How to teach all students to think critically

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Something to ponder – how to teach critical thinking. Credit: Brittany Randolph/Flickr, CC BY-NC-ND

All first year students at the University of Technology Sydney could soon be required to take a compulsory maths course in an attempt to give them some numerical thinking skills.

The new course would be an elective next year and mandatory in 2016 with the university's deputy vice-chancellor for education and students Shirley Alexander saying the aim is to give students some maths "critical

thinking" skills.

This is a worthwhile goal, but what about critical thinking in general?

Most tertiary institutions have listed among their graduate attributes the ability to think critically. This seems a desirable outcome, but what exactly does it mean to think critically and how do you get students to do it?

The problem is that critical thinking is the Cheshire Cat of educational curricula – it is hinted at in all disciplines but appears fully formed in none. As soon as you push to see it in focus, it slips away.

If you ask curriculum designers exactly how critical thinking skills are developed, the answers are often vague and unhelpful for those wanting to teach it.

This is partly because of a lack of clarity about the term itself and because there are some who believe that critical thinking cannot be taught in isolation, that it can only be developed in a discipline context – after all, you have think critically about *something*.

So what should any mandatory first year course in critical thinking look like? There is no single answer to that, but let me suggest a structure with four key areas:

1. argumentation
2. logic
3. psychology
4. the nature of science.

I will then explain that these four areas are bound together by a common language of thinking and a set of critical thinking values.

1. Argumentation

The most powerful framework for learning to think well in a manner that is transferable across contexts is argumentation.

Arguing, as opposed to simply disagreeing, is the process of intellectual engagement with an issue and an opponent with the intention of developing a position justified by rational analysis and inference.

Arguments have premises, those things that we take to be true for the purposes of the argument, and conclusions or end points that are arrived at by inferring from the premises.

Understanding this structure allows us to analyse the strength of an argument by assessing the likelihood that the premises are true or by examining how the conclusion follows from them.

Arguments in which the conclusion follows logically from the premises are said to be valid. Valid arguments with true premises are called sound. The definitions of invalid and unsound follow.

This gives us a language with which to frame our position and the basic structure of why it seems justified.

2. Logic

Logic is fundamental to rationality. It is difficult to see how you could value critical thinking without also embracing logic.

People generally speak of formal logic – basically the logic of deduction – and informal logic – also called induction.

Deduction is most of what goes on in mathematics or Suduko puzzles and induction is usually about generalising or analogising and is integral to the processes of science.

Using logic in a flawed way leads to the committing of the fallacies of reasoning, which famously contain such logical errors as circular reasoning, the false cause fallacy or appeal to popular opinion. Learning about this cognitive landscape is central to the development of effective thinking.

3. Psychology

The messy business of our psychology – how our minds actuality work – is another necessary component of a solid critical thinking course.

One of the great insights of psychology over the past few decades is the realisation that thinking is not so much something we do, as something that happens to us. We are not as in control of our decision-making as we think we are.

We are masses of cognitive biases as much as we are rational beings. This does not mean we are flawed, it just means we don't think in the nice, linear way that educators often like to think we do.

It is a mistake to think of our minds as just running decision-making algorithms – we are much more complicated and idiosyncratic than this.

How we arrive at conclusions, form beliefs and process information is very organic and idiosyncratic. We are not just clinical truth-seeking reasoning machines.

Our thinking is also about our prior beliefs, our values, our biases and our desires.

4. The nature of science

It is useful to equip students with some understanding of the general tools of evaluating information that have become ubiquitous in our society. Two that come to mind are the nature of science and statistics.

Learning about what the differences are between hypotheses, theories and laws, for example, can help people understand why science has credibility without having to teach them what a molecule is, or about Newton's laws of motion.

Understanding some basic statistics also goes a long way to making students feel more empowered to tackle difficult or complex issues. It's not about mastering the content, but about understanding the process.

The language of thinking

Embedded within all of this is the language of our thinking. The cognitive skills – such as inferring, analysing, evaluating, justifying, categorising and decoding – are all the things that we *do* with knowledge.

If we can talk to students using these terms, with a full understanding of what they mean and how they are used, then teaching thinking becomes like teaching a physical process such as a sport, in which each element can be identified, polished, refined and optimised.

In much the same way that a javelin coach can freeze a video and talk to an athlete about their foot positioning or centre of balance, a teacher of critical thinking can use the language of cognition to interrogate a student's thinking in high resolution.

All of these potential aspects of a critical thinking course can be taught

outside any discipline context. General knowledge, topical issues and media provide a mountain of grist for the cognitive mill.

General concepts of argumentation and logic are readily transferable between contexts once students are taught to recognise the deeper structures inherent in these fields and to apply them across a variety of situations.

Values

It's worth understanding too that a good critical thinking education is also an education in values.

Not all values are ethical in nature. In thinking well we value precision, coherence, simplicity of expression, logical structure, clarity, perseverance, honesty in representation and any number of like qualities. If schools are to teach values, why not teach the values of effective thinking?

So, let's not assume that students will learn to think critically just by learning the methodology of their subjects. Sure it will help, but it's not an explicit treatment of thinking and is therefore less transferable.

A course that targets effective thinking need not detract from other subjects – in fact it should enhance performance across the board.

But ideally, such a course should not be needed if teachers of all subjects focused on the thinking of their students as well as the content they have to cover.

Source: The Conversation