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For close to 50 years, educators and politicians from classrooms to the Oval Office have stressed the importance of graduating students who are skilled critical thinkers.

Content that once had to be drilled into students' heads is now just a phone swipe away, but the ability to make sense of that information requires thinking critically about it. Similarly, our democracy is today imperiled not by lack of access to data and opinions about the most important issues of the day, but rather by our inability to sort the true from the fake (or hopelessly biased).

We have certainly made progress in critical-thinking education over the last five decades. Courses dedicated to the subject can be found in the catalogs of many colleges and universities, while the latest generation of K-12 academic standards emphasize not just content but also the skills necessary to think critically about content taught in English, math, science and social studies classes.

Despite this progress, 75 percent of employers claim the students they hire after 12, 16 or more years of formal education lack the ability to think critically and solve problems -- despite the fact that nearly all educators claim to prioritize helping students develop those very skills. Those statistics were included in <u>Academically</u> <u>Adrift</u> [1], the 2011 book by Richard Arum and Josipa Roksa, which caused a stir when the authors asserted that students made little to no progress in critical-thinking ability during their college years.

With perils mounting, many of them attributable to too little critical thinking about the subjects that matter most, we clearly must do more to ensure today's students become tomorrow's skilled thinkers. Fortunately, we are in a position to do so without having to overturn the current higher education system or break the bank.

What Do We Mean by 'Critical Thinking'?

One barrier that has kept us from making more progress in critical-thinking education over the last several decades is the perception that we still do not understand the concept well enough to determine how teaching critical-thinking skills can be integrated into the curriculum.

That paralysis derives partly from debates within the critical-thinking community over how the term should be defined. But such debates, while thoughtful and constructive, should not obscure the fact that there is widespread consensus regarding what skills constitute critical thinking, as well as substantial research on how those skills can be taught successfully.

For example, critical thinking involves thinking in a structured way. The term commonly used to describe this form of productive, *structured thinking* is "logic," but logic describes a number of systems for reasoning systematically.

Formal logic reduces words and ideas to symbols that can be manipulated, for instance, much like numbers and symbols used in mathematics. While formal logic is extraordinarily powerful (just ask any computer programmer), we can also systematize our reasoning using informal logic that allows us to consider the meaning of words rather than reducing them to symbols fit into a structure. There are also a number of graphical systems for mapping out logical relationships, some of them easy enough to be picked up by young learners, that can be applied to any content area.

Since most of the communication we need to think critically about involves everyday human language, rather than machine code, skilled critical thinkers must also be adept at *translating* spoken and written language into precise statements that can be built into a logical structure. This translation process is as much art as science, but with practice, students can perform this kind of translation on anything from historic or literary documents to scientific ideas and mathematical proofs.

When those translated precise statements are built into a logical structure, you have an *argument* -- the basic unit of reasoning. Arguments can be found in political speeches, editorials and advertisements, as well as in communication across STEM fields, and the rules for analyzing the quality of arguments have been in place for more than 2,000 years.

Structured arguments play a special role in highlighting the importance of reasons for

belief (called a *warrant* in logical argumentation), which gives students the ability to understand why true premises can lead to a false conclusion -- rather than labor under the misconception that the world consists of facts that can be true or false, with everything else falling into the category of opinion (or worse, "just an opinion").

Another myth that has slowed down integrating critical-thinking instruction more deeply into the curriculum is fear that teaching skills, including critical-thinking skills, must come at the expense of teaching academic content. Yet one cannot think critically about a subject one knows nothing about. Since *background knowledge*, including knowledge of content related to the academic disciplines, is a vital part of being a critical thinker, understanding content and thinking critically about it do not need to come into conflict.

While people continue to be debate the role of elements such as creativity in the critical-thinking process, there is a general consensus, going back to the earliest definitions of the term, that the concept includes three interconnecting elements: knowledge (for example, knowledge of one or more logical systems), skills (such as skills in applying that logical system to construct and analyze arguments) and dispositions (such as the willingness to apply critical-thinking principles, rather than fall back on existing unexamined beliefs, or simply believe what you're told by authority figures).

Teaching Students to Think Critically

Just as enough consensus exists about what critical thinking is, so too we have adequate agreement regarding how critical thinking is best taught. Research shows that elements of critical thinking need to be taught *explicitly*, rather than assumed to come along for the ride when thoughtful teachers run through complex material with students. As mentioned previously, nearly all college professors prioritize developing their students' critical-thinking abilities, but to move from aspiration to progress, they must marry this priority to practices that make critical-thinking instruction explicit within a discipline.

For example, mathematics is a subject where students are continually introduced to examples of deductive reasoning in the form of mathematical proofs. Yet how many math professors use this opportunity to explicitly introduce students to principles of deductive reasoning, or contrast deductive with inductive logic (the primary mode of reasoning used in science)? Similarly, activities involving informational reading and

argumentative writing provide ideal opportunities to introduce students in college writing classes to logical arguments in which evidence (in the form of premises of an argument) leads to a conclusion and how those arguments can be tested for validity, soundness, strength and weakness.

As it turns out, the number of critical-thinking topics professors and students need to understand is relatively small, certainly compared to the much larger body of content that students need to master in an English, math, science or history course. For students to develop as critical thinkers, however, they must put that knowledge to work through *deliberate practice* that specifically focuses on development of criticalthinking skills. That can be accomplished through carefully designed activities and assignments that provide students opportunities to practice applying critical-thinking principles to answer questions and solve problems specific to academic content areas.

The previous example of a math professor contrasting deductive and inductive reasoning and explaining what each form of reasoning brings to different disciplines demonstrates the potential for critical-thinking skills to *transfer* between academic domains. Since critical thinking is universally applicable, faculty members can also use examples and deliberate practice exercises to show students how they can apply critical-thinking techniques to issues outside class, such as how to systematically make decisions regarding college or work or how to avoid manipulation by politicians and advertisers.

<u>One critical-thinking researcher</u> ^[2] has proposed that becoming a skilled critical thinker requires the same amount of practice required to become a highly skilled athlete or musician: approximately 10,000 hours. If this suggestion is even partially correct, it points out a problem, since no single class, or even years of education, can provide this amount of dedicated practice time.

That is why professors must not just teach students critical-thinking skills and give them opportunities to put them to use, but they must also *inspire* them to continue practicing those skills on their own across academic subjects and in all areas of life. Given that thinking is something we do every waking hour and does not require practice fields, instruments or special equipment, inspired students can apply the critical-thinking skills they learn in class to improve their grades and make better decisions in life, reinforcing their value and creating a virtuous cycle of continuous use.

High-Leverage Critical Thinking Teaching Practices

The techniques I've described above -- explicit instruction on critical-thinking principles and techniques, deliberate practice opportunities that put those techniques to work, encouraging transfer between domains, and inspiring students to practice thinking critically on their own -- all represent high-leverage critical-thinking practices applicable to any domain. Such practices can be applied to focused content areas, highlighting the fact that integrating critical-thinking practices into the curriculum does not need to crowd out other activities college instructors have used for years.

Concrete methods for improving student critical-thinking ability can help colleges and universities, including liberal arts schools struggling in an era emphasizing STEM and career-oriented majors like business, define their mission as the place where the most vital 21st-century skills are explicitly taught, practiced and mastered. One major where a new emphasis on practical critical-thinking skills development can have a double impact is education, where students enrolled in undergraduate and graduate teacher-preparation programs can be taught using high-leverage critical-thinking practices they can then bring into the classroom as they enter jobs in K-12 schools.

Changing colleges to embrace both methods and a culture of critical thinking does not require overhauling education, eliminating courses or even asking professors to sacrifice approaches they have developed and used successfully. It simply involves adding new tools to their arsenal that allow them to accomplish what they already wholeheartedly support: helping students develop the skills needed to think critically about the world.

Jonathan Haber [3] is the author of Critical Thinking Essentials [4], recently published by MIT Press. His site, LogicCheck.net [5], uses the news of the day to teach practical critical-thinking skills.

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Links

[1] https://www.press.uchicago.edu/ucp/books/book/chicago/A/bo10327226.html

[2] https://www.reasoninglab.com/wp-content/uploads/2013/10/Tim-van-Gelder-Teaching-CT-Lessons-

from-Cog-Sci.pdf

- [3] https://www.jonathanhaber.org/
- [4] https://mitpress.mit.edu/books/critical-thinking
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