem lets students explore a class of related problems in greater depth.
- Managing student expectations. Introducing open-ended math problems to students who haven't experienced them before can also be confusing for the students. Students who are used to applying algorithms to problems can be confused about what teachers expect them to do with open-ended problems, because no algorithm is available.
- Asking why. Asking students to explain the rationale behind their answer is critical to improving their thinking. Teachers need to make clear that these rationales or justifications are even more important than the answer itself. These justifications give us confidence that an answer is right. That is, if the student can't justify her answer, it almost doesn't matter if it's correct, because there's no way of verifying it



II. Mathematical Modeling

Another approach is mathematical modeling. Usually used for students in middle or high school, mathematical modeling brings math tools to bear on real-world problems, keeping students engaged and helping them to develop deeper mathematical reasoning and critical thinking skills.

Math modeling is an extremely common practice in the professional world. Investors model returns and the effects of various events on the market; business owners model revenue and expenses, buying behavior, and more; ecologists model population growth, rainfall, water levels, and soil composition, among many other things.

But, despite these many applications and the contributions it can make to general mathematical reasoning and critical thinking skills, mathematical modeling is rarely a main component of the math curriculum. Although textbook examples occasionally refer to real-world phenomena, the modeling process is not commonly practiced in the classroom.

Modeling involves engaging students in a big, messy real-world problem. The goals are for students to:

- refine their understanding of the situation by asking questions and making assumptions,
- leverage mathematical tools to solve the problem,
- make their own decisions about how to go about solving the problem,
- explain whether and how their methods and solutions make sense,
- and test or revise their solutions if necessary.

Mathematical modeling typically takes place over the course of several class sessions and involves working collaboratively with other students in small groups.

Modeling is not just about getting to a "right" answer — it's about considering factors beyond mathematics as well.

Modeling also offers the opportunity to integrate other material across the curriculum and to "think mathematically" in several different contexts. Modeling is not just about getting to a "right" answer — it's about considering factors beyond mathematics as well. For example, students deal with questions like:

- What is a "fair" split?
- What level of risk should someone tolerate?
- What tradeoffs should a society make?

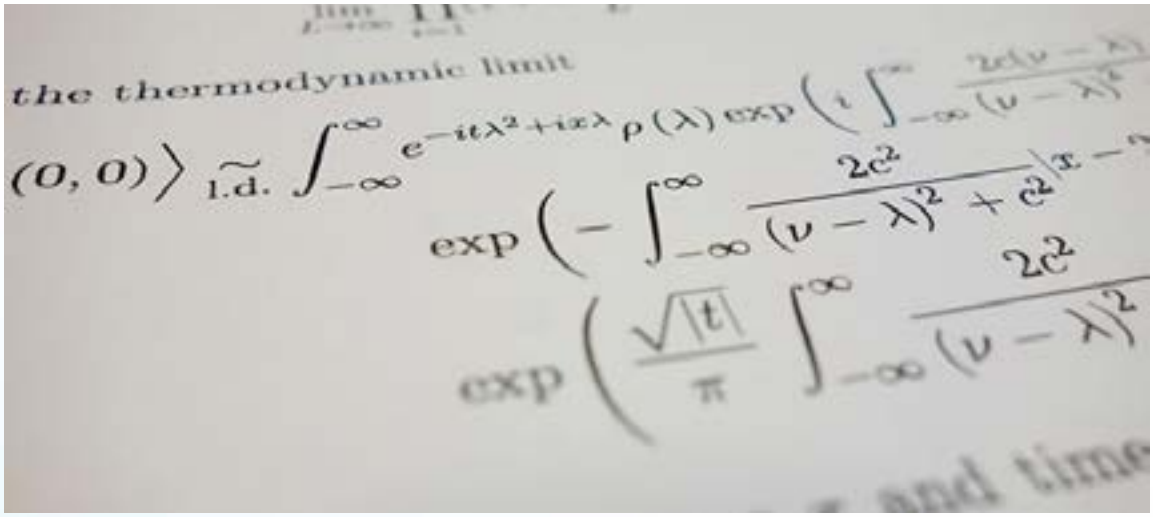
In others words, students come to see mathematics as the socially indispensable tool that it is, rather than an abstract (and sometimes frustrating) school subject.

Mathematical Modeling and Critical Thinking

Research suggests that the ability to solve abstractly framed academic math problems is not necessarily related to mathematical reasoning more broadly: that is, the ability to use math well in everyday life or to integrate mathematical thinking into one's decision-making. Students may be able to follow procedures when given certain cues, but unable to reason about underlying concepts.

It's also very common to hear complaints from students about math — that either they aren't "math people," that math is irrelevant, or that math is simply boring.

Mathematical modeling is one approach to resolving both these problems. It asks students to move between the concreteness of real — or at least relatively realistic — situations and the abstraction of mathematical models. Well-chosen problems can engage student interest. And the practice emphasizes revision, step-by-step improvement, and tradeoffs over single solution paths and single right-or-wrong answers.



Lesson Plan Outline

Mathematical modeling often begins with a general question, one that may initially seem only loosely related to mathematics:

- how to design an efficient elevator system, given certain constraints;
- what the best gas station is to visit in our local area;
- how to distinguish between two kinds of flies, given some data about their physical attributes.

Then, over the course of the modeling process, students develop more specific questions or cases, adding constraints or assumptions to simplify the problem. Along the way, students identify the important variables — what's changing, and what's not changing? Which variables are playing the biggest role in the desired outcomes?

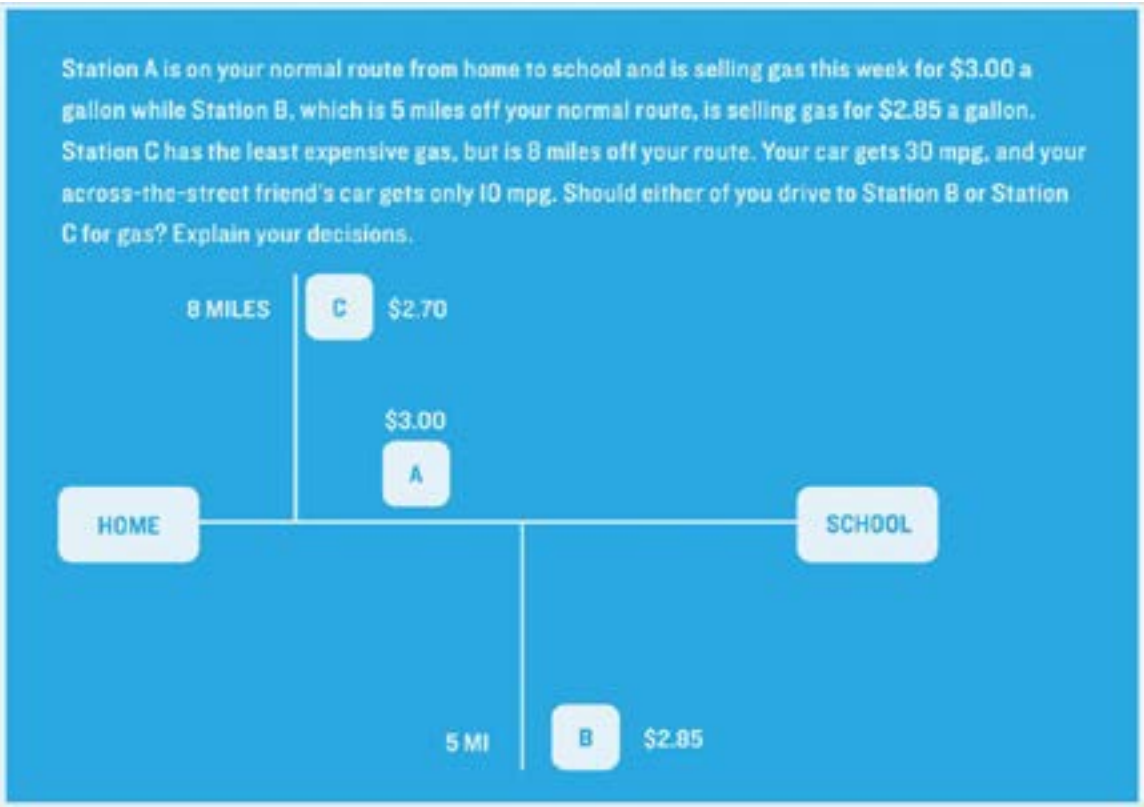
Students with little experience in modeling can leap too quickly into looking for a generalized solution, before they have developed a feel for the problem. They may also need assistance in developing those specific cases. During this part of the process, it can be easiest to use well-defined values for some variables. These values may then become variables later on.

After students explore some simplifying cases, then they work on extensions of these cases to reach ever more general solutions.

A key part of this activity is letting students be creative — students will often come up with unusual or especially innovative solutions.

Throughout the modeling process, the teacher may need to point out missing assumptions or constraints, or offer other ways of reframing the problem. For any given modeling problem, some solutions are usually more obvious than others, which leads to common stages students may reach as they solve the problem. But a key part of this activity is letting students be creative — students will often come up with unusual or especially innovative solutions.

A sample problem, from the Guidelines for Assessment and Instruction in Mathematical Modeling Education is below:



This problem involves variables that aren't necessarily immediately apparent to students. For instance, the size of the gas tank, and how much gas you fill up on per trip. As students manage this specific case, they can take other hypothetical scenarios to generalize their solution: if it's 10 miles away, how cheap would the gas have to be to make it worth it? What about the time spent in the car — is there a value to put on that?

Many modeling problems can be arbitrarily extended in various directions. Instead of just considering the best gas station to go to for a single car, for instance, students can explore the behavior of a fleet of trucks on set routes or seasonal changes to gas prices.

It's also possible to include shorter modeling activities, where students work together in pairs or small groups to extend a problem or interpret the meaning of a solution.

These kinds of modeling activities are not reserved solely for older students. One example of a modeling problem for students in elementary school might be something like: what should go in a lunchbox? Students can talk about what kinds of things are important to them for lunch, "mathematize" the problem by counting student preferences or coming up with an equation (e.g., lunch = sandwich + vegetable + dessert + drink); and even explore geometrically how to fit such items into a lunchbox of a certain size.

Teaching Mathematical Modeling: Further Key Factors

Mathematical modeling activities can be challenging for both teachers and students.

Often, mathematical modeling activities stretch over several class periods. Fitting modeling activities in, especially if standardized tests are focused on mathematical content, can be challenging. One approach is to design modeling activities that support the overall content goals.

The teacher's role during mathematical modeling is more like a facilitator than a lecturer. Mathematical modeling activities are considerably more open-ended than typical math activities, and require active organization, monitoring, and regrouping by the teacher. Deciding when to let students persevere on a problem for a bit longer and when to stop the class to provide additional guidance is a key skill that only comes with practice.

The teacher's role during math modeling is more like a facilitator than a lecturer.

Students — especially students who have traditionally been successful in previous math classes — may also experience frustration when encountering modeling activities for the first time. Traditional math problems involve applying the right procedure to a well-defined problem. But expertise at this kind of mathematical reasoning differs markedly from tackling yet-to-be-defined problems with many possible solutions, each of which has tradeoffs and assumptions. Students might feel unprepared or even that they're being treated unfairly.

Students also have to have some knowledge about the situation to reason mathematically about it. If the question is about elevators, for example, they need to know that elevators in tall buildings might go to different sets of floors; that elevators have a maximum capacity; that elevators occasionally break and need to be repaired.

Finally, the mathematical question needs to be tailored to students' experience and interests. Asking a group of students who don't drive about how to efficiently purchase gas won't garner student interest. Teachers should use their familiarity with their students to find and design compelling modeling projects. This is chance for both students and teachers to be creative.

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Teaching Media Literacy: How to Help Students Navigate the News

Recent changes to the news have transformed media literacy education into an absolute necessity for today's students. But when it comes to actually teaching media literacy, we are in many ways still at square one.

The changes to our information ecosystem have been disruptive. Pernicious sources of misinformation have cropped up, likely having some influence on democratic processes. Social media and ubiquitous tech have changed the way we consume news. And the media industry has undergone substantial shifts to its financial model that have degraded quality and encouraged siloing and groupthink.

> Beginning at a young age, children need help learning to navigate the internet, avoid distractions, and evaluate sources of information.

Amidst all this upheaval, there have been calls for greater media literacy instruction in schools. It's easy to see that, beginning at a young age, children need help learning to navigate the internet, avoid distractions, and evaluate sources of information. This is not just vital for the health of democratic culture and politics, but also, some research suggests, for their own mental health.

Given the fact that most of us are ourselves struggling to navigate this new information environment, it can be difficult to know how to train students. But there's a lot teachers can do to help.

Kids and Media Literacy

Media literacy education should begin at an early age because media consumption begins at an early age. By the age of 8, over 20 percent of kids already have their own smartphones, and by the age of 12, two-thirds do.

The impacts of smartphone use among children and preteens are still not well understood, and it can be difficult to distinguish aspects of a moral panic about tech from genuine problems with technology use.

Still, research from the National Institutes of Health suggests kids spending more than two hours a day performed worse on language and thinking tests. And other research continues to suggest links between tech use and higher rates of depression and suicide attempts among teens.

Although much of the responsibility for kids' media use obviously falls on parents, educators have an important role to play too, especially in ensuring students' thinking skills are augmented, rather than hindered, by their access to information.

One of the most difficult things for children and adults alike is figuring out how to intentionally and actively research and interpret media instead of passively consuming it. Passive consumption makes us more likely to be manipulated even by news sources that may be factual, but present information in a partial or misleading way.

Integrating Media Literacy Into Your Curriculum

Although new initiatives to foreground media literacy have begun in earnest, especially in the aftermath of the 2016 election, there is relatively little time or space in most curricula for explicit media literacy instruction, and standalone media literacy courses are still relatively rare.

Fortunately, media literacy can be integrated into different research projects in the curriculum, especially in writing, history, or civics lessons. And there are lots of exercises, discussions, and assignments teachers can construct in different contexts to help students improve their relationship to media. Media is omnipresent in students' lives and, increasingly, in their studies too. Teaching media literacy the habits of healthy media consumption need not be confined, therefore, to media literacy courses.

Passive consumption makes us more likely to be manipulated even by news sources that may be factual

Below are some suggestions for how to integrate media literacy into your curriculum:

1. Teach Students About How Media Influences Focus. Many students will enter middle and upper elementary school already well-versed in using technology including smartphones, but they may be less aware of how and why apps and social media websites are designed the way they are. An important step toward media literacy is recognition of the interests of advertisers, app designers, and other groups involved in students' use of their phones.

Teachers can spend time with students talking about how and why these devices have been prized by advertisers, how they attempt to manipulate and maintain attention, and the various negative psychological impacts this can have, especially on young people.

Below are a set of articles, one or many of which teachers might organize a conversation around:

- "What It Takes to Put Your Phone Away," Jia Tolentino, The New York Times
- "Can we trust the people who got us hooked on the internet to save us from it?" Kaitlyn Tiffany, Vox
- ·"'The attention economy is in hyperdrive': how tech shaped the 2010s," Oliver Burkeman, The Guardian
- "How does technology impact teenagers' brains? We still don't have enough research to know." Shirin Ghaffary, Recode

These articles cover topics that students should have a natural interest in, so it could be useful and productive to let them talk about them in small groups first. Teachers might make individual students responsible for summarizing the arguments and/or information offered in each article. They could then open up class discussion to more personal concerns and ideas, for example asking students questions like:

- Do you notice your attention span and anxiety levels increasing from spending a lot of time online or on social media?
- Do you use any tools or strategies to prevent yourself from getting distracted online? Why or why not?
- Do you think tech companies or the government have a responsibility to regulate addictive and manipulative features of the internet?
- Do you think the internet has had an overall negative or positive impact on society and culture? Politics? Personal relationships?
- What is media literacy? What does it mean to you? Do you consider yourself media literate?

These kinds of discussions will help students see themselves, metacognitively, as media consumers who need to be careful and intentional about how they navigate the internet and consume information. This is a necessary first step to more careful engagement with media.

2. Encourage Students to Read Laterally. One very significant challenge in teaching media literacy is giving students the skills to challenge and verify information without making them cynical and untrustworthy about all information, even that coming from high-quality sources.

One of the most important ways to do this is through what some media literacy researchers have dubbed "lateral reading." This means interrogating information from a single source by trying to verify or refute it through other — known and reliable — sources.

The Civic Online Reasoning curriculum at Stanford University includes lessons on lateral reading, helping students to interrogate, for example, a tweet from an unreliable source by opening up new browser tabs and looking for information from other more reliable sources.

> No source is perfectly reliable, nor without some kind of bias.

Practice in lateral reading teaches students how to step back from single sources ("reading vertically") to see the broader picture. The practice will also teach them that there are often no simple answers to analyzing information online. No source is perfectly reliable, nor without some kind of bias.

This doesn't mean, of course, that everything is to be automatically distrusted, but just that reasoning, especially in this complex information environment, requires a great deal of good judgment, independence, and willingness to do the research.

3. Engage in Media Analysis. As they gain skills in lateral reading, teachers can introduce more complex assignments in middle and high school on reasoning through matters of opinion and complex policy analysis. For example, teachers could have students read this article, by President Trump's Chief Economic Advisor at the time Gary Cohn, on the tax reform bill that passed in 2017.

Depending on the stage of their students' media literacy skills, teachers might then have students conduct and synthesize research independently on the promises and effects of the tax cut. Or they might give them a selection of articles from different ideological perspectives to read.

Specifically, a teacher could give their students these articles:

- "How FedEx Cut Its Tax Bill to $0," The New York Times
- "America Is Competitive Again," Gary D. Cohn, The Wall Street Journal
- "How Trump Turned Tax Day Into a Giveaway for the One Percent," Mother Jones
- "This is how much American workers saved during the first year after Trump tax overhaul," Marketwatch
- "Let the dust settle on the TCJA before judging its effectiveness," American Enterprise Institute
- "A New Congressional Study Finds Little Economic Benefit From The 2017 Tax Cuts," Tax Policy Center

Class discussion about these articles can be organized around questions that drive students to reflect at a deeper level on the assumptions and behind these stories. Questions might include:

- Analyze the rationale for passing tax reform. What are the different reasons the president and Republican lawmakers support the law?
- What are defenders and critics of the bill saying now? What evidence do they cite for their arguments?
- On balance, which arguments do you think are more convincing? Why?

The class discussion might then lead into an analytical writing assignment. As the students analyze these sources, they should concentrate on a few things:

- Checking for bias: Examining the reliability and biases of the sources. What makes them think sources are reliable or unreliable? What perspective does each source come from? What biases does each potentially bring to the issue?
- Framing and rhetoric: How do these stories frame their analysis, using anecdotes or facts, for example. Do they appeal to emotions or reason? Do they engage with opposing points of view persuasively?

What's missing? Often a news or opinion piece will avoid facts that complicate or contradict its position. Students should be on the look-out for what goes missing and what that says about the message of the piece.

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Teaching Civics: How to Cover Society and Politics in Contentious Times

Given the recent upheavals in American and international politics and the shifting media landscape, there has been a very understandable desire for schools to make a commitment to teaching civics and critical thinking around social and political issues.

Citizenship and civics education has long been thought a central component of education. Indeed the public school system was largely based on the idea that an informed population was necessary for a well-functioning republic. Today, the importance of civics is recognized in theory, but in practice, little time is devoted to civics, at either the primary or secondary school level.

Civics education can start in elementary school, but middle and early high school are opportune times to commit to civics. Students typically have some background knowledge of government and current affairs, and they are eager to express and develop their developing understanding and opinion. But they need encouragement, guidance, and the right setting in order to do so effectively.

Even in the calmest times, teaching civics presents teachers with difficulties:

- Teachers must themselves be informed about the issues under discussion.
- They must be cognizant of students' varying backgrounds and experiences.
- And they must be adept at fostering open and productive discussion around uncomfortable or controversial issues.

Below we outline some of these challenges for teaching civics and offer tips for overcoming them. The article concludes with ideas about how to conduct a discussion around the issue of the death penalty.

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Teaching Controversial Issues

In our politically charged environment, it can feel risky for teachers and students alike to take on topics like social justice, the news media, and electoral politics.

The first step for teachers to take is to lower the temperature around some of these concerns.

They can do this by:

- Setting ground rules and norms.
- Stressing the importance of good faith debate. Make it clear to students that in debate you should criticize arguments not people.
- Emphasizing the need to make an effort to understand different points of view and to give people the benefit of the doubt.
- Establishing a clear distinction between facts and opinions.

Very often, asking students to express their opinions and engage with their peers' opinions brings up new questions of fact. In a discussion of the death penalty, for example, some students might argue that it is effective as a deterrent while others might claim that prison sentences can have a similar effect. That might lead to further questions over whether the violent crime rate in states with the death penalty is depressed compared to those that don't have it.

Teachers should be comfortable with letting these conversations go where they will, at least to a certain extent. If new questions of fact arise that are difficult to answer, teachers can use this as an opportunity to model good research skills.

Managing the Classroom During Civics Discussions

Of course, there are multiple effective ways to facilitate civics discussions. But a few key elements are shared by most.

Preparation. Students will likely flounder if they do not have enough background on the issue to be discussed. Preparation is crucial and should be focused on getting the information in students hands that they will need to make good arguments. Think of this something like a briefing before a debate.

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For example, one civics teacher leads a discussion in his social studies class each year on the Supreme Court case, New York Times Co. v. United States, dealing with freedom of the press and national security. He has students read the case and complete an assignment identifying the basic arguments made by the Justices in their opinions. They then break up into small groups to discuss the text. The teacher even goes so far as to require students to demonstrate a good understanding of the topic before they go on to debate it.

If students know they'll be expected to actively use the information they're studying, it gives them some skin in the game, and is likely to help with focus and motivation.

Modeling Debate Skills. Many students don't have a good mental model of what productive civics discussions look like. One teacher tries to solve this problem by showing students a video from a previous year's discussion where students engaged with each other in an exemplary way. Other teachers use the "fishbowl" method, that alternates the students who participate in the debate with those on the outside, who act as observers reflecting on the strategies and effectiveness of the participants.

Learning how to debate productively also involves learning a new language and conversation pattern. It's useful to be explicit about these things. Teachers can model this language by stopping conversation and rephrasing what students say — or by interjecting their own view. A lot of this language can also help lower the temperature on heated conversations. (Education researcher Terry Heick offers a good list of sentence stems for civics debate here.)

> Writing exercises can be an excellent way to surface students' understanding and views — especially those students who may not yet be comfortable expressing themselves orally.

Mixing Media. Perhaps the most important skill involved in learning to be a critical thinker is learning to express yourself effectively and articulate your thoughts over a variety of different media. Writing exercises can be an excellent way to surface students' understanding and views — especially those students who may not yet be comfortable expressing themselves orally. Quick in-class writing assignments can be a great way to begin. Writing stimulates thoughts and raises new questions that can then be asked and addressed in an open-class discussion Teachers might also experiment with audiovisual projects.

Fostering a Relaxed, Open Environment. Perhaps the most important thing is to make students comfortable trying out views and arguments.

Many teachers role-play debates — meaning students are pre-assigned to argue from a certain perspective. This both helps relax students, since their own opinions aren't being scrutinized, and it gives them the opportunity to inhabit perspectives other than their own — a key component of critical thinking. Playacting can also be fun, of course!

Another idea is to have students switch sides in the middle of a debate. This forces them to integrate opposing viewpoints into their thinking and helps instill the habit of always considering the ways in which they might be wrong.

Example Lesson: Discussing the Death Penalty

Opening and Background. Like in any good written work or presentation, it can be good when teaching civics to begin with an attention-grabbing story or anecdote, especially something connected to current events, so that students will immediately see the relevance of the discussion.

So, with the death penalty debate, for example, you might begin by discussing the Supreme Court's recent decision on the federal use of the death penalty, which permitted the first federal execution in 17 years.

Teachers might then survey the class to get a sense of students' initial views and observations, before delving into more background on the court's opinion and the dissenting opinions.

Discussion. Consider setting up formal mechanisms for debate, where students are assigned to adopt and argue for particular points of view. Then give students time in class or at home to research arguments on their own. The Death Penalty Information Center is a good place to start.

After a formal structured argument where groups of students are given a chance to present their arguments and respond to counter-arguments, it makes sense to lead a guided, metacognitive reflection on the debate. This should cover both reflection on the mechanism of the debate and questions like:

- What worked in your argument? What didn't?
- How could you have better prepared?
- Were you able to anticipate and respond to counter-arguments?
- What did you learn about rhetoric, argumentation, using evidence, etc. that you can apply to future civics discussions (both in the classroom and outside it)?

Students should also address how their own opinions and thinking was strengthened or changed by the research and argumentation process. They should reflect on questions like:

- How did your opinion change?
- Did you find the issue more complicated than you thought at first?
- Did you have trouble reasoning through some of the arguments?
- Do you feel more secure in your opinions now?

Deepening. In this example, a civics educator might consider moving beyond the particulars of the death penalty debate to more abstract issues: like the purpose of the justice system as a whole. They can ask and address questions like:

- What is justice?
- What is the purpose of punishment and the justice system?
- Should we interpret U.S. founding documents more in the light of the intentions of the framers or in light of contemporary moral concerns?
- Do the principles behind our justice system need to be reformed? If so, should reform proceed radically or piecemeal?

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Philosophy and Critical Thinking: The Value of Asking the Deep Questions

Although we've emphasized in this guide that critical thinking skills cannot be taught in isolation from subject matter, there is a great deal of critical thinking to be learned from a subject that studies thinking itself: namely, philosophy. Philosophy and critical thinking are a natural pair.

American schools, unlike schools in some other parts of the world, have been hesitant to adopt philosophy courses into the curriculum. (One exception is the International Baccalaureate curriculum which includes a course called "Theory of Knowledge.") One reason for this is that philosophical texts are often thought of as too dense and difficult for primary and secondary school students.

Philosophy does, of course, involve a corpus of often quite difficult texts from different traditions, but philosophical reasoning itself is not at all outside the reach of even young children. Indeed, children show an interest in philosophical questions at a very young age.

Philosophical reasoning itself is not at all outside the reach of even young children. Indeed, children show an interest in philosophical questions at a very young age.

And older students, especially those who might be demotivated or struggle in other subjects, can be stimulated by the more open-ended, argumentative, and profound nature of philosophical thinking. Philosophical thinking also has a unique, interdisciplinary character that makes it ideal for helping students see connections across disciplines.

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Philosophy for Kids

Philosophical reasoning is not something foreign to kids that needs to be forced on them from the outside. They all naturally ask philosophical questions like:

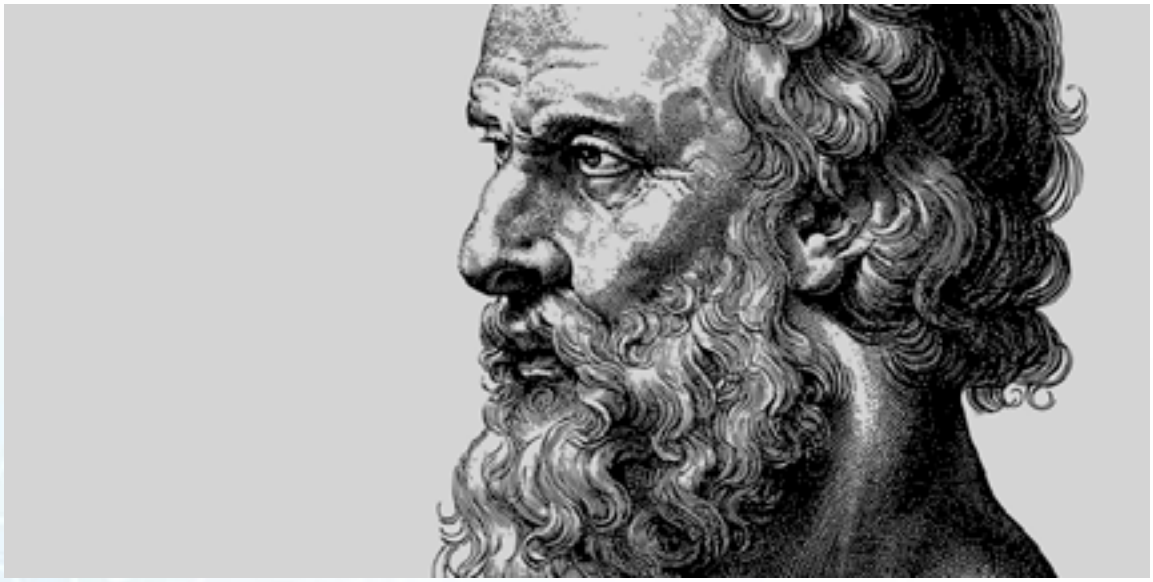
- “How can we be sure that everything is not a dream?”
- “When Dad tells me to be good, what does he mean?”
- “Why is time so slow sometimes?”

Philosophy for kids programs and courses can help encourage this inquisitiveness and help kids to learn to channel it into a reflective frame of mind.

Many philosophy for kids programs attempt to initiate this type of thinking through narrative. For example, the Institute for the Advancement of Philosophy for Children (IAPC) at Montclair State University, which goes back to the work of Matthew Lipman in the 1970s, uses stories to stimulate discussion of a philosophical topic. Children then discuss the topic in a “community of inquiry” where the teacher acts as a facilitator, who “both guides the children and models for them — by asking open-ended questions, posing alternative views, seeking clarification, questioning reasons, and by demonstrating self-correcting behavior.”

Other philosophy for kids initiatives use other stimuli, like visuals, thought experiments, or simply probing questions. But they share the goal of building a “community of inquiry,” where students get a chance to discuss and refine their ideas with one another, undertake to understand outside perspectives, and consider big questions outside the scope of more standard learning.

There is evidence that these kinds of philosophical activities can have a positive impact on student achievement. The Education Endowment Foundation in the UK found in an initial study of Philosophy for Children for 8-10 year olds that the program was promising: students made gains in math and reading compared to those who did not participate



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Teaching Philosophy to Middle and High School Students

As they get older, students are ready for more complex philosophical reasoning as well as instruction in formal logic. Philosophy can, moreover, be a driver of interdisciplinarity during middle and high school, since reflecting on the state of knowledge in other disciplines is one of the core tasks of philosophy.

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This kind of interdisciplinarity may help address one of the thorniest problems with critical thinking instruction: namely, transferability. As we've noted, critical thinking skills in one domain do not easily transfer to other domains. Teaching general critical thinking skills without any context is thus generally not effective. But that doesn't mean students shouldn't spend time thinking about how the skills and knowledge they've gained in one domain relate to those gained in another. Philosophical reasoning is a perfect complement here.

One way teachers can get middle and high school students to start thinking more philosophically in an interdisciplinary context is through epistemology, or the study of knowledge.

Idea for Discussion: What Is Knowledge?

Philosophy is concerned, more than many other disciplines, with definitions. It takes concepts that we might take for granted, like knowledge, and problematizes them, by asking questions like:

How do we know something?

- Are there general principles for what counts as knowledge or does it depend on the discipline?
- How do we come to know things in science? In our daily lives? In religion or aesthetic experiences?

It's easy for these conversations to become too abstract so it's best to start with something concrete. Break students up and assign them each a particular subject matter: art, science, religion, and morality, for example. Ask them to define knowledge in each of these domains?

- How do you know a piece of artwork is good?
- How is a scientific theory known to be true?
- How do people know a religious belief they have is true?
- How do we know the difference between right and wrong moral actions?

Ask students to come up with a definition. As they discuss, circulate to make sure students are using examples from their own study and experiences and trying to develop a list of criteria for knowledge in these different domains.

Bring the class back together to evaluate the definitions. Ask students from other groups to scrutinize each others' definitions. The teacher might raise certain objections to try and deepen discussion:

- In science, for example, a group might say a theory is known to be true because it is verified in experimental results. But Isaac Newton's physics were eventually shown to be inaccurate in certain cases. Is it right to say that before Albert Einstein came along, with a new, more experimentally accurate theory, people knew Newton's theory was true? Or did they only think they knew?

Then, ask students to reflect on whether there is anything shared among these different kinds of "knowledge." Questions that might come up include:

- Are there any general shared principles of inquiry common to these different domains: for example, experimentation or learning from one's predecessors?
- Is it just happenstance that we happen to apply the words "know" and "knowledge" to these very different activities?
- Can we draw a clean distinction between practical knowledge ("knowing how") and theoretical knowledge ("knowing that")?

By working through concepts like "knowledge" in discussion, students will ideally begin to see themselves as independent thinkers whose task as students is not just to absorb and retain information but think creatively and critically about it.

The connections they uncover between disciplines can also help them reflect on broader questions like what they value intellectually and what their education is really for. This can have a clarifying and motivating force for students of all backgrounds, helping them to pursue their education with a enhanced sense of meaning.

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