WHEN IS GOOD THINKING?

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Introduction

What is good thinking? To ask this is to pose one of the most venerable questions of scholarship. Aristotle's (350 B. C. E.) analysis of syllogisms, Francis Bacon's (1878; original work, 1620) account of scientific inquiry, Kant's (1785) categorical imperative, Von Neumann and Morgenstern's (1944) exposition of game theory, Inhelder and Piaget's (1958) notion of formal operational thinking, Wertheimer's (1945) formulation of productive thinking all set forth normative conceptions of various kinds of thinking. Contemporary work expands, ramifies, and refines the analysis into many particular kinds of thinking (e.g. Baron, 1985; Basseches, 1984; Case, 1992; Elgin, 1996; Langer, 1989; Paul, 1990; Toulmin, 1958).

Not only is the normative question important in itself, but it informs another central question of psychology, "How good a thinker are you?" This is a question about individual traits. Psychologists typically try to measure such traits by posing tasks that sample some range of thinking and then looking for consistent levels of performance within individuals, across tasks. When the tasks are unfamiliar and varied, this usually leads to indices like IQ that supposedly gauge a general capacity for handling complex cognitive challenges (e.g. Brody, 1992; Herrnstein & Murray, 1994; Jensen, 1980, 1998). When the tasks range across practical problems in a particular domain, the results may gauge *practical intelligence* in that domain (Sternberg & Wagner, 1986; Wagner & Sternberg, 1985, 1990).

However, the marriage between the normative question "What is good thinking?" and the trait question "How good a thinker are you" may not be as close as it looks. The argument here is that persistent good thinking in realistic situations has at least as much

to do with another question: "*When* is good thinking?" This question draws attention to another important dimension of thinking, broadly, good timing—attempting the right kind of thinking at the right moment. It asks how thinking gets activated or mobilized when needed.

Both psychological and lay views of thinking tend to treat this matter as secondary. It's assumed that people usually think about as well as they can whenever they need to. When they don't, it's mostly because they can't. To compare with rowing across a rushing river, it's not that people miss the boat or decline to take it. It's that they simply can't row well enough. Suppose just the opposite: It's not that people can't row well enough, but that they often miss the boat or decline to take it. Occasions that call for thinking pass them by or they choose not to engage those occasions. This would yield a very different account of how thinking works in the world and what it is to be a good thinker, an account more situated in the flow of everyday events and human motives.

Such an account lies at the heart of what is commonly called a dispositional view of thinking. A dispositional view looks not only to what kinds of thinking people are able to do well, but what kinds of thinking they are *disposed* to undertake. The question "How good a thinker are you?" must be answered as much in terms of people's attitudes, motivations, commitments, and habits of mind as in terms of their cognitive abilities. Although this is hardly the dominant view, several scholars have developed dispositional perspectives, for instance Dewey (1922), Ennis (1986), Baron (1985), Stanovich (1999), Perkins, Jay, & Tishman (1993), Facione, Sanchez, Facione, & Gainen (1995), and Ritchhart (2002).

A plausibility argument supports a dispositional view of thinking. We tend to associate thinking with its more blatant occasions—the test item, the crossword puzzle, the choice of

colleges, the investment decision—situations where there is a problem conspicuously on the table and a strong clear reason (including enjoyment) to pursue it. We tend to take as paradigmatic those situations that call for thinking with a loud voice.

However, many situations call for thinking with a softer voice and there are many reasons why one might not engage them thoughtfully: blinding confidence in one's own view, obliviousness to the possibility that others might see things differently, aversion to the complexities and ambiguities of some kinds of thinking ("thinking makes my head hurt"), avoidance of sensitive topics that one would rather not think about, reliance on quick judgment rather than analytic exploration (which may serve well, but only if the judgment reflects a rich base of relevant experience), force of habit overriding a deliberative pause, and so on. The ready presence of such thinking shortfalls is why, for example, John Dewey emphasizes the importance of good *habits of mind,* which can carry people past moments of distraction and reluctance (1922). This is why Israel Scheffler (1991) underscores the role of *cognitive emotions* in guiding thought, emotions such as curiosity, surprise, and the love of truth.

Further encouragement for a dispositional perspective comes from common discourse. The everyday language of thinking includes terms for a range of positive and negative dispositional traits considered important. A person may be open-minded or closed-minded, curious or indifferent, judicious or impulsive, systematic or careless, rational or irrational, gullible or skeptical. Such contrasts, at least in their intent, have more to do with how well people actually use their minds than how well their minds work. Terms like these capture the essence of what has been called *intellectual character* (Ritchhart, 2002; Tishman, 1994, 1995).

Of course, such plausibility arguments do not make a full case for a dispositional view. Although good habits of mind, refined

cognitive emotions, and other dispositional characteristics are different sorts of constructs than cognitive abilities as usually conceived, it still might turn out that they have a negligible influence compared to abilities on thinking about what matters in one's life. Accordingly, the actual contribution of the dispositional side of thinking becomes a central issue.

We and our colleagues have pursued a line of empirical research and theory building in this area for over a decade (Perkins, Jay, & Tishman, 1993; Perkins & Tishman, 2001; Perkins, Tishman, Ritchhart, Donis, & Andrade, 2000; Ritchhart, 2002; Tishman & Perkins, 1997; Tishman, Jay, & Perkins, 1993; Tishman, Perkins, & Jay, 1995). Our findings, to be reviewed along with others below, support the importance of a dispositional perspective. Moreover, they challenge a presupposition of most dispositional accounts: that being disposed to engage situations thoughtfully is essentially a motivational matter of attitudes, commitments, incentives, and so on. We argue that thinking often falters through missing the moment altogether rather than declining to seize it. Obliviousness contributes at least as much as reluctance.

The pages to follow review dispositional accounts of thinking in the literature, outline our own triadic analysis of thinking dispositions, summarize our research on the contribution of dispositions to thinking performance, examine the case for dispositions as traits, analyze children's knowledge of conditions when thinking is called for, and explore how settings can cultivate thinking dispositions. The article concludes with a summary argument advocating dispositional accounts of thinking over abilities-centric accounts.

Dispositional Views of Thinking

The philosophical roots of the concept of dispositions

The term "thinking dispositions" has its roots in philosophy. However, the general notion that good thinking involves detecting and acting on occasions is found in many accounts of complex cognitive activity. Models of self–regulation emphasize volitional aspects of thinking and individuals' motivation to engage thoughtfully (Schunk & Zimmerman, 1994). Research on mindfulness, which Langer (1989, p. 44) defines as "an open, creative, and probabilistic state of mind," attends to the situational factors that provoke increased awareness of possibilities and to the underlying beliefs that encourage one to look for options. Beliefs and preferences such as the *need for cognitive closure* (Kruglanski, 1990) and the *need for cognition* (Cacioppo & Petty, 1982) have been shown to influence when and to what extent individuals engage in thinking. Constructs such as habits of mind honor the importance of sustained thinking behavior across multiple contexts. A brief examination of such perspectives not only elaborates a dispositional view of thinking but also clarifies some of the confusions about the term itself.

Philosophy has traditionally defined a disposition as "a capacity, tendency, potentiality, or power to act or be acted on in a certain way" (Honderich, 1995). Dispositions are latent tendencies that foretell predictable outcomes under certain conditions. Imagine an inanimate object—glass is a common example (Ryle, 1949)—and ponder the characteristics it is likely to display under certain conditions. When suddenly chilled, glass often will crack; when struck with a hard object, it will shatter; if one tries to force it into a different shape through bending, it breaks. Thus, glass is said to have a brittle disposition. Even if no one is chilling, striking, or bending the glass at the moment, the disposition is still there. The way the glass would behave is predictably determined

by an internal set of conditions. Ryle (1949) states that to possess a dispositional property "is not to be in a particular state, or to undergo a particular change; it is to be bound or liable to be in a particular state, or undergo a particular change, when a particular condition is realized" (p. 43). Although some might refer to this as just another trait like transparency or density, analytic philosophers such as Ryle (1949), Ennis (1986), and Siegel (1997) have called it a disposition.

Psychological dispositions, whether about thinking or other behaviors, can be viewed as loosely analogous to such dispositional properties. Just as glass is disposed to break when struck, a good thinker is disposed to look at both sides of the case upon encountering a broad generalization and disposed to look for hidden assumptions when a problem as initially framed proves troublesome. However, such a descriptive approach to defining dispositions only goes so far. Just as scientists and engineers trying to understand and improve the strength of glass would have to look to its inner structure, so too do psychologists and educators concerned with thinking need to look underneath the basic philosophical idea of thinking dispositions for mechanisms of internal control, motivation, and acquisition.

Psychological perspectives on dispositions

In this spirit, John Dewey (1922) approached this terrain in a more flexible manner. While recognizing the general problem of terminology, he chose to emphasize the importance of clarifying the construct through its underlying mechanisms:

> We need a word to express the kind of human activity which is influenced by prior activity and in that sense acquired; which contains within itself a certain ordering or systematization of minor elements of action; which is projective, dynamic in quality, ready for overt manifestation; and which is operative

in some subdued subordinate form even when not obviously dominating activity (p. 41).

Dewey chose "habit," stating, "Habit even in its ordinary usage comes nearer to denoting these facts than any other word. If the facts are recognized we may also use the words attitude and disposition. (p.41)" Dewey (1922) goes on to state that if the term disposition is to be used, it must be understood as a "readiness to act overtly in a specific fashion whenever opportunity is presented" (p.41), as a predisposition, and not as a latent potential. In this stipulated definition of habit and disposition, Dewey emphasizes the importance of acquisition and development, thus separating habits and dispositions from innate qualities such as capacities, traits, or temperament. Furthermore, Dewey asserts that habits have their roots in knowledge, motivation, and attitudes, thus indicating their complex nature and situatedness.

Like Dewey, other philosophers have recognized the limits of a purely descriptive view of dispositions and dug deeper into the mechanisms at work. Specifically: When does good thinking happen? And what triggers and motivates it in the moment?

For example, Norris (1995) includes a volitional component in his definition of dispositions, stating, "Individuals must either have formed habits to use certain abilities, or overtly think and choose to use the abilities they possess" (p.4), underscoring the importance of noticing when to think and choosing to follow through. Working from this definition, Norris (1995) constructed a simple assessment of the extent to which noticing when to use one's abilities affected thinking performance. Using the *Ennis-Weir Critical Thinking Essay Test,* Norris (1995) produced a new version of the test with hints, such as "think of other explanations for the results" (p. 13), after each paragraph. The hints were designed to "provide suggestions (surrogate dispositions), but for an examinee who does not know how to do what is suggested, they will be useless" (Norris, 1995, p. 13). Norris found that thinking

performance is not synonymous with thinking ability; the group receiving the hints scored over 60% higher on average than those taking the traditional test.

Facione, Sanchez, Facione, and Gainen (1995) offer another view of dispositions as related to but separable from ability. They characterize dispositions as consisting of both behavior and beliefs. Using a small sample of college students and college-bound high school students and later a sample of nursing students, Facione and Facione (1992) compared students' dispositions scores, based on a self-report measure that evaluated both frequency of behavior and strength of belief in certain types of thinking, with performance on a critical thinking skills test. They found a significant correlation of .67 between the two measures. Although this does not of course establish causation, it shows that 45% of the variation in skills test performance can be explained statistically by variation in dispositions. While Norris showed that increasing awareness boosted performance, the Facione et al results suggest that inclination and habit also enhance performance. Combined, these experiments call into question the validity of any pure tests of ability apart from dispositions.

Other disposition-like constructs

As these examples show, viewing dispositions as initiators and motivators of abilities rather than abilities themselves allows exploring what dispositions contribute to thinking performance and how. Many philosophers concerned with educational issues and the promotion of good thinking proceed in similar spirit but with different nomenclature. Instead of discussing dispositions or habits, they refer to beliefs, virtues, passions, character, attitudes, and traits as important mobilizers of thinking (Paul, 1993; Scheffler, 1991; Schrag, 1988). Many address the roles of affect and the environment in shaping intellectual behavior. Israel Scheffler (1991) and Richard Paul (1987, 1993) both discuss

rational passions and emotions as shapers of thinking. "Emotions, feelings, and passions of some kind or other underlie all human behavior" (Paul, 1993, p. 348). Scheffler (1991) states that "emotion without cognition is blind, and ... cognition without emotion is vacuous" (p. 4). Paul and Elder (1997) take the stance that the "mind is a function of three interrelated factors: how we think, how we feel, and what we seek" (p. 3). Only the first of these factors is purely cognitive, the other two relying on affect. These constructs connect to the general dispositional view advocated here because they focus on bridging the gap between one's abilities, the what of good thinking, and one's actions, the when of good thinking.

Similarly, several psychologists address how thinking gets mobilized through dispositions and related constructs. Baron (1988) in his *search-inference* theory of thinking considers cognitive capacities roughly as a matter of what we can do in principle. Within the latitude allowed by capacities, dispositions such as open-mindedness, curiosity, impulsiveness, and dogmatism influence what we actually do. Investigators in the field of personality and social psychology have identified several constructions that bridge between cognitive ability and thoughtful engagement. These include *curiosity* (Maw & Magoon, 1971), the *need for cognitive closure* (Kruglanski, 1990) and the *need for cognition* (Cacioppo & Petty, 1982).

Kruglanski identified the *need for cognitive closure* specifically as "a dispositional construct…manifested through several different aspects, namely, desire for predictability, preference for order and structure, discomfort with ambiguity, decisiveness, and closed-mindedness" that can influence one's thinking performance in the moment (Webster & Kruglanski, 1994, p. 1049). Kruglanski demonstrated that the need for closure is both a trait that remains fairly stable over time in an individual and a manipulable state that can be induced by circumstances

(Kruglanski & Freund, 1983), thus showing that ability alone does not account for performance.

Similarly, Cacioppo and Petty advanced the *need for cognition* as a dispositional construct describing an individual's tendency to seek, engage in, and enjoy cognitively effortful activity. Their efforts build on the earlier conceptual work of Murray (1938), who developed the notion of a need for understanding, and Fiske (1949), who examined the idea of an inquiring intellect. According to Cacioppo and colleagues (Cacioppo, Petty, Feinstein, & Jarvis, 1996), individuals with a high need for cognition do not so much seek closure and structure as they do understanding. These individuals focus on the process of making sense of events and stimuli rather than on quickly producing tidy theories or explanations. Measures of an individual's need for cognition developed by Cacioppo and colleagues have shown that it is a construct distinguishable from ability but highly predictive of performance in many situations (Cacioppo, et al, 1996).

Drawing on information-processing models of cognition, Stanovich and West (1997) claim that cognitive capacities and thinking dispositions "map onto different levels of analysis in cognitive theory. Variation in cognitive ability refers to individual difference in the efficiency of processing at the algorithmic level. In contrast, thinking dispositions index individual difference at the rational level" (p. 9). Their research provides additional evidence that dispositions are distinguishable from abilities. Using self-report measures of dogmatism, categorical thinking, openness, counterfactual thinking, superstitious thinking, and actively open-minded thinking, Stanovich and West (1997) found these measures useful in predicting performance on tests of argument evaluation even after controlling for cognitive capacities.

Dweck and colleagues have investigated another dispositional construct for a number of years—the contrast between *entity learners* and *incremental learners* (Dweck, 1975, 2000). This

work argues that degree of persistence in the face of intellectual challenge reflects underlying belief systems. Entity learners, who see intelligence as fixed, want to look as good as they can and tend to quit when problems prove difficult because they conclude the problems are beyond them. In contrast, incremental learners, who see intelligence as learnable, prove stubborn in the face of intellectual challenge and labor through problems to improve themselves, with less concern for looking good in the short term. An extended program of research has shown that these traits are independent of cognitive abilities, but often influence cognitive performance greatly. Also teaching style and classroom culture can influence considerably the extent to which students adopt entity versus incremental mindsets.

As this brief review demonstrates, dispositional views of thinking abound in both philosophy and psychology. Even though the term disposition is not always used, may scholars have examined what mobilizes the thinking abilities people have. The next section examines these causal mechanisms further, proposing a specific model of how dispositions operate.

The Triadic Analysis of Thinking Dispositions

You read a newspaper article reporting studies showing that less sleep correlates with greater health. You wonder whether you should cut back on your sleep and live longer. But wait, isn't this identifying correlation with causation? You're curious and also it matters to you, so you ask yourself: Are there other reasons why studies might show such a correlation? In a few moments, you assemble several. For example, ill people might need more sleep. You decide to leave your sleeping habits alone.

In the spirit of Dewey, Norris, Stanovich, and others mentioned earlier who have emphasized the dispositional side of thinking, this anecdote illustrates the importance of "When is good thinking?" alongside "What is good thinking?" As to the 'what',

it's good thinking to be cautious about inferring causation from correlation and to identify alternative plausible reasons for a correlation. As to 'when', one has to register the situation in the first place as a possibly hasty causal inference, and care enough to think it through. These are dispositional aspects of thinking.

The anecdote introduces a three-way analysis of thinking behavior that has guided our research for several years. The three aspects of thinking are called sensitivity, inclination, and ability. Sensitivity concerns whether a person notices occasions in the ongoing flow of events that might call for thinking, as in noticing a possibly hasty causal inference, a sweeping generalization, a limiting assumption to be challenged, or a provocative problem to be solved. Inclination concerns whether a person is inclined to invest effort in thinking the matter through, because of curiosity, personal relevance (as in the health case), habits of mind, and so on. Ability concerns the capability to think effectively about the matter in a sustained way, for instance, to generate alternative explanations for the supposed causal relationship. (Sensitivity could be called an ability of a sort—the ability to notice—but in our nomenclature "ability" refers to thinking capabilities once the person is engaged in an effort to think something through.) Sensitivity and inclination are the dispositional aspects of this triad, speaking to "When is good thinking?"

The three reflect a logic inherent not only in thinking but also other kinds of behavior. Recall from the introduction the challenge of crossing the turbulent river. To do so by rowboat, you have to notice conditions that recommend a boat, including the boat itself, the state of the weather and such (sensitivity), decide to try the boat, rather than say walking three miles to the bridge (inclination), and be able to row the boat well enough to make it (ability). The same pattern plays out in many contexts. Sensitivity, inclination, and ability are individually necessary and collectively sufficient to enable a behavior.

Here this pattern gets applied to thinking. Its distinctive contribution is the separation of sensitivity and inclination. Characteristically, dispositional analyses of thinking either treat dispositions as a matter of motivation broadly speaking—interests, commitments, values—or simply lump sensitivity and inclination together. However, the two need to be distinguished, since one might notice an occasion that invites thinking but not care, or fail to notice a situation about which one would care. Empirical research reported later demonstrates that indeed these are separable aspects of thinking.

Although it is useful to examine thinking behavior with sensitivity, inclination, and ability in mind, they are not monolithic traits nor do they operate in an acontextual way. Sensitivity, for example, may reflect a general alertness or mindfulness (Langer, 1989), but also particular repertoire, such as knowing the risks of inferring causation from correlation. Moreover, such knowledge needs to be not "inert" (cf. Bransford, Franks, Vye, & Sherwood, 1989; Whitehead 1929) but active enough to get triggered on the fly while reading a newspaper article.

Likewise, inclination on a particular occasion might reflect broad cognitive traits like *need for cognition* (Cacioppo & Petty, 1982), good *habits of mind* (Dewey, 1922), and attitudes such as curiosity and love of truth (Scheffler, 1991). However, it will also reflect the pulls and pushes of the moment—whether for instance the relationship between sleep and health seems personally important and whether you have the time to think about it right then.

Inclination also speaks to persistence. Whether you think something all the way through will reflect broad traits such as curiosity and stubbornness but also circumstances of the moment, such as what progress you make, how much time and effort it's taking, and whether it stays interesting or gets boring. Just as inclination sustains engagement in thinking, sensitivity continues

to operate midcourse in thinking, to register opportunities and traps off the main line of your thought that you might easily pass by. These points underscore the stochastic character of dispositions. Having a general sensitivity or an inclination does not guarantee that a person will notice every occasion or engage it. "Sensitive to" and "inclined to" mark trends, not inevitabilities.

The three-way analysis also does not imply that sensitivity, inclination, and ability always operate in sequence. At the very moment you read about the correlation between sleep and health, you might find yourself silently saying, "Wait a minute, I hope they're not suggesting that sleeping less is good for our health, because there are lots of possible reasons for that correlation, for instance sick people needing more sleep." In such a case, there is no distinct moment of detection, then of investment, and then thinking through the matter, although, from a functional standpoint, detection, investment, and engagement have occurred.

With these qualifications about the complex, stochastic, and sometimes merged nature of sensitivity, inclination, and ability, one might wonder about the advantages of identifying the triad at all. However, it has proven to be a useful construct, logically clarifying because detection, investment, and thinking through are conceptually distinct matters, and empirically clarifying, because, as will be seen, the three are empirically separable. The triad gives a richer picture of the dynamics of thinking, especially when circumstances call for thinking with a soft voice rather than a loud one.

With this as a backdrop, let us turn to a body of empirical research based on the dispositional triad.

How Much does 'When' Count?

Speaking of turbulent rivers, one such is the gap between a plausible framework and empirical test. The triadic analysis of

thinking behavior may make philosophical sense and appeal to common sense, but it leaves open a question of magnitude. Sensitivity and inclination might turn out to be negligible influences on effective thinking compared to ability.

Research cited earlier suggested that the dispositional side of thinking might contribute substantially to good thinking. For example, Norris (1995) found that offering clues to take the place of missing dispositions boosted performance on a critical thinking instrument by 60%. Stanovich and West (1997), controlling for cognitive capacities, found that dispositional factors identified by self-rating influenced argument evaluation. Both *need for cognitive closure* and *need for cognition* have been shown to influence cognitive performance independent of cognitive abilities (Webster & Kruglanski, 1994; Cacioppo & Petty, 1983). This sets the stage for examining the contribution of dispositions to thinking within the triadic model.

An early study

This issue became the focus of a series of empirical studies carried out over a number of years. The first investigation occurred in the early 1980's, piggybacked on a large-scale investigation of the impact of formal education on everyday reasoning (Perkins, 1985, 1989; Perkins, Allen, & Hafner, 1983; Perkins, Farady, & Bushey, 1991). It predated the triadic framework outlined here and motivated our later investigations of dispositions. The main focus of this work was the impact of conventional formal education at the high school, college, and graduate level on everyday reasoning, and the principal finding was that schooling enhanced students reasoning outside their areas of study only very slightly (Perkins, 1985). However, of concern here is a comparison between subjects' competence and their performance imbedded in the methodology.

The method employed one-on-one interviews. An interviewer posed to a subject an issue current at the time (for example, "Would a nuclear disarmament treaty reduce the likelihood of world war?" or "Would a bottle deposit law in the state of Massachusetts reduce litter?") and asked the subject to reason about it. Pretesting had yielded a set of issues that people saw as vexed. Subjects leaned one way about as often as the other, could argue from several standpoints, and did not vary much in actual expertise, so the issues brought commonsense reasoning to the fore. A subject could take a 'yes' or 'no' position or come down in the middle. Most subjects adopted positions and piled up reasons on their preferred side of the case with little attention to the other side of the case or to possible flaws in their own arguments, a well-known trend sometimes called *my-side bias.*

The methodology also employed a short-form IQ test. IQ correlated with number of points subjects offered on their preferred side of the case at .4 or .5, but often did not significantly correlate with number of points on the other side of the case before prompting (Perkins, Farady, & Bushey, 1991). This suggested that my-side bias reflected dispositions rather than cognitive capacity.

In later research, the interviewer pushed subjects to elaborate their arguments on both sides further. When it appeared that a subject had no more to say, the interviewer then asked the subject point blank to identify weaknesses in his/her argument and to elaborate the other side of the case. Subjects could do so readily. Most dramatically, when directly prompted, subjects increased points mentioned on the other side of the case by an average of 700% (Perkins, Farady, & Bushey, 1991.) The data showed that subjects generally did not, but easily could, examine the other side of the case with care. It implicated an important role for dispositions in thinking: People in trend were capable of, but not generally disposed to, critique their own arguments or examine the other side of the case. Similar results have been found by Baron,

Granato, Spranca, & Teubal (1993). Stanovich (1994, p. 11) generalizes the phenomenon to refer to *dysrationalia:* "The key diagnostic criterion for dysrationalia is a level of rationality, as demonstrated in thinking and behavior, that is significantly below the level of the individual's intellectual capacity."

A methodology for examining sensitivity, inclination, and ability

Years later, we and our colleagues began an extended program of research on dispositions guided by the triadic model, a program that continues today. We developed a methodology to distinguish between the contributions of sensitivity, inclination, and ability to thinking. We focused on intermediate-level elementary school students. The developed procedure used brief stories with embedded shortfalls in thinking. For example, one story concerned a Mrs. Perez who finds that the company she works for plans to relocate to another city. Mrs. Perez explains the situation to her daughter and concludes that they have to move: "I have no other choice. There's no other decision I can think of in this situation." Mrs. Perez's daughter is in the last half of her final year of high school. She is disappointed to leave her friends and miss graduation. The shortfall lies in Mrs. Perez's statement that there's no choice. There are several alternatives. For example, Mrs. Perez might get another job, or negotiate to stay behind for a few months as part of a mop up operation, or arrange for her daughter to stay with friends the last few months of high school (Perkins & Tishman, 2000; Perkins, Tishman, Ritchhart, Donis, & Andrade, 2002).

Several stories concerning decision making, problem solving, and causal explanation were employed, with shortfalls of failing to search for options, considering only one side of the case, and more. To confirm that the shortfalls written into the stories could be detected by discerning readers, we gave a broad sample of the

stories to several individuals involved professionally in the critical thinking movement. They all easily identified the shortfalls.

The basic experimental procedure differed somewhat from study to study but broadly took the form of an escalating scaffold. An experimenter invited a subject to read, for instance, the story of Mrs. Perez. Then, in step 1, the experiment asked what the subject thought of the thinking in the story. Occasionally, subjects would say, "Well, but Mrs. Perez *does* have choices. For instance…" More commonly, a subject did not identify any particular problems with the thinking. In that case, the experiment advanced to step 2 with statements like this: "Some of Mrs. Perez's friends think she should have tried to find more options. Other friends believe she tried hard enough to find options. Suppose you were in Mrs. Perez's place. What would your thinking be like?"

At this point, the subject might agree that Mrs. Perez hadn't examined the options and identify some alternatives. However, maybe not, in which case the interviewer advanced to step 3, asking point blank for options and discovering whether or not the subject was able to devise them.

This three step procedure for the Perez story and a number of others reflects the dispositional triad. Step 1, a test of sensitivity, gives a chance for the subject to recognize a thinking shortfall on his or her own and respond to it. Step 2, a gauge of inclination, alerts the subject to the potential shortfall and determines whether the subject thinks it's worth attention. Step 3 probes ability directly by asking the subject to generate options.

A number of interesting findings have emerged from this series of studies. Details are reported in Perkins and Tishman (2000), and Perkins, Tishman, Ritchhart, Donis, and Andrade (2001). Here the trends are summarized.

Measuring the contribution of sensitivity and inclination

The most important finding, confirmed over and over again in our work, showed that dispositional considerations more than abilities limited thinking. Sensitivity was by far the greatest bottleneck, followed by inclinations. One index of this looked at the successful response rate at step 1 versus step 2 versus step 3. To derive a score, the simple comment that a situation called for attention (e.g. "Mrs. Perez should have considered other options") counted as one hit, with each mention of an option or possible solution or pro or con, depending on the kind of story, counting as one more.

One study involved 64 eighth graders responding to 4 stories, each with 2 thinking shortfalls embedded in them for 8 shortfalls in all. Two of the stories concerned decision making and two problem solving, and the shortfalls, distributed over the stories in a counterbalanced way, concerned looking for alterative options and examining the other side of the case. Thus, the Perez story included a shortfall of failing to seek alternative options in the context of decision making.

Analysis based on the scoring system mentioned earlier showed that by step 3 most subjects could identify some alternative options or other-side arguments. For instance, subjects offered the sorts of options for the Mrs. Perez story mentioned above. The analysis also examined the distribution of when subjects responded with awareness of the thinking shortfall and alternative options or other-side reasons—at step 1, step 2, or step 3. If the dispositional contribution to thinking were small, those subjects who performed at all well would do so right away at step 1. Frequencies of response would fall off sharply from step 1 to 2 and step 2 to 3.

In fact, the findings revealed just the opposite. For alternative options shortfalls, scores at step 1 averaged only .1 hits, at step 2 1.6, and at step 3 2.1. For other side of the case shortfalls, scores at

step 1 averaged again about .1 hits, at step 2 about 3.0, and at step 3 about 2.9. In other words, very few subjects detected the shortfalls at step 1, showing hardly any sensitivity to the shortfalls. When, at step 2, the possibility of a shortfall was pointed out, only about half the subjects agreed that this was a shortfall. But, as gauged by step 3, almost everyone, whether they noticed the shortfall initially or thought it was a shortfall, could devise alternative options and other-side reasons.

This was strong support for the importance of the dispositional side of thinking. It also challenged the common presumption that dispositions were mostly a matter of motivation. To be sure, inclination proved an important factor in accord with the step 2 scores. However, by far the greatest bottleneck was sensitivity—failure to notice at all what needs thoughtful attention.

A second study streamlined the procedures described above, which involved one-on-one or small group administration. This version allowed paper administration in large groups. The study eliminated step 2, focusing on the contrast between sensitivity and abilities. The study employed shorter and more stories, a body of 18 stories spanning three kinds of thinking—decision making, problem solving, and explanation—and embodying shortfalls in seeking options and looking for reasons on both sides of a matter as before. Ninety-four sixth graders responded to all eighteen stories. Scoring for each response was done with a 6 point Likert scale, the low end representing no or sparse responses, the high end richly articulated responses. After some practice, strong interjudge reliability was achieved.

The findings mirrored those from the previous study. If dispositions contributed little to performance, students would easily notice and attend to the thinking shortfalls at step 1, although their comments on the shortfalls might be shallow. Scores for step 1 and (skipping step 2) step 3 would be about the same, because subjects would already have done well on step 1,

perhaps mentioning one or two more responses on step 3. In fact, step 3 performance was far superior to step 1. Composite scores for each subject were created for step 1 and for step 3 by summing ratings across stories. The mean composite score for step 1 (x=2.12) was over one standard deviation lower than that for step 3 (x=2.98, p<.0001)

The results were also analyzed in terms of hits and misses, the style of the previous study, by establishing a threshold on the Likert scales for steps 1 and 3 for what constituted a hit. For both options and other-side reasons, subjects showed a mean hit percentage at step 1 of about 10% and at step 3 of about 70%. These rates did not vary appreciably with the kinds of stories in which the shortfalls were imbedded—decision making, problem solving, and explanation.

Examining the causes of low sensitivity

Because dispositions contributed so much to performance, a further study was designed to examine why. The study compared three possible explanations for subjects' difficulties: (1) subjects lacked the knowledge necessary to make the proper discriminations between shortfalls, even though they could produce other-side reasons, options, and such on demand, (2) subjects had the appropriate knowledge but simply did not approach the situation with an alertness to the shortfalls, (3) the shortfalls were difficult to detect even with the appropriate knowledge and alertness.

The investigation focused on step 1 of the method described previously: Subjects were asked to read stories with imbedded thinking shortfalls and comment on the thinking. The investigation compared the three hypotheses by including scaffolds for saliency and knowledge in a counterbalanced fashion. To increase saliency, for two conditions key sentences where the shortfall appeared were underlined, but not otherwise explained. To support knowledge,

for two conditions, subjects received a crib sheet of five kinds of shortfalls to look for, for instance "this is a place where it is important to look for an alternative explanation," and "this is a place where it is important to make a plan."

The subjects included 105 eight graders, each reading 8 one-page stories across which were distributed 30 thinking shortfalls. The subjects were divided into four gender-balanced groups: no crib sheet and no underlining, crib sheet but no underlining, no crib sheet but underlining, and both crib sheet and underlining. The experimenters evaluated subjects' responses in two ways. Detection meant that a subject detected a shortfall by marking it. This was relevant only in the no-underlining conditions because in the underlining conditions detection came free. Explanation meant that a subject explained a shortfall appropriately, either after detecting it or coming across it underlined. This was relevant in all conditions, because having the crib sheet still did not tell a subject which shortfall applied.

First consider detection, only relevant in the not-underlined conditions. The results showed little impact of providing the crib sheet. Subjects detected about 41% of the targets without standards and 38% with, a negligible and nonsignificant contrast. This argued against hypothesis 1, that subjects lacked the knowledge, and against hypothesis 2, that subjects had the knowledge but lacked alertness, since the crib sheet both provided knowledge and alerted subjects about what to look for.

Now consider explanation. When subjects detected a shortfall in the not-underlined conditions, they offered a satisfactory explanation 88% and 81% of the time with no crib sheet and crib sheet respectively, another nonsignificant contrast. The crib sheet had more impact in the underlined conditions. Without the crib sheet, subjects offered satisfactory explanations about 67% of the time but with the crib sheet 86%, a statistically significant contrast. However, arguably this was to a considerable extent an artifact of

the method, since the crib sheet reduced the interpretation of an underline to a multiple choice problem with a 1-in-5 probability of getting it right by luck. The pattern of findings provides further evidence against hypothesis 1, that subjects lacked the knowledge, because providing knowledge via the crib sheet did not enhance explanations much.

In summary, providing knowledge of what to look for did not help subjects to detect shortfalls and not much to explain them. Saliency, on the other hand, allowed most subjects to go on and explain the shortfalls. The results favored the third hypothesis, that shortfalls were difficult to detect in the midst of the stories despite appropriate knowledge and priming. This is in keeping with the perceptual overtones of the notion of sensitivity, suggesting a pattern recognition process that goes beyond simply knowing about in principle and even looking for shortfalls in reasoning.

Conclusion

In general, then, this series of studies provided strong support within the methodology adopted for the importance of the dispositional side of thinking. People often do not perform nearly as well as they might in situations that call for thinking principally because they miss the situations altogether and secondarily because they fail to engage the situations thoughtfully. This challenges the hegemony of abilities-centric accounts of thinking and indeed intelligence.

Dispositions as Traits

The work outlined above focused on the relative contribution of sensitivity, inclination, and ability to intellectual performance. Another question concerns the extent to which sensitivity and inclination are trait-like constraints independent of ability. In particular, (1) are such candidate traits stable across time and task, (2) are they more domain general or domain specific, (3) are they

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statistically independent of ability measures, and (4) what dispositional traits are there—one or many and which ones? Such questions were not the central focus of this program of inquiry, but they were addressed from time to time and research from other quarters speaks to them.

Stability across time and task

Research on constructs such as need for cognition (Cacioppo, Petty, Feinstein, & Jarvis, 1996) and need for closure (Kruglanski, 1990) has demonstrated test-retest reliability. The present program examined test-retest correlations on sensitivity scores for detecting thinking shortfalls and found correlations of about .8 for a ninth grade sample and .6 for a fifth grade sample.

As to stability across tasks, these studies also involved several different kinds of thinking trouble spots—neglecting alternative options, my-side bias, and more—imbedded in different problem situations—decision making, problem solving, and explanation. Factor analyses of the influence of trouble spots and story types generally yielded single "sensitivity" and "inclination" factors despite the differences in trouble spots and story types. In other words, subjects performed consistently across these variations (Perkins, et al, 2000, 2001).

Domain generality

Related to stability across time and task is the matter of domain generality. Whether a cognitive skill is relatively domain general (roughly, operative over a wide range of settings and disciplines), or relatively domain specific (operative only in particular domains where the individual has a well-developed knowledge base and a version of the skill adapted to the domain) is a complex and controversial issue (Anderson, Reder, & Simon, 1996; Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991; Perkins & Salomon, 1989). Although we have argued here that thinking dispositions complement thinking skills rather than

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reducing to them, much the same question arises for dispositions. For example, if one is disposed to think about the other side of the case or to scrutinize sources of information for potential bias, does this tendency figure broadly and generally in one's cognition or only in scattered domains where one is especially knowledgeable and well-practiced?

A full examination of this challenging issue is beyond the scope of the present treatment, but several observations are in order.

1. In principle, some dispositions are domain general and some more restricted—for instance the general disposition to look for evidence on both sides of a matter versus a lawyer's specific disposition to look for legal precedents.

2. However, a disposition general in principle may not operate in a general way, even when the person possesses the relevant knowledge. For example, one of our early studies (Perkins, Farady, & Bushey, 1991) examined student lawyers' disposition to examine the other side of the case on everyday issues and found them on the average just as subject to my-side bias as other populations.

3. Those who do not exhibit the general form of a disposition may display a more local form. For example, we presume (this was not tested) that, in the context of planning a legal case, the student lawyers' training would lead them to consider how the other side might argue.

4. Moreover, a disposition general in principle is likely to operate that way for some people. For example, as noted earlier, we validated our instruments on several experts in critical thinking, all of whom performed vary well across our diverse stories. They proved generally alert to a number of traps that caught most of our subjects.

5. However, a disposition even if operative in general form is not likely to serve well when a person's domain knowledge is sparse. For example, one of our critical thinking experts would certainly seek to

examine the other side of a legal case, but would likely lack the legal knowledge to do so well.

In summary, it is much too sweeping to ask whether dispositions are domain general or domain specific, yes or no. They may be relatively general or relatively specific in principle, and when more general in principle may actually operate fairly generally or in more restricted ways depending on individual development.

Relationship to abilities

In studies of such dispositional constructs as need for cognition (Cacioppo, Petty, Feinstein, & Jarvis, 1996) and incremental vs. entity learning (Dweck, 1975, 2000), researchers have often found a low or negligible correlation between the disposition and intellectual aptitude as conventionally mentioned. Our studies occasionally examined this question. First of all, the investigation from the 1980's showed no correlation between my-side bias and IQ (Perkins, Farady, & Bushey, 1991).

In the study of 94 6th graders described earlier, the experimenters gathered grade point averages for the students as a rough proxy for intellectual aptitude (permission for a short-form vocabulary test could not be obtained) and examined the relationships among the sensitivity measure, ability on the task at hand in the sense of step 3 performance, and grade point average. Sensitivity correlated with step 3 performance at .72 but with grade point average at only .36. However, step 3 performance correlated with academic standing at .61. The pattern of results suggests that sensitivity depends on somewhat different cognitive resources than intellectual aptitude as reflected in school grades (Perkins, et al, 2000, 2001).

In the study of causes of low sensitivity, permission was obtained to use a short-form vocabulary test as a proxy for intellectual aptitude. Detection plus explanation in the conditions

without underlining seemed the best gauge of sensitivity, since this showed that subjects detected shortfalls without help and understood what they had noticed. The correlations between detection plus explanation scores and vocabulary scores were .32 without the list of standards and .26 with the list, neither significant at the .05 level. Although the study included no step 3 condition in the sense outlined earlier, the underlined conditions were more abilities-centered, because they did not ask the subject to detect but simply to explain a shortfall of thinking in the story. In the underlined conditions, the correlations were .45 without the list of standards and .44 with, both significant at the .05 level. Although the differences are hardly dramatic, this again suggests that sensitivity is somewhat less related to intellectual aptitude as usually measured than are tasks that directly pose a problem to be solved (Perkins et al, 2000, 2001).

Distinct dispositional traits

What distinct dispositional traits are there? This question is particularly challenging given the present state of research. Many of the investigations have addressed isolated dispositional constructs, such as need for cognition, and their contrast with intellectual aptitude as conventionally conceived. Research of this sort does not propose complementary sets of dispositions.

Other scholars have advanced lists of complementary thinking dispositions (see Ritchhart, 2002 for a full review of lists of dispositions). For example, Ennis suggested a list of fourteen critical thinking dispositions, including seeking and offering reasons, seeking alternatives, and being open-minded (Ennis, 1986). Peter and Noreen Facione (1992; Facione, Sanchez, Facione, & Gainen, 1995) proposed a list of seven, including open-mindedness, inquisitiveness, systematicity, analyticity, truth-seeking, critical thinking self-confidence, and maturity. We and our

colleagues synthesized several sources in the literature to suggest a list of seven (Perkins, Jay, & Tishman, 1993):

1. The disposition to be broad and adventurous
2. The disposition toward wondering, problem finding, and investigating
3. The disposition to build explanations and understandings
4. The disposition to make plans and be strategic
5. The disposition to be intellectually careful
6. The disposition to seek and evaluate reasons
7. The disposition to be metacognitive

These and other lists certainly articulate dispositional traits that appear to be conceptually distinct. Whether they are psychometrically distinct is another matter. Recall that our factor analyses of performance across types of shortfalls and types of stories yielded single factors for sensitivity and inclination. Most of these lists were constructed conceptually rather than empirically. The Faciones based their list on a factor analysis. However they employed not subjects' performance on tasks but subjects' self-ratings of a long list of traits such as: *We can never really learn the truth about most things*, and *The best argument for an idea is how you feel about it at the moment*. Therefore, their list most likely represents subjects' conceptual groupings rather than performance factors.

It is not necessarily surprising that conceptually distinct dispositions would merge into a single factor. The same is true of much of human knowledge and skill, simply because most people learn the same things at about the same time. Whether or not such lists ultimately prove to reflect distinct factors based on performance rather than self-rating tasks, they do guide the construction of studies and can inform instruction designed to cultivate dispositions, a matter addressed later.

What Kids Know about 'When'

As noted earlier, one should not view sensitivity and inclination as monolithic traits. They are better treated as complex processes, with measurements of sensitivity and inclination only extracting broad trends. They involve the alert use of knowledge about 'when'—about thinking traps such as neglecting the other side of the case and thinking opportunities such as looking for tacit assumptions when a problem proves difficult. To be sure, knowledge is at best a necessary condition. As noted before, knowing about something does not guarantee its active use, the problem of inert knowledge. Nonetheless, it is of some interest to examine youngsters' knowledge of the traps and opportunities of thinking.

Accordingly, we interviewed students informally to explore what they knew about the whens of thinking. The interviews were part of an investigation into how teachers and schools might best foster thinking dispositions. The interviewees were students in grades four through eight at schools in both the United States and in Sweden. The interviews took the form of informal classroom discussions. They centered on three important areas of thinking: seeking truth, evaluating fairness, and directing one's own thinking.

Three questions organized these discussions. In the case of truth, the investigator would begin with "Sometimes it's hard to know whether or not something is true. When are some times when that happens?" (An equivalent phrase for fairness was "sometimes it's hard to know whether something is fair" and for directing your thinking "sometimes it's hard to direct your thinking"). Student wrote responses before sharing them with the class. With examples shared and captured on the blackboard, the investigator took a further step: "When it is hard to know whether or not something is true, what can you do about it?" Students shared their ideas here as well and the investigator recorded them

on the blackboard. The investigator then asked a third question, sometimes on a later day because of time, following the same procedure: "It's often hard to investigate the truth of something. When is it worth the trouble?"

Clearly this procedure is limited. Discussions in this style give a collective but not an individual sense of what students know. Students' reflections reveal only what they think about thinking, not how they perform in real situations. Nonetheless, much of interest emerged. The discussions revealed what knowledge students have about when thinking becomes challenging, which is relevant to sensitivity. The discussions exposed the repertoire of strategies students possess around truth and other areas of thinking, which is relevant to their ability. Finally, the discussions led students to recount what motivational factors made thinking more or less worthwhile, relevant to inclination.

Students' thinking about truth

In general, students' reflections on truth proved much more advanced than one might anticipate. Although they did not use sophisticated terminology, they brought forward many basic and sometimes nuanced dilemmas of seeking truth.

Students showed an awareness that the truth is often ambiguous and must be investigated. Across all ages, students indicated that information cannot be equally trusted from all sources. Fourth graders and eight grader alike noted that books, news accounts, and the conversations of peers may not always be true—"Its not always easy to know the truth about things someone tells you or what you read in the newspaper." However, younger students more readily accepted truth from expert sources they knew personally, such as peers or parents. Older students showed more awareness of multiple perspectives and the need to synthesize. Furthermore, older students saw that issues of truth go beyond mere facts, including the challenge of self-knowledge

("It's hard to know the truth about your own opinion and feelings sometimes"), ethical issues ("It can be hard to know the truth about what is right and wrong in a situation"), larger epistemic issues ("Scientific theories like the Big Band can be hard to know the truth about") and issues of faith ("It's hard to know things about God").

Pondering what's worth thinking about, younger students focused on the importance of the truth to them personally at that moment. If there were no immediate consequence for them, they often signaled that it wasn't a strong priority. Not surprisingly, older students recognized the impact of the truth on others and distinguished between personal relevance and larger societal relevance. Addressing the latter, students evaluated worth based on their ability to contribute to the truth. Knowing the truth about chemical weapons in Iraq might be very important, but it wasn't worth their time personally. Besides potential to contribute, students also identified curiosity as a motivation. Although they might not need to know whether cola drinks break down tooth enamel, it might be fun to find out, particularly if the investment in finding out was not too taxing.

When it comes to strategies for investigating truth, students at least talked a good game. For younger students, strategies often took the form of simple information gathering from more reliable sources: Look in a book, check the internet, ask the person, etc. Older students saw a need to combine information from multiple sources, assess the motives and bias of those sources, and synthesize this information. These students were also more likely to see themselves as important judges of truth in some situations: "You need to try it out for yourself. You should gather your own evidence. You need to look within yourself."

This data, informal as it is, suggests that students know a remarkable amount about issues of truth, when it becomes problematic, what one might do about it, and when it is worth the

bother. Though students had never had these discussions before, the readiness of their responses showed knowledge rather close to the surface and readily uncovered.

Students reflections on issues of fairness

Students generally showed great familiarity and indeed passion for issues concerning fairness. All of these discussions were spirited: What's fair and unfair is of great interest to students. In addition to the usual discussions about "When is it hard?" "What can you do when it is hard?" and "When is it worthwhile?" our colleague Angela Bermúdez conducted an extensive analysis of 61 Massachusetts fifth graders recognition of instances of unfairness in their lives and their subsequent assessments of those events. The investigator asked students to rate the unfairness of the described situations on a continuum from "highly unfair" to "only a little bit unfair" and to justify those rankings, revealing how these students reasoned about issues of fairness and what variables they paid attention to in making their assessment.

The fifth graders demonstrated an understanding of fairness as an issue of equity or balance among competing claims, interests, values, or opportunities. The most prevalent type of unfair situation students identified, accounting for 37% of the 323 responses generated, involved equity in the distribution of goods, opportunities, or responsibilities. "My brother ate the bigger half of the bagel. I got the small half and didn't get to eat as much as him," was an example of unfair goods. "My baseball coach put the older players on the field more than the younger players. The older kids get to play more than the younger kids" was an instance of unfair opportunity. "I always have more homework than my sister" was an example of unfair responsibilities.

Students mentioned several other kinds of situations frequently: consistency ("When my older brother was little he had a later bedtime than my older sister. But now I have the same

bedtime as my younger brother. I think I should have a later bedtime."); actions based on false information ("My brother threw a ball and it hit the lamp and broke, and he said that I did it, and I got in trouble."); not having one's say ("We had a group project. The teacher told us to agree on a topic. The group chose a topic I didn't like and I didn't agree on."); reciprocity ("I was mean to an old friend and she was being nice to me."); undeserved burdens ("I threw my toy down the toilet and my parents had to pay for something I did."); promised outcomes ("Yesterday my mom promised me we could play a game and then she said I had to go to bed."); relationships ("I left a friend out of our project and made fun of her behind her back. I am sorry! I used to be best friends and then we kind of grew apart. It wasn't right."); human rights/social justice ("When people kill other people on the street, because people lose their lives.") and action against one's wants ("My mom didn't let me finish my project because it was too late. It was unfair because I need to do my homework.")

As these examples show, students readily recognized many kinds of unfairness, noticing different types of inequity and imbalance in their lives. Further, in making judgments about how unfair these situations were and explaining them, students showed that they were not taking absolute stances toward these situations but could recognize aggravating and mitigating factors. In particular, students paid attention to issues of need, who was first, age, capability, ownership, intention, relationship to the person, and the amount of burden in deciding how unfair a situation was. These nuanced assessments show that students bring a wealth of awareness with them to the spotting of occasions.

Students understanding of self-direction

One would not expect students to know as much about self-direction as about truth and fairness. The term "self-direction" certainly is not part of students' everyday speech—indeed we were

not able to locate a vernacular term for self-direction in either English or Swedish—and the construct itself is not always easy to grasp. Accordingly, the investigator began with conversations about what it might mean to manage or be in charge of one's own thinking. Students responded with ideas related to reflecting on ideas and action, checking over one's thoughts to make sure they were right, controlling one's mood, considering consequences, giving oneself time to think, and evaluating one's thoughts. Building on students' ideas, the investigator then introduced a simple four-part framework for self-direction that included: thinking ahead, taking on the right attitude, checking in, and reflecting back. Each of these areas was explored in turn, and students identified instances of when and how they might be used. These tasks laid the groundwork for discussions of when self-direction of one's thinking is a problem and what you can do about it.

As to when it's a problem, students overwhelmingly mentioned factors related to mood, attitude, and one's physical state: "It's hard when you are in a bad mood. When you don't care. When you have no energy left." Their strategies for dealing with such situations were limited, even simplistic: "Get more sleep; take a break; think about something fun." They often passed the responsibility on to another: "Ask the teacher for help; have the coach check in with you; ask someone who has already done it."

Though this data is informal and one should not make too much of it, the contrast with the same students' understanding of issues of fairness and truth was striking. Both spotting occasions and suggesting remedies, even in the reflective sense probed through discussion, seemed impoverished when it came to self-direction. This is understandable. The concept of self-direction does not receive as much natural play in students' social interactions as does truth or fairness. Furthermore, the metacognitive demands of self-direction make it more complex.

Students do not encounter such situations in the same kind of direct way they do issues of fairness and truth. Therefore, the consequences of poor self-direction and the sense that one could do better may be less acutely felt than matters of fairness and truth.

How Settings can Develop Good Thinkers

The notion that thinking can be taught is as old as the Greek rhetoriticians, who systematically cultivated the art of argument albeit not always for noble ends. Today a number of approaches to teaching thinking of various sorts thrive, with diverse philosophies, frameworks, and track records. Although the prospects of teaching thinking have been challenged from several quarters, there is clear evidence that at least some interventions are effective—see for example the reviews in Grotzer and Perkins (2000), Perkins (1995), Perkins and Grotzer (1997), Nickerson (1989), and Nickerson, Perkins, and Smith (1985).

That said, most programs do not attend directly and systematically to dispositional aspects of thinking, although they may foster dispositions as a side-effect. In the context of the present discussion, it becomes important to ask: What might instruction designed to cultivate the dispositional side of thinking look like?

One view of this argues that culture is the best teacher of dispositions (cf. Dewey, 1922, 1933; Tishman, Jay, & Perkins, 1993; Tishman, Perkins, & Jay, 1995; Vygotsky, 1978). Plainly people pick up much of their general alertness and attitudes from the culture around them, as part of becoming streetwise about whatever streets one walks. A culture in the classroom, the family, or the workplace that foreground values of thinking and encouraged attention to thinking would likely instill street wisdom about thinking. Moreover, an enculturative approach helps to avoid a dilemma inherent in the concept of dispositions: They cannot be taught as directly as skills because dispositions are not

procedural. Students cannot straightforwardly "practice up" values and commitments that motivate thinking and alert states of mind that favor detecting thinking opportunities. Enculturation suggests a kind of osmosis that avoids this dilemma.

However, just how does this osmosis operate? How can settings, in particular classroom settings, nurture students' sensitivity and inclination toward thinking as well as their ability? One place to look for answers to these questions is in classrooms where such work is currently taking place, environments in which teachers are establishing a classroom culture rich in thinking.

Ritchhart (2002) conducted a year-long qualitative study of six such classrooms, focusing on urban, suburban and private school settings at the middle school level. These case studies proved rich in the particulars of how teachers establish cultures of thinking and develop students' thinking in their settings and subject areas. At the same time, the cases revealed common trends. The teachers studied did not treat thinking as content to be covered but used the culture of the classroom to instill it. They created settings where thinking was welcome, where there were many attractive "whens"—occasions when thinking was appropriate and incentives to undertake it.

Making room for thinking

What does it mean for a teacher to provide students with thinking opportunities? Ritchhart's (2002) research found that such patterns of practice focused on big ideas, included occasions for student choice and self-direction, encouraged students' intellectual independence or autonomy, and provided time for thinking. There was much worthwhile to think about, indeed that required thinking, as well plenty of room to notice and develop one's own ideas.

For one specific practice, teachers based their instruction on guiding questions such as "What does it mean to 'come of age'

and how does it differ across culture, time, and gender?" Such questions not only focus the curriculum but also provide a daily touch point for class reflections. Furthermore, such questions call in a rather loud voice for thinking. For other practices, teachers made time for thinking in several ways: Teachers followed their questions with considerable wait time, often fostered extended discussions, and framed homework and tests to explore a few questions or issues deeply.

Besides making room for thinking, teachers' formal and informal interactions with students encouraged and guided students in when and how to think. One can examine their practices through the dispositional triad.

Developing ability: Creating spaces and structures for thinking

While the classrooms studied made ample room for thinking, students still need to know how to think—the abilities issue. These teachers did not teach thinking skills directly. They relied on the incorporation of what we call "thinking routines" (Ritchhart, 2002). Like other classroom routines (Leinhardt & Greeno, 1986; Leinhardt, Weidman, & Hammond, 1987), thinking routines become part of the way students do things in the classroom. They are simple procedures or practices that see frequent use.

Brainstorming is a good example of a thinking routine. It is a simple procedure designed to promote a specific type of thinking (openness and flexibility) with wide applicability across subjects and grade levels. It works well at the group level, and individuals can also use it. Brainstorming and other practices functioned as routines, rather than simply strategies, because they became regular features of classroom learning. Routines operate at the socio-cultural level, first experienced and learned in group settings and gradually internalized as patterns or habits of thinking.

Besides brainstorming, the teachers developed routines for discussing and exploring ideas, such as the "why?" routine in

which students were regularly asked to explain the thinking and reasoning behind their ideas or the "take a stance" routine in which students had to defend a position. There were routines for managing and documenting thinking, such as using journals for regular reflections. Finally, there were routines for exploring ideas, which might involve a specific process for the making of interpretations or writing as a means of exploring what one knows and thinks.

Nurturing inclination: Conveying the value of thinking

During the first days of school, the teachers Ritchhart (2002) studied conveyed their values to students both explicitly through their talk of expectations and implicitly through their actions. For instance, teachers talked with students about the importance of curiosity, inquiry, and "playing with ideas" as part of the work of the classroom. In addition, they probed students' responses in a Socratic manner that let them know the importance of justifying one's responses and engaging in dialogs that build understanding. These early steps go a long way toward cultivating students' inclination toward thinking in the classroom setting.

Teachers' ongoing actions also supported inclination. Teachers honored students' disposition toward thinking by recognizing their thoughtful contributions and demonstrating genuine interest in students' ideas, sending the message that thinking is valued. By helping students to experience cognitive emotions, such as the joy of verification, surprise at unexpected outcomes, and the thrill of discovery, teachers led students to see not only that thinking is important in the given situation but that thinking has intrinsic rewards and benefits. Teachers' modeling of their own thinking revealed what prompts them to think and the paths that thinking can take, helping students to see the whens of thinking. However, the kind of modeling most often observed was not direct demonstration of a certain type of thinking behavior,

metacognition, for example, but the regular day-to-day demonstration of the teacher's curiosity, reasoning, and reflection. This kind of modeling, the kind that just comes up, seemed to be a powerful force in maintaining a classroom culture of thinking.

Cueing Awareness: Starting and sustaining thinking

It's axiomatic that to spot opportunities for thinking, the opportunities must be there. A prerequisite for developing students' awareness of occasions for thinking is a classroom rich in thinking opportunities. However, even in such a culture many thinking opportunities are likely to go unnoticed. When opportunities do get detected, students still have to match them with an appropriate type of thinking: Is this a moment to consider other perspectives, weigh alternatives, or seek clarification? Clearly, opportunities are not sufficient to ensure that students will find and exploit them.

The teachers studied used a variety of means to make occasions for thinking more salient for students. These means were generally so subtle and ingrained that the teachers themselves were often unaware of them. One means was the teachers' use of the "language of thinking" (Tishman & Perkins, 1997)—process terms such as reflecting, product terms such as hypothesis, stance terms such as agreeing or disagreeing, and state terms such as clarity or confusion. The language of thinking was rich in these classrooms, and it was the extensive use of product and stance words that especially stood out. For instance, in one math classroom students were always being asked to produce conjectures, form hypotheses, and take stances toward others' ideas. Such words may be particular useful because they call for an outcome that can be observed and thus prompt the desired action.

Sensitivity toward particular occasions of thinking also can be cued more directly. Just as a writer uses foreshadowing to heighten a reader's awareness of future events, the teachers sometimes cued

students to anticipated occasions for certain types of thinking. Such cues were most often general in nature. They acted as sensitivity boosters rather than explicit commands to think in a certain way. For instance, an English teacher engaged students in a discussion of the meaning of power and then told them, "This is the kind of thinking you can be doing as you're reading." As students engaged tasks rich with thinking opportunities, many would still pass them by. When this happened, teachers scaffolded thinking by pushing students to the next level. For instance, in a discussion of citizenship requirements in a history class, students reacted to a proposal emotionally in terms of whether they liked it or disliked it. The teacher then raised expectations, stating, "Okay, now that we are past your personal feelings, let's go to the next level. What is the intent in requiring something like this?"

A Vygotskian perspective

This discussion of classroom cultures of thinking suggests a learning process with a distinctly Vygotskian cast. In the social setting of the classroom, teachers foster values, practices, and foci of attention that play out in public ways—in the language used, the kinds of verbal and written products produced, the small-group and whole-class conversations held, and so on. These make up the warp and weft of the classroom culture. Students' participation in that culture engenders a process of orientation and internalization that advances their individual skills and dispositions as thinkers.

The notion of creating a culture around students certainly has not passed educational developers by. It figures prominently in some approaches to cultivating thinking and thoughtful learning—for example, the *Philosophy for Children* program developed by Matthew Lipman and colleagues (Lipman, 1988; Lipman, Sharp & Oscanyon, 1980), which foregrounds Socratic discussion, and the *Knowledge Forum* developed by Scardamalia and Bereiter (1999, 1996), which engages learners in collectively building on-line

knowledge webs through inquiry processes scaffolded on-line by the language of thinking.

Veterans of several program development initiatives in thinking (see for example *Odyssey* (Adams, 1986), *The Thinking Classroom* (Tishman, Perkins, & Jay, 1995), *Keys to Thinking* (Perkins, Tishman & Goodrich, 1994), and *Thinking Connections* (Perkins, Goodrich, Tishman, & Owen, 1994)), we and are colleagues are currently using the idea of thinking routines in the design of a program to support students' dispositional development. While routines provide an important avenue for teaching thinking skills and strategies, thus fostering students' ability, their presence as routines and not merely isolated strategies offers other benefits. Because thinking routines constitute ways of doing things in a particular sub-culture, they can help to engrain patterns of behavior, support the development of students' inclination toward thinking, and increase sensitivity to opportunities for using the routines to engage in thinking.

Initial results indicate that teachers find such routines easy to integrate into their instruction and curriculum and that students quickly pick up the pattern of thinking encouraged through a routine. This can be seen in students using the "what makes you say that?" routine. This simple prompt asks students to give evidence for inferences they have made about an object, picture, or story they have encountered. Students quickly catch on to the idea of supporting their assertions with reasons and evidence and begin to do so even without prompting. Furthermore, they internalize the idea that opinions, inferences, and claims need supporting evidence and often ask for such evidence from others.

Beyond Abilities

Both folk psychology and a good deal of academic psychology give abilities center stage in explaining good and not-so-good thinking. This becomes especially evident in testing practices. To

gauge how well people think, we give them problems to solve and motivate them to do well. The idea behind all this is simple and plausible: How well you think when pressed to perform explains and predicts how well you will do out there in the world when you need to think. Along with this abilities-centric view of thinking comes an abilities-centric view of what it is to teach thinking: To get people to think better, improve their abilities—teach problem solving skills, learning skills, self-management skills, and so on.

All this certainly has value as far as it goes. However, the arguments advanced here question the completeness of the storyline. They challenge whether perform-on-demand tasks are a good model of how thinking works in everyday life. An abilities-centric account of thinking leaves out the matter of 'when'. The same common-sense folk psychology that places abilities in the center also and paradoxically makes room for and considers important various traits of intellectual character—curiosity, persistence, open-mindedness, due skepticism, and so on (a luxury of folk psychology is that it need not be consistent). As a matter of logic, accepting an intellectual challenge implies dealing with the 'when'—Is this a problem here and one worth engaging? While some situations, such as taking a test, call for thinking with a loud voice, others do not. One might easily miss a deceptive point in a politician's speech or a decision point one should treat thoughtfully rather than by default.

Empirical research underwrites the importance of the 'when' of thinking. As reviewed earlier, research on a variety of dispositional constructs—for instance, need for cognition (Cacioppo & Petty, 1982), need for cognitive closure (Kruglanski, 1990), entity vs. incremental learning (Dweck, 1975, 2000)—has shown substantial influence on performance. Moreover, such traits generally correlate weakly or not at all with typical measures of cognitive ability. Our and our colleagues' research on sensitivity, inclination, and abilities has provided evidence that sensitivity to

occasions that invite thinking is a major bottleneck, a factor that more than anything else may undermine thoughtfulness in day-to-day matters.

A devotee of abilities-centric theories might dismiss such arguments as follows: "Well, of course motivation matters. Motivation matters throughout human behavior. All such research really shows is that motivation matters to performance and we never doubted that." However, this response reduces the dispositional view to a straw man. The dispositional view has much more depth and nuance. For one point, the dispositional side of thinking involves not just motives, which may be transient, but stable intellectual values and habits of mind. For another, research from our group emphasizes that a large part of the dispositional side of thinking does not straightforwardly concern motive in any sense but rather sensitivity to occasion.

With a dispositional view of thinking comes a different approach to the teaching of thinking. Whether thinking can be taught at all in any general sense is somewhat controversial, although surveys cited earlier have revealed what appear to be clear positive instances. In any case, efforts to do so are generally abilities-centric, as noted earlier. A dispositional view suggests that efforts to teach thinking should give substantial attention to cultivating values and commitments associated with thinking, as well as alertness to the subtle signs of occasions for thinking that might pass one by. Since neither values and commitments nor alertness can be practiced in a straightforward sense, this in turn looks toward enculturative styles of teaching and learning, where learners internalize values and patterns of practice from the classroom, family or workplace culture around them. To be sure, abilities-centric interventions may accomplish some of this in any case, simply through putting thinking in the foreground and treating it seriously and attentively. Nonetheless, it seems likely

that deliberate attention to the dispositional side of thinking from an enculturative perspective would add value.

In *Cognition in the Wild,* one of the notable books about cognition in recent years, Edwin Hutchins (1996) related his studies of crewmen on U. S. Navy ships coping with the many complexities of navigation. Hutchins emphasized how different the work of cognition looked in this setting from the mind-with-a-pencil model that seems so prominent in typical laboratory research on cognition. Hutchins noted how cognitive work was socially distributed across team members at various levels of command and physically distributed across various instruments and notational systems.

Another characteristic of the wild—whether on a Navy ship or on the playground or in a work setting—is the great range in how loudly or softly circumstances call for thinking. When, in one incident Hutchins reports, a ship suddenly loses all power and steerage while underway, everyone knows there's a problem to be solved, especially since a large vessel can coast for miles under its own momentum and thereby end up in disastrous places. There is little doubt that this is a 'when' for quick thinking and quick action. However, often we do not know whether there's a problem or whether it's worth addressing. Only when the 'when' of good thinking takes its place beside the 'what' are we likely to have a rich explanation of how and how well people think in the wild.

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