**The Skills and Values of Inquiry**

Peter Ellerton

*The University of Queensland, Australia*

**Abstract**

*‘Inquiry’ is a term with a very broad and sometimes diffuse educational use and is hence subject to misinterpretation. This article attempts a more categorically distinct use of the word by linking inquiry to the use of cognitive skills. The cognitive skills, such as analysing, synthesising, evaluating, justifying and inferring can be thought of, at a certain functional level, as things you do with knowledge or content. Effective inquiry is presented as the effective use of a range of cognitive skills. That these skills are being used, however, does not guarantee that they are being used well. Proficient use of cognitive skills requires the application of values such as precision, cohesion, accuracy and simplicity. Understanding educational inquiry as the opportunity to use and development cognitive skills and teaching students how to apply the values of inquiry to optimise their thinking provides a means of giving useful feedback to students about their thinking, and to develop meaningful learning experiences. A thinking matrix demonstrating how the values and cognitive skills relate to each other is provided. In general, this article presents a model and consequent imperatives for the teaching of critical thinking.*

Keywords: Cognitive skills, Inquiry, Values, Critical Thinking

**Introduction**

This article concerns itself with terms whose definitions are not all uniformly agreed upon nor applied. ‘Inquiry’, ‘values’, ‘cognitive skills’ and indeed ‘critical thinking’ are not categorically clear ideas. Where there may be clarity of representation, it is not universally recognised, at least in educational practice. It may be bold, therefore, to collectively address these terms and risk compounding this ambiguity. My goal, however, is to construct a methodology, or model of teaching critical thinking. In his methodology, it will suffice to produce definitions of these terms that cohere. What will be at stake is the usefulness of the model rather than the ontological solidity of the terms. I therefore suggest a dynamic to bind cognitive skills, inquiry and values into what I hope is an educationally useful conception of how to create critical thinkers.

I begin by looking at a category of cognitive skills that requires manipulation of higher order mental representations. These particular skills are above the level of characteristically animalistic cognition and involve sophisticated mental processing. I then posit inquiry as the process that necessitates the application of a range of these cognitive skills to bring it to completion. This is a very broad definition of inquiry, but I show that this inclusive use does not diminish its educational utility. I will then introduce the idea of values as an element of what Kuhn (1970) calls the ‘disciplinary matrix’. These values are not moral or ethical values, but rather those that can be applied during the process of inquiry. They are many and include precision, simplicity, plausibility and accuracy. I will show that values can be useful in two ways, to provide feedback to students on their use of cognitive skills, and to allow teachers to model effective application of values. I will also show that the cognitive skills and values of inquiry, and by implication critical thinking in general, can be taught explicitly and made transferable between disciplines and other contexts.

**Cognitive skills**

The act of cognition describes a mental process. It is not something associated with purely reflective behaviour or characterised in its use by reference to just any kind of neural behaviour. Neural behaviour is *necessary* for cognition, but not *sufficient*. Cognition, as the term is routinely used, involves knowledge formation or manipulation by direct perception or by more complex higher order processing of information and as such is a particular kind of mental process. The abilities and skills that may be called ‘cognitive’ range across such diverse areas as the use of language, the attribution of causal connections, pattern detection and the recognition of agency in others. Cognitive skills may be classified in apes, for example, through association with tools and causality, social learning, communication and theory of mind (Herrmann, Hare, Call and Tomasello, 2010). Humans extend this into language at the least and other types of abstraction such as music. I will focus on those skills involving mental manipulation of higher order mental representations. Higher order mental representations are those that are themselves representations of lower order mental states, such as basic desires or beliefs (Fletcher & Carruthers, 2012). For example, argumentation as a process between individuals is dynamic and temporal, but a specific argument such as:

(Premise 1) Fred is a Gronk

(Premise 2) All Gronks are green

(Conclusion) Fred is green

is itself a higher order representation containing premises, conclusions and the inferential process that binds them.

 In educating for thinking, it seems evident that we must be targeting the development of cognitive skills. It would be useful to understand which cognitive skills students are bringing to bear (beyond those we share with other apes) on which educational tasks, and how these tasks might be developmentally arranged to produce and promote a desirable variety of cognitive skills. Note that I am speaking about teaching students how to *think*. This is not the same thing as teaching them how to *learn*. Of course we might quibble that students are learning how to think, and this is indeed true, but more often learning is directed towards declarative or procedural knowledge, and does not extend into more advanced critical thinking skills. Asking how students best learn declarative or procedural knowledge, often the bulk of the curriculum, gives a different set of answers from asking how they learn to think.

 Exactly what cognitive skills are we talking about? Happily our assessment criteria and syllabi are already populated with terms that describe cognitive skills and how they might relate to one another. Words such as *analyse*, *evaluate*, *infer*, *synthesise*, *categorise* and *interpret* all represent cognitive skills. Moreover, each of these skills may require the application of some others in its execution. For example, it might be necessary to analyse something before it can be evaluated. Any number of other words might be used to represent different cognitive skills such as *compare*, *contrast*, *decode*, *justify*, and *estimate*.

 Cognitive skills such as the above are often associated with effective or critical thinking (Facione, 1990). In this more specific educational use, in which very fundamental cognitive skills such as language formation or theory of mind are assumed to have become sufficiently developed to allow students to extend their thinking into more complex areas, I suggest cognitive skills can be thought of as things we do with knowledge. At a basic level, it would seem that knowledge could be *recalled*. Analysis, synthesis, justification and evaluation would require our knowledge, including our knowledge of processes and procedures, to be used with more sophistication. Bloom’s Taxonomy of Educational Objectives (Bloom, 1956) contains many references to cognitive skills so defined, as well as other outcomes. I could argue that in perceiving one pile of rocks as larger than another I am not ‘doing something with knowledge’; I simply perceive a difference. But that is not the educational level I have in mind. Cognitive skills that involve manipulation of higher order representations create a category of skills that seems most associated with paradigmatic critical thinkers and hence provide a sharper educational focus. I will therefore use the terms ‘thinking skills’ and ‘cognitive skills’ interchangeably in this methodology.

 An additional value in relating cognitive skills to knowledge use is that content-heavy curricula need not be immediately seen as bereft of opportunities to teach thinking skills. Teaching thinking skills does not imply, in this framework, the need for removal of swathes of content. Rather the challenge is to look for opportunities within the content to develop cognitive skills, to ask the question: What can we do with this knowledge?

**Inquiry**

Inquiry is a dominant theme in education. It is also an ancient one, being famously effective in the hands of Socrates. It is also a central theme in the well-named Community of Inquiry, first articulated by Peirce and later developed by Lipman, via Dewey, as an educational methodology (Lipman, 2004). ‘Inquiry-based learning’ is a phrase impossible to avoid in educational research. I will not justify its large educational footprint here, but I will provide an argument for why inquiry as I will define it is valuable in the development of thinking skills.

 I am not as concerned with a theory of inquiry as I am with the idea of inquiry. These are not the same thing. A theory of inquiry might consider how one goes about the process of inquiry, with reference to the nature of knowledge and any potential link between them. The idea of inquiry can be seen simply as that which is necessary and therefore common to the production of any theory of inquiry. Inquiries in science, ethics or in art have this in common. Whether inquiry is initiated by disequilibria (in the Deweyan sense) or idle curiosity, the act of inquiry, with philosophical connections to knowledge, is categorically distinct from other cognitive activity in its purpose to solve an unknown.

 One thing that must be true of inquiry is that it uses a range of cognitive skills. There is an Australian myth that a farm dog is selected from a litter by throwing a tin can into the middle of the litter. The animals quickly scatter, but sooner or later one dog will return to tentatively sniff the can. That is the dog to keep, supposedly because it is the boldest. That dog is certainly inquiring, but the knowledge it will gain about the can comes predominantly from its senses and perhaps some basic association. This is not the educational inquiry I have in mind. If we restrict our use of inquiry to include only those cognitive skills I have identified as involving manipulation of higher order mental representations, then we have an educational model of inquiry pegged to an educational model of cognitive skills. This has certain implications for our classrooms.

If, then, thinking in the classroom is considered desirable, the curriculum cannot present itself as clear and settled, for this paralyses thought. (Lipman, 2003, p. 21)

Lipman means that, for a thinking education, the classroom cannot simply be seen as a medium for the smooth transmission of knowledge from teacher to student. What we value in a thinking education, in part, is the development of cognitive skills. This development requires, by my definitions at least, that the classroom is a place of inquiry. Inquiry is the process by which the cognitive skills are best developed, and an inquiring classroom is one in which the opportunities for the use of the cognitive skills is optimised over time. Classrooms in which things are ‘settled and clear’ imply that the most efficient means of learning is memorising, or at best the acquiring of procedural knowledge such as algorithms or general reproducible techniques through practice. Logically, learning experiences inhibiting inquiry would be those in which students were asked merely to recall information, or those in which students knew the outcomes they were ‘supposed’ to achieve and were provided with all the steps needed to get here. Here we see one of the key differences between teaching declarative or procedural knowledge and teaching how to think: the curricula for thinking skills is not a ‘clear and settled’ one, but one that contains elements of uncertainty, and the classroom is one in which questions are not closed, testing simply for recall, but are open and come from both teachers and students (Cam, 2006).

 The definition of inquiry I have given is descriptive. It can be recognised in the classroom through opportunities to develop cognitive skills. This descriptive account is also inclusive of common uses of inquiry, particularly the classroom Community of Inquiry mentioned earlier. I have not addressed the motivation for inquiry. While motivation is an important component of any learning experience, it is not necessary to include it in this model of teaching critical thinking. The model provides a framework to inform practice, but it is not exhaustive as a pedagogical tool. Teachers have a broad range of extant techniques to motivate students, and none of these should be incompatible with this model. Having said that, the value of questions that do more than ask students to simply recall information, that ask them to explore in ways that are cognitively rich and require collaboration with their fellow students, should not be underestimated as motivating in itself. Recognising the model’s core characteristics, however, is educationally useful, as the conditions under which it can occur can then be readily produced.

 Understanding inquiry is a function of how we understand cognitive skills. This has two broad and immediate pedagogical consequences. The first consequence is that subject content knowledge gives us the grist to develop cognitive skills. This is because cognitive skills involve the manipulation of higher order mental representations ultimately based on this content (as it is commonly said in relation to thinking critically – you have to be thinking about something). The second consequence is that we need to provide inquiry opportunities in the classroom for the use of cognitive skills so that these skills can develop. This is because inquiry demands the use of a range of cognitive skills, beyond simple recall. Moreover, the use of cognitive skills is analogous to the use of physical skills in that neither can be learned without the opportunity to use them (Ellerton, 2015). As it is not possible to learn to surf without at some stage getting on the board, it is not possible to develop a range of cognitive skills without an opportunity to think. They are both experiential.

**Values**

It is not necessary to engage with all the ways in which value can be understood to show its place in inquiry. In particular, not all values are ethically derived. I will use Kuhn’s concept of value as an element of what he calls the disciplinary matrix.

 The disciplinary matrix represents common practice and inquiry within a discipline. The elements of the matrix include symbolic representations, acceptance of mutually coherent explanatory frameworks, and a set of classic problems and learning experiences typical of an education in that discipline. Shared values also contribute to the disciplinary matrix.

What one must understand, however, is the manner in which a particular set of shared values interacts with the particular experiences shared by a community of specialists to ensure that most members of the group will ultimately find one set of arguments rather than another decisive. (Kuhn, 1980, p. 31)

Kuhn notes that scientists are not rule based in their decision-making. Were they rule based, then two scientists applying the same methodology to the same evidence would process this evidence identically (assuming they were equally proficient at this) and inevitably and invariably come to the same conclusion. Such an algorithmic application of rules does not allow for a difference in the conclusions of the scientists. As scientists obviously do disagree with each other even given the same evidence, they must not be merely following rules (at least rules that, when equally applied, result in the same outcome).

According to Kuhn, scientists reach different conclusions given the same evidence because they apply similar values in different ways. While one scientist may value accuracy over simplicity, say, another may not. This results in changes in how the evidence is understood or processed between the scientists and hence to different conclusions. Here, then, Kuhn is identifying accuracy and simplicity as values. He also lists simplicity, consistency and plausibility (2011, p. 185). From these examples, we might induce others including precision, clarity, coherence, breadth and depth of treatment, reproducibility, logical development, and any number of things that scientists apply in a preferential manner. Of course, the weighting of any of these values may change as the issue under investigation, or the manner in which it is investigated, change. Some may not be relevant to one particular inquiry but be considered critical to another. Moreover, just as individual scientists’ personal understanding of these values may develop uniquely over individual practice and experience, the values themselves may take on different meanings in different situations. The synthesis of judgement over the range of applied values, therefore, is a very organic process and complete uniformity of judgement is not to be expected.

The values I have noted apply to scientific inquiry, and I will leave this unextended except to say that there is clearly nothing about these values as a set that would seem to limit them to science. I grant that reproducibility would seem strongly connected to experimental work, but I take it that there may be a sense in which the methodology of other disciplines could claim it as important. Regardless, values such as precision and coherence are employed in the inquiry of many disciplines; no historian, for example, would eschew these or assign them no methodological value. It is not necessary that we have a definitive list of these values to work with, only to acknowledge that those I have named, and others like them, are employed in the business of inquiry to introduce variation in outcomes given the same evidential input.

A significant application of what I will call ‘values of inquiry’ is to provide feedback on the use of cognitive skills. Consider a student engaged in the skill of analysis. It is obvious that just because she is analysing it does not mean she is doing it well. Feedback could involve comments about the *breadth* or *depth* of the analysis. It could mention that there was a lack of *clarity* in how the elements of the analysis are represented. The analysis may suffer from a lack of *precision*, perhaps by not quantifying some important aspects. The representations within the analysis may not be very *accurate*, and so on.

Part of a thinking education is teaching students the values of inquiry. This is more complex than it sounds. There are at least three aspects to this: first to teach that something is a value, second to teach why it is a value, and third to learn, as we must with all types of values, how (and also when) to apply them. This last aspect is an important one. The first two would seem to be only propositional knowledge. Knowing that something is a value and knowing why it is a value could be learned and recalled. Knowing how to apply it, however, is subtler. It is more akin to the ‘knowing how’ of Ryle (1970) than ‘knowing that’. Again, we see an experiential aspect in learning how to think. Knowing how to use the cognitive skills and knowing how to apply the values of inquiry are examples of non-propositional knowledge.

Elder and Paul have chosen a selection of these values of inquiry, calling them “Intellectual Standards” (2013), to form the basis of their understanding and teaching of critical thinking. I prefer the earlier, Kuhnian, use of the term values rather than standards for a variety of reasons. The first reason is that standards suggest benchmarks. Benchmarks in turn suggest that particular levels have been attained or not; it is a binary conception of thinking. The second reason for preferring values over standards is that standards suggest specificity of approach. For example, one might have particular industrial standards for the manufacture of a particular type of chair, and another set of standards for the length of car battery life. Values, on the other hand, are general. Clarity can be improved in writing by ensuring only one key idea is encapsulated in a paragraph, or in science by taking care in the labelling of axes on a graph, or in mathematics by setting out working in a systematic way. Clarity is a general value of inquiry, and the art of inquiry involves learning how to apply the general value in specific circumstances. The third reason to prefer values to standards is that standards suggest a compliance model, in which basic standards, having been met, can be thought of as attained or even exhausted, seeming more like competencies than nuanced abilities. The fourth reason to preference values is that unlike standards, which can be quite discrete, values overlap. Precision can contribute to clarity. Depth of analysis can benefit from clarity. Depth of analysis can improve logical development. The image of a graphic equaliser comes to mind. As certain types of music benefit from a particular mix of frequencies, some genres sounding better when mid-range frequencies are boosted and others when lower frequencies are damped, certain types of inquiry, and certain types of inquirers, will preference certain values of others. This was precisely Kuhn’s point. Elder and Paul certainly do not propose such industrial use of their intellectual standards, and do indeed treat them as values in the Kuhnian sense. It is simply the potential for misunderstanding in an educational context, as well as following the original work of Kuhn, that leads me to a prefer the term ‘values’.

A class I teach provides a further example of subtlety in value application. The class is composed of students preparing to be Physics teachers. These students typically come from a strong background in physics and mathematics. One of the first inquiry activities I introduce is to experimentally determine the factors influencing the period of a pendulum. While they often measure the initial angle of release of the pendulum using a hand held protractor resulting in a very large potential uncertainty, they are provided with a stopwatch that records to a hundredth of a second. They usually seem quite happy to record the angle of release plus or minus 5 degrees or more and combine this with the reading on the stopwatch of a period measured by eye. The key lesson is to understand how they are valuing precision. What is the value of using the reading to a hundredth of a second while other factors are so uncertain? Might we value, say, reproducibility more in this case? Precision pursued for its own case, in ignorance of context and use, shows a lack of understanding in the application of this value. It is also a good indicator of acting outside the norms of a particular discipline. For example, advertisements for ‘miracle pendants’ that increase your resistance to negative energies by 92.5%, or shampoos that make your hair 26% fluffier show a poor understanding of the application of the value of precision in science, both in incorrect use of quantification and in vagueness of language. Such inappropriate application of a value is an excellent indicator of pseudoscience.

**A simple model of teaching critical thinking**

We can now see the dynamic between the three nouns in the title of this article. Effective educational inquiry can be understood as allowing for the development of a range of cognitive skills. Cognitive skills involve the things we do with knowledge; specifically, they involve the manipulation of higher order mental representations. The values of inquiry provide feedback on how the cognitive skills are developing and, through this, students learn how these values are to be applied normatively.

 I have not given a definitive list of cognitive skills or of the values of inquiry. Not only might such a task be impossible, at least to the satisfaction of all, but also it is sufficient that the skills and values are categorically defined with enough coherence so that others can be generated or recognised for what they are as required. For example, one might find words like *extrapolate*, *speculate*, *hypothesise*, *classify* and *translate* in assessment criteria sheets or in tables of outcomes. It is not difficult, I hope, to recognise these from what I have outlined above as manipulations of higher order mental representations. They are clearly cognitive skills. Similarly we would clearly value *explanatory power*, *falsifiability* and, perhaps above all things, *cogency* in the activity of inquiry. Considering the terms *generalising* and *generalisability*, we would see the first as a cognitive skill and the second as a potential value.

 There is a further test of our ability to discern between these two categories. If I now introduce the term *persistence*, one might wonder as to its correct allocation. It is tempting to say that we value this. It does not seem quite like a cognitive skill – it’s not something we would do with knowledge. But I would not include this as a value for a simple reason: it is a characteristic of a person, and is therefore perhaps best seen as a virtue[[1]](#endnote-1). Other virtues commonly associated with critical thinking are things such as *inquisitiveness*, *open-mindednes*s and *intellectual honesty*. They are also called affective dispositions (Facione, 1990), being things we value in people, rather than as a characteristic of good inquiry itself. We might say we also value *clarity* in people, but that merely describes what they produce. We are generally quite happy with their individual opacity.

 I have suggested a relationship between cognitive skills, inquiry and a particular set of values. There is also a potential relationship between values and virtues. It could be that proper training in the values of inquiry would lead to inquirers with the virtues I have mentioned. Understanding, indeed appreciating, the value of clarity and accuracy would suggest a tendency towards intellectual honesty, for example. Valuing falsifiability in a theory may produce an inclination to open-mindedness. There seems nothing about mastering the application of values that logically necessitates developing particular virtues, but it is sensible to see mastering values as a path to virtue, though this mastery may be neither necessary nor sufficient for virtue. It is sensible to imagine, however, that virtues such as inquisitiveness and a willingness to revise theoretical assumptions could only enhance the inquiry process. This is not an argument I will pursue for the moment, but it is worth future exploration to better understand critical thinking in general.

 I will now present some examples of how the values can be applied to a range of cognitive skills. More specifically, I will outline how work that shows appropriate use of the values of inquiry can be described. To facilitate this I have produced a matrix of cognitive skills and values, based loosely on cognitive skills outlined by Facione (1990) and the intellectual standards outlined by Elder and Paul (2013). The cognitive skills are represented in rows, and the values of inquiry in columns. This matrix is too large to appear here in full.

 The row headings are: Interpretation-categorising; Interpretation-decoding significance; Interpretation-clarifying meaning; Analysis-examining ideas; Analysis-identifying arguments; Analysis-argument deconstruction; Evaluation-assessing claims; Evaluation-assessing arguments; Evaluation-synthesising claims; Inference-querying `stating results; Explanation-justifying procedures; Explanation-presenting arguments; Self-regulation-metacognition; Self-regulation-self-correction.

 The column headings are: Clarity (intelligibility); Accuracy; Precision; Depth (complexity/relevance/significance); Logic (coherence); Breadth (alternatives/perspectives,/collaboration).

 The matrix is populated by a collection of statements describing student work. These statements are not meant to be definitive or comprehensive, they are simply descriptors of work. They represent the kind of statements that educators could provide to students to evaluate their work and to provide feedback. The following are examples of how the values of clarity and depth of analysis might be applied in a selection of cognitive skill use.

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| Cognitive skill | Clarity | Depth of Analysis |
| Interpretation-categorising | The criteria for categorising are unambiguous and the common characteristics of elements within the category are explicitly stated and recoded as necessary. | Categorisations are made through relevant and significant characteristics rather than superficial resemblances. Logically coherent criteria are used. |
| Inference-conjecturing alternatives | Possible inferential pathways are articulated based upon varying use of evidence and argumentation. Alternative hypotheses and potential conclusions are distinguished with relation to their assumptions. | Alternative hypotheses maintain the emphasis on significant and relevant information, as well as a focus on solving the core problem. Complexity is managed and problematic causal and evidential relationships are addressed across possible outcomes. |
| Explanation-presenting arguments | Argumentative prose, diagrams, charts, graphs and graphics convey unambiguous meaning which adhere to convention. Points at issue are clearly defined and stated. | Counter-arguments are identified and addressed. Causal and logical relationships that relate to the argument are identified and their role made explicit. Problematic aspects identified and solutions explained.  |
| Evaluation-assessing claims | The nature of evidence is well defined and presented in context. Inferential pathways between evidence and claims are made explicit.  | Claims and conclusions are connected to the nature of the problem and of the evidence. Cognitive and social biases are explored. The contextual relevance of questions, information, principles, rules or procedural directions are assessed. |

**Table 1:** How values are applied to the use of cognitive skills.

Note that the descriptors as I have written them are not discipline-specific. That they can be written in this way allows two significant claim to be made: first, learning to think well is not the domain of any particular discipline, the skills and values involved in thinking well are generic; second, because these descriptors can be instantiated within individual disciplines, these skills and values must be transferable.

 I have already suggested how the value of clarity might look across different contexts. Teaching analysis, as an example of a cognitive skill, can also be done outside a discipline context. Consider that we could define analysis as the breaking down of a conceptualisation into its constituent elements, with some regard to how these elements may be categorised, how they relate to one another and to the overall nature function of purpose of the original conceptualisation. It is not necessary that we agree on this definition, just that a definition of this sort might be made. Now, having gone though this with students, we might examine a work of visual art and ask questions based on our definition. What elements are involved and how they do conspire to produce a particular effect? We could present a particular scientific model, or a poem, or a text-based account of the reintroduction of wolves into Yellowstone National Park and the consequent impact on the ecosystem, and ask the same questions. There is nothing about this hypothetical method that logically restricts the teaching of analysis to a discipline. Similar accounts could be given for any of the cognitive skills and, for that matter, any of the values of inquiry. Of course, the nuances of how the values of inquiry are applied between disciplines do vary, though Kuhn himself noted that these are the most easily shared aspects of all the disciplinary matrices (Kuhn, 1970, p. 184).

**Inquiring into critical thinking**

If the model I have outlined above has value, one would expect it to be useful in, or at least descriptive of, how the model itself has been derived and communicated in the first place. It should be self-referential.

 In the first case, the freedom to inquire is an essential aspect of working in the academy. This freedom may be far removed from the freedom to inquire in a school (or even undergraduate) classroom, but it is not different in character. Within this inquiry environment, constructing this model required a broad range of cognitive skills. I needed to analyse a great deal of material, evaluate claims and arguments, synthesise this into a model and then justify its merit as an educational device. In discussing this with colleagues, I received feedback about clarity, breadth and depth of treatment, inclusion of significant and relevant material, and logical development of my ideas. Some of these discussions showed that I could have been more rigorous in the use of my cognitive skills. I then attempted to improve my work by better applying the skills of analysis and synthesis in particular. In terms of my application of the values of inquiry, I should have taken care to be clear in the language I used, in the placement and sequence of ideas, in the use of examples to illustrate my points, and in the unambiguous use of terms. I should have used words with precision (in the right way at the right time), adhering to convention as best I could. I should have ensured any claims were accurate, referenced when necessary and did not misrepresent source material. That I have no doubt maintained the potential for improvement despite their efforts shows that I am still learning to improve my cognitive skills and to apply the values of my discipline.

 It may seem that the model I propose for developing critical thinking skills is a comfortable fit with the experience of writing this article, as I have just outlined it, because it is so loosely applied. But this is exactly my point. The model is broad enough to be inclusive of most practice, but maintains pedagogical imperatives that can inform that broad scope of practice.

**Conclusion**

It is possible to understand critical thinking as the proficient use of a broad range of cognitive skills and the result of an education in the application of the values of inquiry. Cognitive skills are the things we do with knowledge, or more specifically the manipulation of higher order mental representations. The values of inquiry are those things we value in the process of inquiry. We may value them because they lead to more effective outcomes, because they are more closely linked to a preferred epistemology, or because they are the norms of a particular discipline of which we aspire to be a part or for which we hope to be an exemplar. Pedagogically, the interplay between cognitive skills and values is best facilitated in an environment in which inquiry, as the requirement to use a range of cognitive skills, is permitted and encouraged. This implies a curriculum and practice that promotes uncertainty and open questions. Moving away from a teacher-centred approach with outcomes emphasising declarative and procedural knowledge towards one that makes students think in collaboration which each other and with the teacher, even while processing that knowledge. This is a path to the development of critical thinkers.

**Notes**

1. Elder and Paul also outline a selection of virtues, which they call “Intellectual Traits” (Paul, 2015). These virtues include humility, empathy, autonomy and courage (each prefaced by the word ‘intellectual’).

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1. [↑](#endnote-ref-1)