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Thinking skills: the question of generality

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This paper examines the question of whether there are useful general thinking skills. It offers a working definition of 'thinking skill' and identifies ways in which this concept has been over-applied. Thinking skills, used across domains, are not inevitably weak as a result of the generality–power tradeoff. Admitting that thinking skills require domain-specific knowledge for their application, it is contended nonetheless that there are general thinking skills that involve substantial amounts of domain-independent knowledge. These skills usually address 'generic thinking tasks', common mental challenges that people face in many practical and intellectual endeavours, including the 'domain of practical affairs'. The educational implications of these findings are discussed.

The decades-old quest to teach people how to think has engendered an equally aged controversy over thinking skills instruction and the critical thinking (CT) movement. On one hand, CT proponents such as Ennis (1989, 1991) assert that there are important general thinking skills (GTSs) that apply across domains or fields of practice. Such skills can presumably be taught most effectively in general education courses where they will not be overshadowed by discipline-specific content. The contrary position, championed by McPeck (1981, 1990b), maintains that the only useful thinking skills are domain-specific. Students should be taught how to think by taking courses associated with traditional academic disciplines.

McPeck (1981) offers two salient arguments against GTSs. The first, his 'content' argument, claims that thinking is always about something, and that the content of thought strongly shapes the nature of thinking. Consequently, GTSs are logical impossibilities. McPeck's (1990a: 12) second objection, the 'triviality' argument, alleges that purported GTSs are 'trivially obvious' and have no practical cognitive value. This is the case, he suggests, because the usefulness of a skill necessarily diminishes as its generality increases. The content argument has been rebutted (Miller 1986, Siegel 1988, Ennis 1989, Andrews 1990, Brel 1990), although apparently not to McPeck's satisfaction. GTS proponents have also responded to the triviality argument by citing thinking skills—evaluating sources, for instance (Blair 1992)—that seem to be both general and substantive. McPeck and his supporters ignore these counter-examples, focusing instead on purported GTSs—for instance, pinpointing the problem

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(Johnson and Gardner 1999)—that are clearly deficient. In large part, the two sides of this debate talk past each other.

The GTS controversy has other dimensions as well. It is part of a broader debate over the effectiveness of CT programmes. McPeck and other scholars (e.g. Walters 1992) assert that CT is an overly narrow and, for that reason, seriously inadequate approach to the improvement of thinking. While CT proponents almost invariably favour the GTS position, some GTS supporters (e.g. Norris and Ennis 1989) admit that traditional CT instruction does not sufficiently consider creativity, problem solving, and other important parts of what is involved in being an effective thinker.

Another issue concerns the extent to which effective thinking is a matter of skill. Increasingly, scholars recognize that thinking effectiveness derives from various kinds of knowledge—of concepts, principles, standards and heuristics, among others (e.g. Bailin *et al.* 1999a, b). Moreover, not only knowledge but also values and mental habits or dispositions influence thinking performance. Thus, the development of mental skills, general or domain-specific, is only part, and perhaps not the most important part, of becoming a capable thinker.

The sometimes-forgotten pedagogical bottom-line for this debate is simple: *by what means should educators teach people how to think?* More pointedly, is there a substantial body of important material (concepts, principles, skills, and so forth) that is general (broadly applicable to practical affairs and various disciplinary domains) which could be taught, for instance, in general education courses in such a way that students would be able to transfer and apply their knowledge in other relevant contexts?

A simple resolution of the GTS controversy is to regard thinking-skill generality as a matter of degree, different skills occupying different positions along a continuum. Although this moderate position makes sense, it is not satisfying. Educators would like to have a deeper understanding of these issues, and a more principled resolution of the debate. In this paper, I respond to this need by developing a more complete understanding of the nature of thinking skills and their potential for generality.

In the next section, I analyse the concepts of 'skill' and 'thinking skill', identifying ways in which the latter has been misapplied. I then consider the generality–power tradeoff, finding that it has been misunderstood, and that thinking skills usually lack power for want of operationality and specificity. A discussion of domains of thought suggests that they are not so discrete as GTS opponents have assumed. A 'domain of practical affairs' is identified as well as 'generic thinking tasks', the bases for many important GTSs. In the concluding section, I explore the implications of these findings for educational theory and practice.

Skill basics

The notion of skill has become controversial in educational circles (Hart 1978), largely because of how the concept of 'thinking skill' has been applied. Disagreements ultimately derive from the fact that 'skill' is a

family resemblance concept (Wittgenstein 1953): it is defined by a cluster of properties, none of which is a necessary or sufficient condition for the concept's application. As such, 'skill' is a graded rather than a discrete classification, certain instances being central or prototypical, while others are marginal members of the class.

Skills

A skill is a capacity, usually acquired through training and experience, to do something well, to perform competently certain tasks. Skills are differentiated by the tasks they address. The skill of riding a bicycle is different from that of solving crossword puzzles. Ability is the nearest synonym for skill, although the latter term often connotes a higher level of training, experience and proficiency. The skill–ability relationship suggests that 'skill' has two distinct connotations. Some skills refer to an acquired ability or capacity; others imply highly competent performance. A toddler acquires the skill of walking, but a skilled driver can do more than just operate motor vehicles. Thus, 'skill' can be used to mean either 'mere ability' or 'special capacity'. As Griffiths (1987) points out, skill is also associated with procedural knowledge, what Ryle (1963) termed 'knowing how'. Although declarative knowledge, 'knowing that', can be involved, skills centre on knowing how to do something.

This core meaning of skill can be extended in several ways. As procedural knowledge, skills are sets of activities that can be 'schematized or purposively sequenced' (Smith 1984: 227) in varying degrees. Skills are exercised by choice (Johnson and Gardner 1999); their initiation and operation are largely subject to conscious control. Skills are repeatable and transferable (Smith 1984), within limits: a skill applies to a certain kind of task, but task kinds do not always have clear boundaries. In these respects, skills have much in common with strategies, methods and techniques, more overt forms of procedural knowledge. Indeed, skills typically consist, in part, of strategies and methods that have been internalized, seamlessly incorporated into a performance routine. One's skill at playing tennis reflects learned strategies and methods for serving, volleying, and other tennis-related activities.

Like methods and techniques, skills have a scope. A broad skill encompasses more activities than a narrow skill. Indeed, broad skills typically include narrow skills as their constituents. This characteristic of skills has created confusion about the concept's applicability. If I admit only very narrow abilities as skills, I will be defining the concept's most common referents out of existence, replacing them with 'micro-abilities' that rarely appear in everyday discourse: carrying and borrowing will supplant adding and subtracting in skill talk. On the other hand, by defining broad skills that are simply aggregations of narrower skills, I create instances of the concept which lack the structured procedural quality that is one of its defining characteristics. Objections to the notion of 'critical thinking skill' (Barrow 1987, McPeck 1990b) are well-founded because there is no broad CT procedure that one could be skilled at. This apparent

dilemma can be resolved if I only apply the skill concept to performances whose constituent activities are sequenced or otherwise structured into a coherent whole. On this view, ice-skating is a skill but playing hockey is not; performing brain surgery is a skill but being a physician is not. Problem solving is a skill insofar as its performance can be adequately represented by stage or functional models; otherwise it is not. I can speak of individuals as being skilled thinkers or as having strong critical thinking skills, but I should not speak of 'critical thinking skill' *per se*.

Skills are evidenced through task performance. In most cases, the possession of relevant skills is neither necessary nor sufficient for successful performance. Luck can intervene (an incompetent baseball player gets a hit) and countervailing factors can override skill (a crafty pitcher strikes out the league's leading hitter). Skill is but one of many individual characteristics that bear on performance, there being numerous extra-individual influences as well. Over multiple performance instances, however, skill correlates positively with task achievement. In cases (e.g. walking, adding) where skill has a 'mere ability' connotation, skilled performance is the norm. When the concept's 'special capacity' connotation is in effect, the possession of skill implies that one's performance exceeds general standards. For this to happen, skilled activities must extend beyond or be better than is normal. Skills of this kind (e.g. communication skills) are not demonstrated by the exercise of natural performance capabilities.

Thinking skills

Thinking skills share characteristics that apply to skills in general, while also having attributes that are more distinctive. Like other skills, a thinking skill has procedural knowledge at its core; one knows how to perform certain mental activities. Although it is difficult to make crisp distinctions between thinking skills and other forms of knowledge (Nickerson *et al.* 1985, Bailin *et al.* 1999a), having a thinking skill entails more than just having declarative knowledge, say, of the fallacy of bifurcation. The mental activities comprising a thinking skill are sequenced or otherwise structured in some way. Being exercised by choice, thinking skills are high-level, consciously controlled, mental activities. The scope of a thinking skill—the set of mental activities it encompasses—can be broad or narrow. However, broad thinking skills are not simply collections of mental activities; their constituent parts must be organized into a coherent whole.

The intense educational interest in thinking skills has several implications for the concept. First, thinking skills must be teachable. Although this follows from the fact that they are relatively structured mental activities subject to conscious control, it deserves to be stated as an explicit criterion for the concept. The efforts of the vast thinking-skills movement in education should only be concerned with teachable, learnable mental activities. Secondly, thinking skills are 'special capacities', extending beyond the 'mere ability' to think. Most people are able to think with some base level of competence. The possession of thinking skills implies

that one exceeds this baseline in certain ways. Thinking skills must be developed, typically through education.

Finally, although thinking skills are structured activities like other skills, they are not fully proceduralized. The notion of thinking, hence that of thinking skill, implies the exercise of discretion, the use of judgement and understanding, a sensitivity to context. This, in turn, implies that thinking skills cannot be fully proceduralized. They are not algorithms. Having a thinking skill is not like having a recipe, a complete set of instructions that can be applied by rote in any situation. Rather, one who possesses a thinking skill has procedural knowledge of how to perform certain thinking tasks. This knowledge is more or less detailed, but it is inevitably incomplete in the face of context-specific task demands. Mental tasks that have been fully proceduralized, reduced to algorithms, are no longer viewed as thinking tasks. They are given task-specific names (e.g. 'computation of return-on-investment') and turned over to computers. Some thinking skills are more judgement-dependent and context-sensitive than others. However, the notion of thinking skill implies a measure of mental discretion. Several scholars (Hart 1978, Barrow 1987) emphasize the role of judgement and understanding in thinking, without incorporating them into the notion of thinking skill.

Thus, thinking skills lie between two extremes. On the one hand, they must be sufficiently structured to be teachable, consciously controlled mental activities that can be exercised at their possessor's volition. On the other hand, they must not be so highly proceduralized as to lack thinking *per se*. Thinking skills lie between intuition and algorithms.

The foregoing analysis sheds light on the nature of thinking skills and provides a more principled basis for the concept's application. A thinking skill is a teachable, partially proceduralized, mental activity that reaches beyond normal cognitive capacities and can be exercised at will. Assessed against this definition, many current uses of the concept can be seen as inappropriate. Complaints that the notion of thinking skill has been too profligately applied (Hart 1978, McPeck 1981, Barrow 1987) have considerable merit. The following misapplications are most common.

- *Collections of mental activities*: This mistake may derive from the 'naming fallacy' (Johnson and Gardner 1999), in which the existence of a general label (e.g. problem solving) is taken to imply the existence of a general skill. However, skills have a degree of procedural structure that mere collections of mental activities invariably lack. For this reason, it is a mistake, as suggested earlier, to regard CT as a skill.
- *Mental capacities that lack procedural content*: During the course of their cognitive development, people acquire mental capacities that enable certain kinds of performances. However, these capacities—intuition is an example—cannot be acquired through direct instruction, nor are they procedures that one can activate at will. Thus, they should not be viewed as thinking skills. For instance, reading comprehension and understanding are better regarded as mental capacities than as thinking skills (Smith 1984, Woodhouse 1991).

- *Mental activities that lack procedural structure*: Many purported GTSs, such as the ability to determine relevant facts, fall under this heading. These activities lack the procedural content required of a thinking skill. Conceivably such content could be developed, although perhaps only in particular domains—for instance, knowledge of generic criminal motives might point one towards relevant facts. However, without this kind of elaboration such 'skills' must be regarded as empty constructs expressing more hope than substance.
- *Applications of declarative knowledge*: A fixation on the skill side of the skill–content dichotomy has led educational theorists to excesses in couching other forms of knowledge as skills. Knowing a fallacy becomes the skill of detecting or avoiding it; understanding the notions of necessary and sufficient conditions becomes the skill of applying these concepts. This practice is justified when considerable procedural knowledge is involved, over and beyond the knowledge being applied, so there is more to having the skill than just knowing related facts. All too often, however, this condition is not met, and purported skills are created out of simple content knowledge.
- *Mental activities that are part of our normal cognitive repertoire*: Because the realm of normal is not well-defined, one can rarely establish definitively that a purported thinking skill merely expresses normal human capabilities. However, some skills clearly offer less 'value-added' than others, raising the question of whether they should be regarded as skills. Some of de Bono's (1982) prescriptions are vulnerable to this criticism. Most people have an inclination and ability to evaluate alternatives before making a choice. Telling them to 'do a PMI', explicitly considering the pluses (P), minuses (M), and interesting (I) aspects of each option, may be beneficial, but it is unlikely to extend one's thinking ability to a considerable degree.
- *Simple mental habits*: Much of de Bono's work falls under this heading as well, being prompts to perform mental activities that effective thinkers undertake as a matter of habit. Unlike true thinking skills, these mental habits lack procedural depth: there is no real 'how to' to be learned, so there is no real skill to be acquired. The challenge lies not in knowing how to do the activity, but in remembering to do it. Purported thinking skills are just reminders or, as de Bono (1982) calls them, 'attention directors'. Rather than being a GTS, as suggested by Perkins (1985), asking 'Why not?' is a good mental habit. People can be helped to develop such habits, and related reminders should be included in programmes that teach people how to think. However, they should not be regarded as thinking skills.

Many supposed 'thinking skills' fall into these categories, failing to satisfy appropriate standards for the concept's application. At the same time, however, many legitimate thinking skills remain. Deductive reason-

ing, causal diagnosis, argument construction and conceptual analysis are examples. Of course, having thinking skills is only part of what is involved in being an effective thinker. Much of the knowledge that has been denied the 'thinking skill' designation is important and deserves to be included in instructional programmes. However, the debate over whether there are GTSs must be grounded in an adequate account of the 'thinking skill' concept. Having developed such a conceptualization, I now turn to the GTS debate.

The generality of thinking skills

Are there GTSs? This question lies at the heart of the thinking skills controversy because of its implications for how thinking should be taught. The generality of a thinking skill is its applicability across subject-matter domains and contexts; a GTS is procedural knowledge that can be applied to different kinds of content. The notion of thinking skill seems to imply some degree of generality, because thinking, as noted earlier, involves judgement, understanding and other context-sensitive activities. Even the most domain-specific thinking skill could not be a one-size-fits-all procedure. Beyond this base level, however, thinking skill generality is likely to be a matter of degree, some thinking skills being more general than others (Baron 1985). It is important to distinguish between a thinking skill's generality and its scope, the latter concept referring to the breadth of mental activities a skill encompasses. McPeck (1990a), for one, is confused on this point. Counting and adding are skills of very narrow scope—they do not involve many different activities—but because they can be employed with virtually any content, they are, contra McPeck, extremely general.

However, matters are more complicated than this section's simple opening question suggests. For one thing, the fact that a thinking skill is general—capable, in principle, of being applied in multiple domains—does not establish that it is generalizable—that thinkers will be able and likely to apply it in different fields, a point raised by both McPeck (1990b) and Johnson (1992). This, of course, is the issue of *transfer*, an empirical psychological question that will be examined later. My immediate concern—thinking skill generality—faces an even more serious challenge from GTS opponents. Even if there are GTSs, they contend, such skills are inevitably weak and ineffectual, not worth the effort of learning. This is due to the generality–power tradeoff, a supposed 'iron law' that prevents general skills, methods, strategies and other procedural knowledge from being powerful means of performing tasks. To be general is inevitably to be weak, a charge that McPeck (1990a, b, 1992) makes repeatedly. Ennis (1990) responded by claiming that supposedly trivial GTSs (e.g. not contradicting oneself and not believing everything one hears) are still worth teaching because the mistakes are made so commonly. Whatever its merits, this rebuttal does not challenge the generality–power tradeoff, nor does it allay a concern that GTSs might not have much cognitive substance.

The real question to be examined is this: are there useful (reasonably powerful) thinking skills that are general (applicable in multiple domains) and that could be taught in thinking courses/programmes that are not discipline-specific in a way that plausibly enable knowledge transfer to various fields of practice?

The generality–power tradeoff

Any skill, method, strategy, heuristic or other form of procedural knowledge can be characterized in terms of its generality and power. As Newell (1969) explains, the generality of a problem-solving method is a measure of the size of the method's domain, the set of problems to which it applies. A general method or skill can be used on more occasions, in more situations, than its less general counterparts. Power is the method's ability to deliver solutions, its effectiveness. Powerful methods reliably produce high-quality solutions for problems in their domains. Correspondingly, a GTS is one that can be used on many different occasions and situations encountered in multiple fields of knowledge and practice. A powerful thinking skill enables one to be consistently successful in performing the thinking tasks for which it is employed.

To be powerful, a method or skill must exploit opportunities created by characteristics of certain kinds of situations. Newell (1969) describes how linear programming, a powerful mathematical modelling technique, makes use of the linear constraints and objective functions of certain kinds of resource-allocation problems. However, its sources of power, at the same time, restrict the method's generality, because relatively few situations possess these key characteristics. Thus, the generality–power tradeoff: General methods can only address generic problem characteristics that provide little problem-solving support. As a result, they lack power. Likewise, a GTS that is applied to many kinds of tasks and situations would not be powerful enough to be effective in any. This, it is argued, is the fate of GTSs like not contradicting oneself, not believing everything one hears (McPeck 1990a), looking for tautologies, and making sure the conclusion follows (McPeck 1990b).

Here the thinking skills movement's want of conceptual discipline has got it into trouble. For the supposed GTSs denigrated by McPeck are not thinking skills at all, being better regarded as reminders (e.g. 'Don't believe everything you hear!'). Other purported GTSs that have been criticized—for instance, selecting and using evidence (Johnson and Gardner 1999)—lack the procedural specificity to be true skills. The fault lies not with GTS opponents, but with GTS supporters, who have been much readier to propose GTSs than they have been to develop them.

On the other hand, GTS opponents can be faulted for not assessing thinking skills that GTS supporters claim are both general and useful. Reasoning by analogy (Weddle 1984), experimentation (Swartz 1987, Schunn and Anderson 1999), and the evaluation of sources (Blair 1992) have all been proposed as GTSs. Means-ends analysis, causal reasoning, mnemonics, argument analysis, design by top-down refinement and cost-

benefit analysis could also be cited. Each is applicable to multiple domains and has the procedural content and other characteristics required of thinking skills. Perhaps GTS opponents have assumed that, because of the generality–power tradeoff, such skills must inevitably be weak. Yet, they certainly seem to be useful activities. How, in light of the generality–power tradeoff, can this be?

This conundrum is resolved when one realizes that the generality–power tradeoff is irrelevant to the GTS debate. The tradeoff has been misinterpreted and misapplied by McPeck and other GTS opponents. To understand this, one must recognize a distinction between generalizing over *tasks* and generalizing over *domains*. As explained earlier, skills and methods lose power when they generalize over tasks. In trying to do too much, they sacrifice the power achieved by exploiting characteristics of particular situations. However, the GTS debate is concerned with whether thinking skills apply in multiple domains of knowledge and practice. A skill focused on a particular task would be general if that task was addressed in more than one domain, and the skill would not lose power on account of being general in this way. Figure 1 graphically depicts the different kinds of generality. GTS proponents do not claim that a purported GTS addresses a broad array of thinking tasks, as shown on the left side of figure 1. Rather, their claim is that the particular tasks addressed by a GTS appear in multiple domains of practice, as depicted on the right side of figure 1. Thinking skills that are general over domains lose no power; they can be sufficiently well specified to be effective in diverse practical applications because they perform the same basic task in each.

Consider, for instance, the evaluation of sources, which Blair (1992) identified as a GTS. Because people in virtually every field use information collected from other sources, the need to evaluate source credibility is

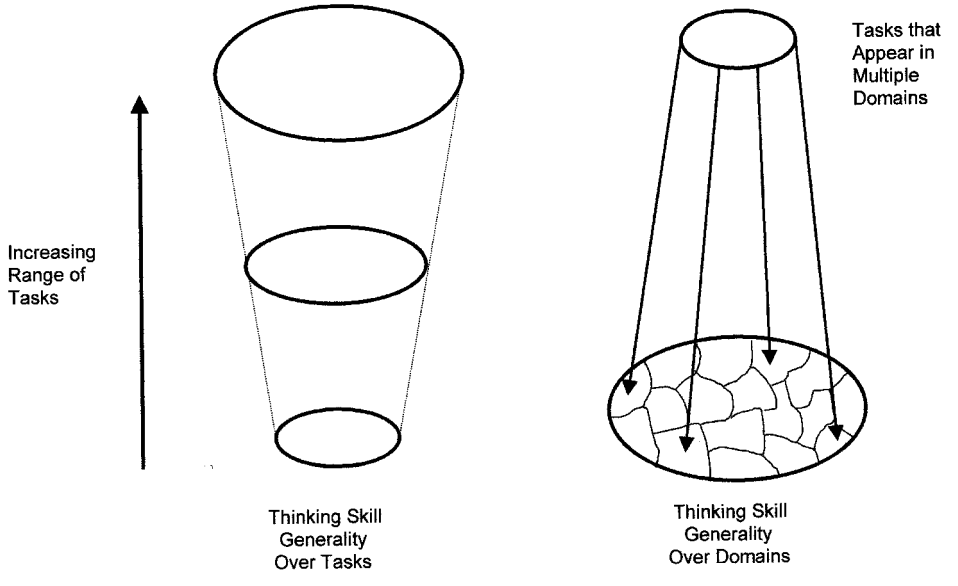

Figure 1. Different kinds of thinking skill generality.

widespread. Thus, the target thinking task is general across domains. Moreover, this task can be nicely operationalized in terms of various characteristics of sources to consider in assessing their credibility. For instance, credible sources have relevant background and experience, they have no apparent conflicts of interest, and they use appropriate procedures in gathering information (Ennis 1996a). Although domain knowledge might help one make related assessments within a domain, useful evaluations can be made without this specialized knowledge. There is considerable value in being aware of these general characteristics. Accordingly, the evaluation of sources is a reasonably powerful thinking skill that is highly general across domains.

Operationality and specificity

Although McPeck and other GTS opponents have misused the generality–power tradeoff, their allegation that many GTSs lack power is correct. It is important to understand why. The problem is not, as McPeck (1990b) claims, that GTSs are designed to apply too broadly, to address so many kinds of tasks that they lose power. Rather, the problem is that such skills have not been developed or elaborated with the procedural specificity needed to make them powerful. Reasoning by analogy is a GTS because it encompasses enough domain-independent content (e.g. about mapping and types of analogies) to be a useful piece of procedural knowledge. The purported GTS of determining relevant facts, on the other hand, lacks this level of development, and probably could never attain it.

For a thinking skill to be powerful, two conditions—operationality and effectiveness—must be satisfied. First, the skill must be operational; it must be specified through instructions that individual thinkers can reliably perform. Secondly, the skill must consist of activities that constitute an effective way of performing the target thinking task. A key to operationality is specificity: the more specific the instructions and advice constituting the skill, the more likely it is that thinkers will be able to perform related activities. Unless the operationality condition is satisfied, the skill cannot even be assessed in terms of the effectiveness condition.

The trouble with most thinking skills, general and otherwise, is that they are underspecified. They are empty prescriptions, shells, rather than operational forms of procedural knowledge. Thinkers are not told what to do with their minds in order to actualize the skill. 'Generate creative alternatives': How? 'Synthesize': Tell me more! Virtually every criticism of alleged GTSs (McPeck 1990a, b, 1992, Johnson and Gardner 1999) focuses on their lack of specificity and consequent lack of power, even though generality is supposedly what is at issue. As suggested above, the notion of thinking skill implies a degree of proceduralization. Many purported thinking skills fail to satisfy minimal requirements in this regard.

Thinking skills become more powerful as a result of being made more specific and operational. With a GTS, the question is whether this can be done in a way that is independent of domain content. Figure 2 illustrates the concern. Its horizontal axis designates different degrees of thinking skill

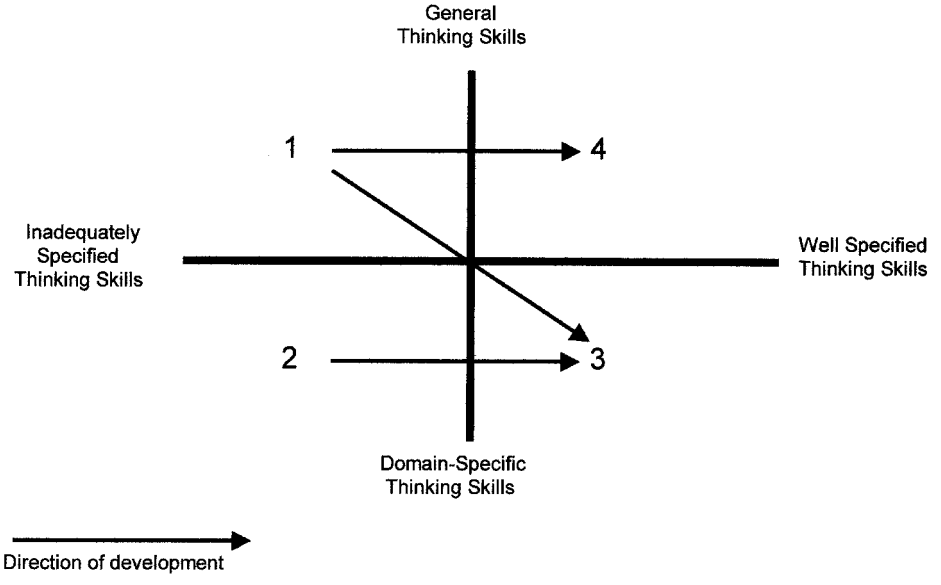

Figure 2. Thinking skill generality and specificity.

specificity, while the vertical axis indicates whether the skill is general or domain-specific. While some GTSs (e.g. cost-benefit analysis) fall in Quadrant 4 in figure 2, most are in Quadrant 1, indeed on its left side, making it questionable whether they are thinking skills at all. To make such 'skills' more useful and legitimate, they must be specified more fully, developed in greater detail. This can be done by adding general or domain-specific knowledge, moving the skill to Quadrant 4 or 3, respectively, in figure 2. If the latter, the skill has gained power by losing generality, so it is now a more useful, but domain-specific, thinking skill.

For instance, the purported GTS of 'identifying assumptions' involves recognizing the assumptions in an argument that, taken together with stated premises, render plausible the argument's conclusion. Although general, this advice provides scant procedural content and specificity for the crucial activity of recognizing assumptions. 'Identifying assumptions' could conceivably be developed into a GTS, but doing so would entail providing more detailed instructions for identifying assumptions in arguments from any field. More plausibly, one might be able to specify heuristics and other instructions for identifying assumptions in legal arguments, historical arguments, or reports of scientific research. Doing so would convert 'identifying assumptions' into one or more domain-specific thinking skills. Schunn and Anderson (1999) show how the general skill of experimental design is further operationalized and specified within a particular domain of practice (e.g. cognitive psychology). In that case, GTSs—experimentation, experimental design—coexist with more elaborate, domain-specific offspring. Even skills in Quadrant 4 in figure 2 must be implemented in context-sensitive ways, but this is true of all procedural knowledge: applications are always contextualized. What makes these skills general is the fact that they encompass significant amounts of knowledge

that apply across domains and specific contexts of application. Acquiring the general skill is a valuable step towards learning its domain-specific variations.

Ultimately, the existence of GTSs hinges on the existence of generic thinking tasks, important mental jobs whose near-variants appear in multiple domains of practice. If these generic tasks have enough domain-independent content, then GTSs, targeted on those tasks, can be developed and taught. This issue is considered in the next section.

Domains of thought

The previous section rebutted arguments that GTSs are inevitably weak, by showing how the generality–power tradeoff has been misapplied. It also identified several useful and important GTSs, claiming that they are general because they address significant thinking tasks, each of which occurs in multiple domains of thought. This claim challenges a core assumption of GTS opponents: the belief that domains of thought are discrete and highly individuated, having little or no overlap of content, so that thinking in each domain is *sui generis*. This assumption and topics relating to it will now be considered in greater depth.

McPeck's content argument

In *Critical Thinking and Education*, McPeck (1981: 3–5) used the observation that 'thinking is always thinking *about* something' as the basis for an argument leading to the conclusion that 'it makes no sense to talk about critical thinking as a distinct subject and that it therefore cannot profitably be taught as such'. This 'content argument' was repeated in his later book, *Teaching Critical Thinking* (1990b: 20) which expressed a key premise more explicitly: 'there are almost as many ways of thinking as there are things to think about'. Add in another premise that McPeck left unstated—the content of thought strongly shapes the process—and you have the following argument: Thinking is always about some content. Contents vary significantly and strongly shape the thought process. Accordingly, ways of thinking vary with content, being different in different domains of thought. Thus, there are few, if any, general ways of thinking, or GTSs.

Although several scholars (Barrow 1987, 1991, Rogers 1990) have endorsed McPeck's position, the content argument has aroused considerable opposition (Weddle 1984, Miller 1986). McPeck (1990b) considered objections by Norris, Siegel and Paul but did not find them to be persuasive. An extensive challenge by Ennis (1989) led McPeck (1990a: 12) to allow that there are 'some very limited general thinking skills', but that these are vitiated by the generality–power tradeoff and the difficulty of applying them in specific contexts. Other criticisms (e.g. Andrews 1990, Brel 1990, Adler 1991, Ennis 1992), more recent and forceful, have gone unanswered.

The claim that thinking is always about something is, as Adler (1991) points out, trivially true. Thinking is the processing of mental representations that necessarily have content. It must also be granted that there is considerable variation in possible contents or objects of thought. However, to move from these premises to McPeck's intended conclusion—that there are no useful GTSs—requires the further assumption that thinking is strongly shaped by its content. Lacking this assumption, there is no reason to believe that 'there are almost as many ways of thinking as there are things to think about' (McPeck 1990b: 20). Indeed, this claim seems ludicrous on its face: Do yellow and green Volkswagens require different ways of thinking? What about cars and trucks? Vehicles and furniture? Where does one draw lines that separate different kinds of things, for thinking purposes, while satisfying the related challenge of designating a distinct kind of thinking for each specified kind of thing? His rhetorical excesses notwithstanding, McPeck wants to draw such lines to coincide with traditional domains of thought—academic disciplines, professional fields, and so forth. However, as Andrews (1990) and Ennis (1989, 1992) contend, these domains do not have clear boundaries.

What if domains could be clearly demarcated on some principled basis? No matter what boundaries were used, it would be easy to demonstrate the existence of significant content differences, for thinking purposes, within domains, so that new domains would have to be defined more narrowly. It would also be easy to demonstrate the existence of significant content commonalities, for thinking purposes, across domains, so new domains would have to be defined more broadly. Indeed, there is no way of parcelling up potential contents of thought into discrete packages, each of which requires a distinct way of thinking that has nothing significant in common with any other way of thinking required for any other package. However, this is exactly what the content argument proposes in claiming that there are no GTSs. Although McPeck and other GTS opponents can pick domains that have salient dissimilarities—for instance, physics and history (Rogers 1990)—they have not begun to specify all the different 'ways of thinking' that the content argument postulates. Nor have they acknowledged the important commonalities of subject matter and thought possessed by seemingly dissimilar domains (e.g. history and geology, both of which deal with the past). These commonalities allow for the existence of GTSs.

Differentiating domains

McPeck's content argument reflects a very distinctive notion of academic disciplines, fields of practice, or, more generally, domains of thought. It regards domains as discrete entities having little or no overlapping of content or method. Each domain is its own world with its own subject matter and way of thinking. Because no thinking practices are held in common, there are no GTSs.

Epistemic holists, people who believe in the unity of knowledge, lie at the opposite extreme. During the 20th century, this position was endorsed

by positivists who asserted that all science could be grounded in physics and that logic and mathematics were the universally applicable foundations of scientific method. General systems theory, which emerged in the 1950s, is another version of holism. It proposed that systems concepts and techniques constitute a universal language and methodology for explaining reality.

This is an old debate, sometimes described as pitting 'lumpers' against 'splitters'. It is concerned with the value of making distinctions in a world in which any two things have both differences and commonalities. Holistically-inclined lumpers ignore differences while emphasizing commonalities. This keeps them from making useful distinctions and risks leaving them in an undifferentiated conceptual morass, what Hegel termed 'the night in which all cows are black'. Splitters, on the other hand, fail to recognize useful commonalities. This reduces the value of their knowledge because it cannot often be applied. Moreover, it leaves them with the problem of determining when to stop making distinctions. McPeck's (1990b) claim that almost anything one can think about requires its own way of thinking illustrates the extremes to which this approach can be taken. Obviously, there are points beyond which lumping and splitting both have diminishing returns.

With regard to the task of differentiating domains of thought, it must be remembered that there are many characteristics in terms of which domains can be defined and many of these characteristics are graded rather than discrete. For instance, the difference between the individual and the social that demarcates psychology from sociology cannot be sharply drawn, hence the existence of social psychology. The boundaries of domains of thought are inherently vague, this vagueness being transmitted to the concept (Ennis 1989, Sternberg 1989).

Fortunately, there is a way out of the dilemma, an approach that does not require sharp domain boundaries to be drawn. It resolves the lumper–splitter debate by doing both, although at different levels of abstraction. Thus, the approach is hierarchical; it views knowledge as existing on multiple levels. At the lowest level, there are many domains of thought, each addressing a more-or-less distinct subject matter. While most of the concepts and methods employed at this level are domain-specific, abstract notions that apply across multiple domains play important roles (e.g. conservation principles in the physical sciences, motivational notions in the human sciences, and experimental methods in both). Thus, domain differences at low levels coexist with commonalities at higher levels of abstraction. This hierarchical view of knowledge is reflected in the typical university structure, which groups specialists from fields and sub-disciplines into departments, and closely related departments into colleges or faculties.

The fact that general concepts are used in multiple domains having diverse subject matters is strong evidence of high-level commonalities across domains. Terms like 'feedback', 'equilibrium', and 'inflection point' have useful applications in many different fields. Notions of development and causality possess an almost universal relevance. Although GTS opponents acknowledge these commonalities (Johnson and Gardner 1999),

they do not admit the almost certain upshot: that some thinking tasks and practices (e.g. causal reasoning) must apply in multiple domains as well.

The trouble lies not in the identification of multiple domains of thought, but rather in the insistence, by McPeck and others, that each domain has distinctive ways or modes of thinking and its own epistemological standards. Unfortunately, there has been little or no demonstration of these multifarious ways of thinking. Weinstein (1990) cited some epistemological differences, but these are between very remote fields (e.g. literature and chemistry) and do not suggest anything like the degree of low-level domain differentiation that the argument against GTSs requires. As Siegel (1992) pointed out, although there are differences in criteria of reasons-assessment across fields, these exist under a unitary epistemology. McPeck and his supporters have been as promiscuous in their use of terms like 'way of thinking' and 'epistemology' as others have been with the notion of thinking skill.

The domain of practical affairs

Despite the tendency towards excess in the differentiation of domains of thought, a very important domain, highly consequential for educational purposes, has gone unnamed, if not unnoticed. Nickerson (1994: 437) refers to 'the kinds of thinking and problem-solving challenges that people face in everyday life'; Weddle (1984) differentiated 'Field Dependent Life' from 'The Rest', suggesting that the latter was dominant in quantity and importance of thought. This is the field denoted here as 'the domain of practical affairs'. It encompasses the knowledge people use and the thinking they do in everyday life, both in their personal affairs and in the non-disciplinary aspects of their work. Professionals (e.g. accountants and engineers) use this knowledge when addressing interpersonal and organizational issues in the workplace. They, and everyone else, also use it in their homes, community organizations, and during recreational, shopping and other personal activities. The domain of practical affairs encompasses a huge variety of thinking tasks—designing gardens, diagnosing cars that will not start, negotiating with merchants, predicting the outcomes of football games, planning vacations, generating career options, and deciding which apartment to rent, among others. As will be seen, there is considerable overlap between these thinking tasks and those encountered in other domains of thought. Because the domain of practical affairs is intrinsically interesting and relevant to students, it offers a highly motivating context for the teaching of thinking.

It might be argued that one learns how to think about practical affairs through training in the disciplines included in a traditional liberal education. McPeck (1990a: 11) claims that 'the whole point of school-subject knowledge is to enlighten people about our everyday world for this everyday life', and that 'the disciplines had their origins in the human condition and are substantively about the human condition' (McPeck 1990b: 30). Certainly, knowledge acquired from a liberal education provides a wealth of understanding that helps students navigate their ways through the domain

of practical affairs. McPeck's (1990b) suggestion to teach explicitly the structure and philosophy of each discipline would increase this value to students. Nonetheless, the key thinking tasks that are encountered in practical affairs—diagnosis, design, planning, negotiation, prediction, evaluation, and so forth—are not often explicitly addressed by the disciplines, nor are related skills explicitly taught. Moreover, when these tasks and skills are covered, instructors quite naturally focus on discipline-specific applications. In light of what is known about transfer (Perkins and Salomon 1989, Salomon and Perkins 1989, McKeough *et al.* 1995), it is unlikely that, under such conditions, students will carry their disciplinary knowledge over to the domain of practical affairs. Generalizable thinking skills must be taught *explicitly*, and the teaching must include direct applications to practical affairs for transfer to occur (Ennis 1989). It is naïve to expect instructors in the disciplines to do this, given their inevitable pre-occupation with discipline-specific content.

Thinking is, as McPeck asserts, always about something, and thinking can only be taught with some subject matter as its content. Owing to its interest and relevance to students, and to the range of thinking skills that are involved, the domain of practical affairs provides the natural content to use in thinking-skills instruction.

Generic thinking tasks

Recognition of the domain of practical affairs provides further evidence of the existence of generic thinking tasks, alluded to earlier. These are the ultimate basis for the existence of GTSs: thinking skills like argument-construction and means-ends analysis are general because they address thinking tasks that appear in multiple domains. Such tasks exist because people in many fields of endeavour routinely encounter certain fundamental challenges. Creative alternatives must be generated by artists, people who work for advertising agencies, and parents trying to come up with novel birthday gifts for jaded pre-teens. Predictions must be made by weather forecasters, securities analysts and farmers deciding which crops to plant. Managers evaluate their employees' performance just as teachers evaluate student essays and consumers evaluate product alternatives.

Admittedly, domain-specific knowledge is essential for performing such tasks in any particular field. However, there is also a considerable amount of general task-related knowledge that applies over multiple domains. Consider the task of diagnosis, determining the cause(s) of a problem, or other state of affairs. This task appears most saliently in medicine and equipment troubleshooting, but it also occurs in everyday affairs (e.g. 'Why can't I lose weight?') and in many other domains of thought (e.g. 'Why didn't that sales promotion work?'). Diagnosis-related knowledge from medicine and other diagnostic disciplines can be applied in other fields (Smith 1998). For instance, the distinction between causes and conditions—active initiating factors vs passive enablements—is universally relevant. Physicians are taught to start with general causal categories (e.g. respiratory infection) and gradually narrow down to specific causal candi-

dates, a strategy that applies as well with auto-repair. Troubleshooters look for patterns in the occurrence of a problem—certain times, places, or other conditions that are commonly problematic—another generalizable mental practice. There is much that students can learn about diagnosis that can be applied in their personal lives and in other disciplines in which they learn and practice.

Although the thinking-skills movement has recognized some generic thinking tasks (e.g. evaluating sources), many have not been addressed. This is due to the movement's traditionally narrow focus on CT. Adopting a broader view of effective thinking provides a more complete appreciation of the basic mental challenges people routinely encounter in their personal and professional lives (Smith 2002). The domain of practical affairs offers a natural context for teaching task-related concepts, skills and heuristics in a way that will encourage knowledge-transfer to other domains.

Conclusions

These findings have several important implications. First, educators and scholars must be far more restrained in their use of the term 'thinking skill(s)'. Over-application of this concept has led to confusion, controversy and the misdirection of educational efforts. Legitimate thinking skills that are identified must be fully specified and developed. For instance, the skill should be defined, positioned within an overall repertoire of mental activities, and its component activities identified. A review of relevant literature should disclose how the skill is employed by expert practitioners and the ways in which it is typically taught. Domain-specific applications of the skill should be analysed, looking for differences and similarities that suggest general aspects of the skill. Recommendations for general and domain-specific teaching of the skill should be proposed, along with suggestions for research to develop skill-related knowledge. By setting higher standards for 'skill-talk', educators will eliminate current excesses and insure that future contributions have more practical and intellectual value.

A starting point for the identification of GTSs is an understanding of generic thinking tasks. Appearing in many different fields—design, for instance, is prominent in architecture, engineering, computer programming and the development of business products and processes—generic thinking tasks have spawned substantial research literatures, techniques, teaching methods and practical heuristic knowledge. This knowledge can be exploited to develop pedagogical materials for teaching task-related GTSs to appropriate populations of students.

The existence of generic thinking tasks indicates a need to expand the notion of effective thinking well beyond 'critical thinking', as traditionally understood and taught. Good thinking involves much more than reasoning and argumentation, the central foci of the CT movement. Among other things, students should be taught how to identify, define and analyse problems; how to think creatively when generating alternatives; how to make plans and design artifacts; and how to resolve conflicts through

negotiation. Assuredly, many scholars and educators are reaching beyond traditional CT content. It is possible that CT can be broadened conceptually to encompass the needed array of knowledge (e.g. Bailin *et al.* 1999b). Or it may be necessary for the thinking-skills movement to adopt a new conceptualization of and label for its product (Smith 2002). However, those who teach thinking must have a more expansive understanding of this endeavour than has historically been the case.

This expansion must occur on another dimension as well: the teaching of thinking must be viewed as more than the teaching of skills. Effective thinking requires knowledge of concepts, principles, standards and other forms of declarative knowledge, and of heuristics that are less proceduralized than skills. It also reflects values and dispositions that can be inculcated through education. Scholars have recognized this need and have proposed additions of content for the teaching of thinking (Ennis 1996b, Bailin *et al.* 1999b). However, it is not clear that these new contents have been adequately developed and effectively integrated into instructional programmes.

Recognition of the domain of practical affairs offers an opportunity to remedy another inadequacy of current instructional programmes: excessive use of puzzles and 'toy problems'. Insofar as problem solving has been taught as part of thinking-skills instruction, it has too often been taught through tasks like 'Towers of Hanoi' and 'Cannibals and missionaries'. Whatever their value for research purposes, these tasks are too structured and content-lean to have ecological validity for students or to develop practical thinking skills. Researchers should study the domain of practical affairs and identify the kinds of problems, situations and issues that people think about in their daily lives. This knowledge can be used to develop realistic instructional material that will capture student attention. It will also help scholars refine their understanding of the concepts, skills and other content to be included in GTS programmes.

Finally, despite concerns raised about illegitimate 'thinking skills' and unduly narrow conceptions of thinking, my findings strongly support the practice of teaching thinking apart from domain-specific content. The question raised in its opening section—Is there a substantial body of important material (concepts, principles, skills and so forth) that is general (broadly applicable to practical affairs and various disciplinary domains) which could be taught, for instance, in general education courses in such a way that students would be able to transfer and apply their knowledge in other relevant contexts?—can be answered in the affirmative. There is ample knowledge—of concepts, heuristics, skills, and dispositions—that is both general and useful, to justify a dedicated course in both high school and college curricula. GTSs instruction should be reinforced by instruction in the disciplines, but the latter is no substitute for the former. Everything known about transfer (Perkins and Salomon 1989, Salomon and Perkins 1989, McKeough *et al.* 1995) indicates that knowledge of thinking will only transfer if it is taught explicitly and with transfer firmly in mind. As Ennis (1989) noted, students taught to think through 'immersion' in domain-specific courses are unlikely to transfer their knowledge to practical affairs or any other field. In light of my argument that there are valuable GTSs

that can be taught, it is essential that students acquire these skills in a way that encourages their greatest possible application.

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