# Think, talk, write, reflect: How to teach students to think critically

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**Abstract**

*A focus on critical thinking is back at the forefront of concern across multiple contexts and disciplines. Unfortunately, research indicates that we have not been very successful at developing a critical thinking capacity in students. This paper discusses why this might be so and suggests that we can improve outcomes by using an epistemological framework to highlight the process of knowledge creation. This links critical thinking to outcomes. It then sets out how this can be done by presenting a few simple techniques that have been shown to be effective. The advantage of the techniques described is that they are applicable across disciplines and do not require the displacement of topic content. It is our contention that these techniques, when applied appropriately, will improve students' critical thinking capacities in measurable ways.*

## Introduction

We all think. Along with our emotions, thinking determines what we believe and how we then act. If we think well our choice of actions will reflect that and are more likely to produce positive outcomes. But if we think poorly our actions may not achieve the outcomes, we would want and could even cause harm. Given the role of thinking in determining what actions we choose and the negative consequences that can result from poor thinking, it is unsurprising that there is continued demand for good thinkers as well as a demand for ways to improve our thinking. Recent events in the United States around the political impact of fake news and media manipulation have not only highlighted the dangers of poor non-reflective thinking practices but emphasised the need to develop a framework for better thinking that could lead to a more discerning public.

Our students are that public. They are going out into the world as professionals, as doctors, social workers, lawyers, teachers, as researchers and writers, as contributing members of society. They are the future decision-makers, the voters and policy writers. How would we want our graduates to be? How would we want them to think and act? At a minimum, we would expect them to be able to apply their knowledge in relevant contexts, to think reflectively and critically about its applicability within those contexts, and to understand its limitations. We would want them to be open-minded to alternative approaches and ideas and be willing to adapt and learn in line with new information. We would want them to think about what they already know, and how they can add to that knowledge. We would want them to think critically. The onus is on us, as academics, to ensure our graduates leave the university with that capacity.

## The relevance of epistemology to thinking critically

For graduates to be able to reflect on and apply their knowledge effectively requires an understanding of the process of knowledge creation and how we know what we know, epistemology. It is essential for students to understand why we believe certain things or engage in certain practices and why others are no longer considered appropriate.

Understanding why those knowledge claims either stand or change over time enables us to understand the link between that knowledge and its application in practice. It is not enough to accept that a particular intervention or practice works to solve a problem most of the time. We also need to have some understanding of why it works. This will enable us to think about its application in context and whether it might work more effectively if applied differently or to a different but related problem. It might help us understand why it may not work as well or at all in another related situation.

Similarly, it is crucial for students to understand that even though we have gained an inordinate amount of knowledge about the world over the last century, we know there is much more to know. We only need to reflect on changes to medical practice or advances in technology over the previous 100 years. Practice has changed in line with changes to knowledge and the subsequent development of supportive technologies. But what this also shows is that our knowledge is finite and incomplete and that there is still much to find out. Just as in the past, some of what we currently accept as true may turn out to be false. Consequently, it is important to continually check and question our beliefs and the claims we make about the world we live in to see if they still hold.

In this context, how the knowledge is justified – what reasons and evidence there is to accept it – will determine how reliable or strong it is. The stronger the justification there is for a theory or practice, the more likely it is that the theory or practice is appropriate or effective. But it is not possible to evaluate that knowledge without knowing what the justification is and how reliable the evidence is in supporting it. This is where epistemology and critical thinking intersect. Effective evaluation of practice requires understanding how the knowledge behind the practice became knowledge and why it still holds. How do we know what we know? Why do we do what we do? This is what informs and drives practice. We don't just do what we do because that is what we have always done; past practice or tradition are not necessarily best practice. Such an assessment or evaluation will also enable us to change practice in light of new convincing evidence. As humans, we can (and do) make mistakes; we can be, and have been, wrong. Critical thinking helps reduce our mistakes and the probability of being wrong.

**What is critical thinking?**

If critical thinking is something that is important to teach, we should be able to identify it, explain what it is, know how to teach it and know that we *are* teaching it. But explicating the concept in a way that is broadly acceptable to a wide spectrum of academics has been fraught with disagreement, controversy and endless debate, triggering what has been dubbed the critical thinking 'industry' (Moore 2011, p. 27). The literature on critical thinking makes much of the fact that there are a multitude of definitions and little apparent consensus about what belongs within the ambit of the term (Barnett and Davies 2015). Nevertheless, universities operate on the belief that critical thinking skills can be defined, taught, acquired and applied in a range of contexts (Mulnix, 2012). The Delphi Report (Facione 1990) is the most well-known attempt to reach a consensus view of what critical thinking entails, culminating in Facione's definition of critical thinking as,

> … purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based (p.2).

Since this historically significant definition was developed, there have been other attempts at defining critical thinking that have tried to address what have been perceived as its shortcomings or limitations. Thayer-Bacon (2000), for example, pushes for a 'constructive thinking' model that recognises the role of intuition, emotion and imagination. She also sees it more as a social practice that draws on multiple participants with diverse backgrounds and orientations. More recently, Barnett (2015, p.10) has offered an alternative concept called 'criticality,' which is a composite of critical reason, critical self-reflection and critical action. Criticality, according to Barnett, will develop critical being which will lead to critical persons. Critical persons are more likely to engage in critical actions, leading to societal change. Both Thayer-Bacon and Barnett are concerned about the focus of traditional critical thinking models on individual intellectual traits and dispositions and seek to introduce a social or moral dimension to counter this. Mulnix (2012), on the other hand, argues that we need to be careful not to make the term 'critical thinking' synonymous with all higher order thinking. At its heart, she argues, it is about reasoning; it is not a moral framework. As we know, reasoning well can (and does) result in different justifiable social and moral positions.

Like Moore (2011) and Dasbender (2011), we believe there is a broad enough consensus amongst academics on what the key critical thinking attributes are. These are traits like being systematic and logical in one's thinking, trying to be objective and aware of mistakes and biases (being open-minded), knowing how to evaluate claims and arguments, and knowing what counts as reliable and relevant evidence for justifying those claims. This fits with Mulnix's (2012, p.473) definition which, she claims, gets to the nub of critical thinking. She defines it as:

> … the ability to recognize inferential connections holding between statements, where this would include the ability to understand the possibility that what we believe might be false and the ability to identify the sorts of evidence that would undermine our beliefs.

While Mulnix's definition focuses on the essential elements of what it means to critique, clearly-defined claims such as knowledge claims, it is not always enough for the types of applications found in practical disciplines like teaching, social work and nursing. In a practice context, the outcomes of thinking are essential. To accommodate this, we define critical thinking as a process of analysis and critique that is used to ensure that we come to the most reasonable conclusions we can about the world we live and work in, as well as the best solutions for what we want to achieve. It is a process of thinking that helps us make sure we have strong and reliable grounds for our beliefs and actions and allows us to acknowledge ambiguity or uncertainty where it exists in the real world.

Many of the critical thinking characteristics outlined above are considered 'universal' standards of intellectual thinking (Paul & Elder 2010). The premise of this paper is based on the idea that critical thinking can be taught using a generalisable intellectual framework that is applicable across disciplinary domains. As Dasbender (2011) says, applying 'general principles such as rational thinking, making independent evaluations and judgments, and [adopting] a healthy scepticism' is consistent across disciplines and reflective of a standard critical thinking approach. One other important criterion singled out by Ennis (2015) and relevant in a global context is – be alert to alternative explanations and points of view.

**Teaching critical thinking across cultures**

Social and political upheaval around the world, globalisation, the internationalisation of universities, and skills-based immigration policies have led to large numbers of culturally and linguistically diverse (CALD) students looking to gain a Western qualification in an English-speaking environment (Bednarz, Schim, & Doorenbos, 2010). Teaching staff are exposed to an increasingly diverse student population, some of whom appear to have different academic expectations and approaches to learning. Students from Confucian-heritage cultures (CHC), for example, come from predominantly exam-based assessment pedagogies that do not appear to encourage a critical attitude. Such students desire a more structured learning environment with explicit instruction, the antithesis of what will promote a critical thinking attitude. Because of this, there has been a suggestion that critical thinking itself is a Western cultural concept (Egege & Kutieleh, 2008). This is important to ascertain given the critical thinking discourse speaks of representing universal standards of thinking, implying a cross-cultural instantiation (e.g., Paul & Elder 2010). If this is not the case, then we should acknowledge its culturally-specific nature up-front.

How Western is the concept of critical thinking? It needs to be noted that the model of critical thinking used at Western universities has emerged from the classical Greek tradition of philosophy and its focus on argumentation. This means it has strong European roots. But this does not entail that what we view as rational or clear thinking is a purely Western concept or a prerogative of the West. All cultures have had to solve problems by finding solutions to survive. What we recognise today as maths, science and medicine were well developed in China, India, North Africa and the Middle East centuries before Europe went through its intellectual enlightenment (Grun, 1975; Lloyd, 1996). Those developments necessarily built on experience and evidence of what seemed to work and what didn't. So, it would be false to say that the rational thinking process and the use of justification, representative of a critical thinking approach, is a Western cultural innovation. Cognition and meta-cognition are human, not cultural, capacities. One's culture merely provides the opportunities to develop certain types of capacities rather than others.

Having said that, the ways we expect students to show *evidence* of critical thinking in their academic work is very specific. One way we expect students to demonstrate their critical thinking is through the 'argumentative essay' using counter-argument and critique. This is representative of the Socratic philosophic tradition. The expectation to 'question everything,' including the voice of authority, is integral to that tradition. It is adversarial rather than aimed at reinforcing traditional positions which is a more Eastern approach (Lloyd, 1996). This process doesn't sit well with some cultures and political systems and should be explained to students within the context of knowledge development and justifying best practice. Reflecting on and explicating the cultural and academic expressions of critical thinking that we expect and take for granted can help others to better understand and apply critical thinking in their practice as appropriate. When students from CHC backgrounds are given permission to question, critique, overtly disagree and justify their views, they perform as well as any other student (Biggs, 1997). This indicates that it is the method of thinking critically, not the capacity to think critically, that is culturally specific.

Engaging in an overt process of critically examining, identifying and then explaining any cultural differences we might have empowers students from other cultures to do the same. It is important for all students to be aware of their own cultural beliefs and biases and how these can impact on their thinking and work practice. A lack of such reflection can lead to ill-informed actions and inappropriate interventions through misunderstandings and cultural

stereotyping. Thinking critically and self-reflectively become essential for best practice. We need to be critically aware of our epistemic beliefs and practices to see how these impact on what we consider to be good practice. We need to ascertain whether our reactions or judgements are cultural rather than epistemologically informed. This makes an understanding of our own epistemological framework and knowledge of the evidence that grounds our practice highly relevant.

**How can we teach critical thinking?**

There is a common assumption amongst academics that acquiring a university degree will automatically develop critical thinking skills in graduates. It is generally assumed that these skills develop either through the often-embedded critical thinking demands of the course or via the process of learning the topic content itself. Research findings, however, indicate that this is not the case and our assumption is false. One of the recurring problems identified in the critical thinking literature is how unsuccessful we have been at teaching it. Numerous studies conducted over many years indicate that university graduates are not leaving universities with well-developed critical thinking capacities, despite our efforts (Abrami et al., 2008; Willingham, 2007). A recent analysis of test results from 200 American Colleges confirmed that this was still the case (Belkin, 2017). According to Abrami et al. (2008, 2015), one of the reasons for our lack of success is the limited levels of expertise or training in what constitutes a good teaching pedagogy. As academics, we are rarely taught how to incorporate critical thinking instruction into topics or what the best ways to teach it are. This has resulted in a hit-and-miss approach where some teaching of critical thinking has been very effective while other methods have not been effective at all (Abrami et al., 2015; Bertacchini De Oliveira et al., 2016). Given how essential critical thinking is to our academic study and work practices, we need to find out what strategies work and how we can incorporate them in our teaching without sacrificing all-important discipline content.

Trying to ascertain what are effective teaching strategies for developing a critical thinking capacity in students, is hampered by the lack of regular rigorous evaluations that have been undertaken. Even when evaluations have been conducted, the evidence is often anecdotal or some form of qualitative self-assessment (Abrami et al, 2008; Bertacchini De Oliveira et al., 2016). There have, however, been a couple of comprehensive reviews which have managed to identify both rigorous studies and the strategies that appear to be most effective (Abrami et al., 2008, 2015; Bertacchini De Oliveira et al., 2016; Pithers & Soden, 2000).

One academic area where the teaching of critical thinking does have a distinct pedagogy and where critical thinking is both the content and learning outcome is in non-discipline-specific stand-alone critical thinking topics. While these may be effective for developing critical thinking capacities, they are not available at all universities and may not be an option for students to take as part of what can be a tight degree structure. There is also research that suggests there is a connection between developing critical thinking skills and content knowledge (Pithers & Soden, 2000). For most academics, the more broadly applicable option is to try to embed effective critical thinking instruction within discipline topics. That way we can ensure that all students have access to critical thinking instruction, can benefit from it, and are able to apply it within their knowledge domain.

***Things that don't work***

It was clear from the reviews we accessed (mentioned above) that there were more and less effective ways of teaching critical thinking, and some strategies that worked and some that didn't. Pithers and Soden (2000, pp. 242–243) outlined a set of student and staff

characteristics or approaches that were likely to inhibit the development of critical thinking. For students, traits that impeded a critical and self-reflective approach were being impulsive, lacking confidence, having difficulty with comprehension, being over-dependant, inflexible, or dogmatic. For teaching staff, believing they had nothing to learn, that they were the arbiters of critical thinking, that there was a correct approach and a right answer, that critical thinking was a means to this end, and that students 'should be correct 90% of the time,' were all seen as impediments to the teaching of critical thinking. Effective critical thinking requires mental flexibility and an embracing of ambiguity; traits that need to be encouraged in students and role-modelled by teaching staff. We know the world is not a static place, situations change, and mistakes happen. As most of our knowledge claims are justified using inductive or probabilistic reasoning, there may often be a different answer or an alternative solution to questions or problems.

In an attempt to see which interventions or strategies had a measurable impact on the effectiveness of teaching critical thinking, Abrami et al. (2008) identified four distinct modes of teaching intervention for critical thinking that were variously used at institutions:

- the generic stand-alone critical thinking topic already mentioned above
- the infusion method where critical thinking skills are implicitly embedded in the teaching topic content, but critical thinking is made explicit in the content outline
- the immersion method where the teaching topic has engaging or challenging content, but critical thinking is not made explicit as an outcome
- the mixed method where the content includes explicit critical thinking instruction and critical thinking skills are an explicit objective of teaching topic content

Of them all, the *mixed method* was by far the most effective mode for teaching critical thinking. It produced the most statistically significant effect on critical thinking outcomes compared to the other methods. The least effective was the immersion method. It was also ineffective to just list critical thinking as an objective or to have it included in assignment guidelines. To be effective, critical thinking had to be explicitly taught within the teaching topic content. Surprisingly, Bertacchini De Oliveira et al's review (2016) found that some other well-known strategies for developing critical thinking did not markedly improve critical thinking outcomes. These strategies were simulations, role-modelling, using concept maps, reflective writing, or using an animated pedagogical agent (APA, part of an intelligent tutoring system). Such strategies may have an impact when used in conjunction with other strategies but the research data from their study failed to identify any significance when using the strategies in isolation when compared to traditional teaching methods.

***Things that do work***

First, we need to be clear what it is we want students to be able to do. If all we want is for them to know the right answers and why they are right, then traditional teaching methods will work well. If we want to develop their critical thinking skills, then it is not enough. Knowledge is an essential foundation, but it is not a skill that will help students to evaluate the strengths of competing claims, to solve practice problems, or assess complex situations with multiple competing factors. Nor will setting a problem and giving students the 'right' heuristic to mechanically apply to solve a problem.

Abrami et al.'s (2008, 2015) reviews show that teaching critical thinking explicitly within the topic or subject domain, the *mixed method*, is the most effective way of getting some improvement in a student's critical thinking skills. While the effectiveness of that instruction

will be dependent to some extent on the way critical thinking is taught, bearing in mind the attitude and expertise of the instructor, some effective generic strategies can be adopted within any topic without sacrificing the content knowledge we want students to master. To think critically, students need to develop their analytic and problem-solving capacities, and this requires material with scope and space for students to work things through where the answer is not a given. Students benefit from having this process modelled and by having plenty of regular practice. The strategies below, assessed using validated tests[1], have resulted in statistically significant improvements in critical thinking:

- Problem-based Learning (PBL) – this was the only strategy identified by the researchers that, on its own, produced significant improvements when compared to traditional methods such as lectures (Bertacchini De Oliveira et al., 2016).
- Authentic instruction – exposing students to authentic examples or problems in real-life contexts produced a significant effect when compared to other methods.
- Dialogue or discussion – encouraging students to engage in discussion which is guided by the teacher who "interrogates" a point to push the discussion. This method produced greater significant effects when coupled with authentic instruction.
- Using argument analysis to unpack students' thinking about their points of view and underlying assumptions and values.
- Using argument mapping – useful for identifying, analysing and mapping arguments found in texts and has been shown to be useful as a critiquing tool to improve students' critical analysis of research findings and the quality of their own arguments.

The above strategies have been shown to produce measurable improvements in students' critical thinking skills. However, even with these strategies, there are a lot of barriers to thinking critically that we need to make students aware of, such as perceptual limitations and cognitive biases. Encouraging students to engage in self-reflection and meta-cognitive thinking will help minimise the impact of these barriers. As teachers, we need to remember that critical thinking is hard work and doesn't come naturally. We also need to note that critical thinking is a process of making our thinking more rigorous and systematic - there is no 'right' way to think but there are better ways to think and act. This requires a careful and critical assessment of all relevant factors.

**A model for teaching critical thinking**

While the strategies above have been shown to be effective in teaching critical thinking, one of the issues that academics have raised with us is how to use them effectively. The Paul and Elder model we present here is one framework that can guide us in applying these strategies. They suggest that a teacher's role is as a facilitator or coach (Paul & Elder, 2001, p. 2). Teachers should be '…coaching students, sitting on the sidelines, listening to peer interaction, providing feedback on the sorts of problems in thinking they are noticing in students.' Teaching the process of thinking to students, rather than merely teaching the content of a topic, can be very challenging. As teachers, we need to model critical thinking so that students can see and hear critical thinking in action before they go ahead and practice it themselves. Paul and Elder recommend, '…design[ing] the class so that YOU model the thinking you are looking for. This requires you either to think aloud in front of the class or to

[1] Validated tests for critical thinking include the California Critical Thinking Skills or Disposition Test, the Critical Thinking Disposition Scale for Nursing, and the Watson-Glaser Critical Thinking Scale.

present the class with thinking in written form.' Their model consists of three parts: 1) elements of thought, 2) universal intellectual standards, and 3) intellectual traits or virtues.

***Elements of Thought***
There are eight elements of thought in this model that are understood to be present whenever thinking takes place:

- There is a purpose to the thinking. There are goals or objectives that provide direction for the thinking process.
- There is a question at issue, a problem to solve, or an issue to explore.
- There is the use of information that is considered consisting of a range of data, facts, reasons, observations, experiences, or evidence.
- There is the process of interpretation and inference leading to conclusions or solutions for the question, problem, or issue being considered.
- It relies on concepts, theories, definitions, laws, principles, or models that provide structure and meaning to the thinking.
- Assumptions, presuppositions, axioms, and things we take for granted underlie thinking.
- There are always implications and consequences resulting from it.
- It always comes from a point of view that includes frames of reference, perspectives, and orientation of ourselves and others.

While it is essential to be able to tease one's thinking apart to examine it, it is not enough to only describe the structure or logic of the thinking process. We also need to be able to evaluate the quality of thinking, by applying intellectual standards to the elements of thought.

***Universal Intellectual Standards***
Some universal intellectual standards, as defined by Paul and Elder (2014) are clarity, accuracy, precision, relevance, depth, breadth, logic, fairness. These (and other) intellectual standards are applied to the elements of thought to evaluate thinking. As already discussed above, while there are some culturally specific elements to critical thinking, such as the way we expect students to demonstrate it, the generic critical thinking skills are considered universal. If we try to think without these standards, we won't get far in our communication with others or in our attempts to answer questions, solve problems, or resolve issues.

***Intellectual traits or virtues***
According to Paul and Elder (2014), if we practice thinking critically by teasing apart our thinking and applying intellectual standards to it, we will begin to develop traits like intellectual humility, courage, empathy, autonomy, perseverance, integrity, confidence in reason, and fairmindedness. Paul and Elder's model is ideally suited to the disciplined practice of thoughtful questioning which is at the heart of teaching critical thinking. The elements of thought and the intellectual standards provide a rich resource for generating questions that promote a deep and meaningful dialogue with students. Using the elements of thought, questions can be created for interrogating literature or a specific practice. It can be used to guide thinking in ethics, law, clinical reasoning, and other areas of work.

**Designing critical thinking experiences for students**

When designing and implementing critical thinking situations for students, it is helpful to bear in mind the following points. It takes time and effort to develop the intellectual traits and values described by Paul and Elder, so students need a lot of practice. The acquisition of

critical thinking skills is a process rather than a mechanical application of strategies or heuristics. Real life situations are often indeterminate, contextual, and replete with black swans (Taleb, 2010) and wicked problems ("Wicked problem," n.d.) that require flexibility and the embracing of ambiguity. Our thinking is fraught with preconceptions, prejudices, and a tendency to egocentrism and cognitive bias which prohibits critical thinking. As teachers we need to be aware of our own biases and encourage students to reflect on theirs.

Whatever strategies for learning you decide to use, they should include the student verbalising or writing out their thinking. Otherwise, it will be impossible for you, as a teacher, to assess a student's thinking skills or the depth and breadth of the knowledge and skills they are learning. Whatever learning strategy is engaged in, you, as a teacher, need to continually draw attention to the activity of critical thinking to ensure it is explicit and to guide students through the process. As a coach we want students to practice critical thinking so often it becomes an habitual part of their learning repertoire. It might help to ask the following questions about your own teaching strategies using Paul and Elder's model.

- Does the strategy provide the opportunity for students to work through the model of critical thinking presented here?
- What is the purpose of the strategy and does it align with the learning outcomes of the course or topic the student is studying?
- Does the strategy lend itself to the student explicitly teasing apart their thinking using the elements of thought and evaluating it by applying the intellectual standards?
- Does the strategy include clear instructions for using it?
- Do the assumptions underlying the strategy align with your beliefs and values about learning?
- How might a student experience the strategy from their perspective?
- Does the strategy result in the outcomes you and the students need?

## Conclusion

The explosion of information access via social media and internet resources and the subsequent concerns about the quality of information sources makes developing the skills of critical thinking even more relevant for today's students, especially for those entering professions that involve high stake decision-making. As such, developing critical thinking should be an essential component of all university teaching. We recognise, however, it is not easy to know how to do it or what is the best way to do it. We have presented some proven strategies and a framework for their application that we believe is adaptable to any topic content in any discipline. The strength of the Paul and Elder model is that it is a practical and flexible framework that students can take with them and apply within their work and life contexts. As they repeatedly apply the model, thinking critically will become increasingly habitual and will have a significant impact on the quality of their professional practice and their ability to participate in a democracy, and as global citizens in a rapidly changing world.

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