

Intelligence in the Wild

A Dispositional View of Intellectual Traits

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Abstract

Most accounts of intelligence are “abilities-centric.” They aim to explain intelligent behavior in terms of IQ or other measures of intellectual aptitude. However, several investigators have proposed that intelligent behavior in the wild—in everyday circumstances where carefully framed tests do not tell people exactly what intellectual task to attempt—depends in considerable part on thinking dispositions. Definitionally, dispositions concern not what abilities people have but how people are disposed to use those abilities. Everyday language includes a number of dispositional terms such as curiosity, open-mindedness, and skepticism. We review several dispositional constructs that researchers have investigated, sometimes under the label dispositions and sometimes not. The findings in trend show that dispositions are stable traits that help to explain intellectual performance over and above measures of intellectual aptitude. It is argued that a dispositional view of intelligence is warranted, and that it is an important area for continued research.

Intelligence in the Wild

A Dispositional View of Intellectual Performance

A reporter asked Eleanor Roosevelt how her husband thought. She answered more or less, “How does the president think? My dear so-and-so, my husband doesn’t think. He decides.”

Such words seem timely today, when heads of state sometimes appear to do altogether too much deciding without enough thinking. In any case, Eleanor Roosevelt’s quip points up a side of intellectual performance not often addressed either in the history of psychometrics or in volumes of research and practical programs about problem solving, decision making, and learning strategies. Her comment concerns not Franklin Roosevelt’s ability but his attitude, not what neural equipment or cognitive processes or thinking strategies Franklin Roosevelt possessed, but how he tended to deploy those resources. A number of words in English and other languages testify to this dimension of intellectual performance. Decisiveness, curiosity, open-mindedness, fairness, systematicity, skepticism, judiciousness, and like traits concern not what abilities people have but characteristic patterns of playing out those abilities.

As a broad generalization, most accounts of intellectual performance and its cultivation are abilities-centric. They foreground the cortical equipment people bring to intellectual endeavors, as in views of intelligence that emphasize the efficiency of the neural substrate (e.g. Jensen, 1980, 1988; but see the cautious review by Brody, 1992, chapter 3). Or they foreground the presence and effectiveness of constituent cognitive processes and metaprocesses (e.g. Baron, 1985; Carroll, 1993; Sternberg, 1985). Or they foreground strategies and skills of thinking and learning such as brainstorming, considering hidden options, searching for evidence, and relating new information to old (e.g. Chipman, Segal, & Glaser, 1985; Baron & Sternberg, 1986; Nickerson, Perkins, & Smith, 1985; Perkins, 1995; Segal, Chipman, & Glaser, 1985). In all these perspectives, intellectual traits are treated as a matter of what the person is equipped to do.

In laboratory and testing situations, it is natural that an abilities-centric view of intellectual performance should prevail. Typically, people in such settings face clearly posed tasks in a context that motivates them to perform well. Ideally, they understand the tasks and strive to accomplish them. Thus, differences in performance can be attributed to differences in ability of one sort or another. However, the challenges of exercising one’s intelligence “in the wild” are strikingly different from those in such tame laboratory and testing situations (cf. Hutchins, 1996). Everyday contexts present a wildness of vaguely marked and ill defined occasions for thoughtful engagement. Opportunities for investing one’s intelligence must be detected. When they are, whether to bother is often more a personal decision than a compelling need. In everyday life, people’s sensitivity to subtle occasions for thinking and their inclination to follow through would appear to be substantial influences on intellectual performance alongside their capabilities.

This side of intellectual performance has been recognized by a growing literature, often although not always under the name of thinking dispositions. Dispositions concern not only what people can do but how they tend to invest their capabilities—what they are disposed to do, hence the term dispositions. This literature challenges the idea that intelligence as it shows itself in realistic situations can be accounted for adequately within abilities-centric paradigms.

Sometimes this view is identified with the recently popularized notion of emotional intelligence (Goleman, 1995). Although there is a relationship, a dispositional view of intelligence and emotional intelligence are somewhat different matters. According to Goleman, emotional intelligence concerns our sensitivity to and artful handling of our own and others' emotions. While this is certainly very important, a dispositional view of intelligence does not focus on emotions any more than any other facet of human life.

In this paper, we review a range of research pertinent to a dispositional view of intelligence. First we examine the concept of dispositions as it has been articulated by various investigators. Then we look to the empirical literature, keeping in view five questions key to the viability of a dispositional view of intelligence:

1. What kinds of thinking dispositions are there?
2. Are thinking dispositions mental attributes stable across tasks and time?
3. How much do thinking dispositions contribute to intelligent behavior?
4. How do dispositions relate to abilities?
5. Can thinking dispositions be learned?

It might be noted that this list doesn't ask about efforts to teach thinking dispositions. Although there have always been educational programs that are more dispositional in nature than others, few wide-scale programs have been designed to explicitly teach thinking dispositions as they are discussed in this article, and fewer still have been formally evaluated. As this article will show, reliable methods for assessing thinking dispositions have been developed. Yet, because a dispositional view of intelligence is in its formative stages, these methodologies are often time-consuming and suited to concept development rather than wide-scale classroom use. Such a stage is natural in the growth of a theory, and the authors are optimistic that as more educational programs are expressly designed to teach thinking dispositions, more streamlined assessment methodologies will also be developed.

The Idea of Thinking Dispositions and What it Might Offer

It may be difficult to explain intelligent behavior in everyday contexts solely in terms of abilities. Passions, motivations, sensitivities, and values all seem likely to play a role in intelligence. To define intelligence as a matter of ability without also honoring

the other elements that enliven it is to fail to capture its human spark. In recent years, a small but growing number of scholars have aimed to capture the human spark of intelligence by reconceiving intelligence as dispositional in nature rather than abilities-centric.

The concept of intelligence is a normative concept of mind, because it expresses a view of what counts as good, or effective, cognition. So it is not surprising that scholars interested in dispositions have also reconceived related concepts of mind in terms of dispositions, such as the concept of rationality, and the concept of critical thinking. For example, Stanovich and Baron have both put forth conceptions of rationality that are dispositional in nature (Baron, 1985; Stanovich, 1994). Perkins, Jay, and Tishman (1993) have advanced a dispositional conception of high-level thinking that emphasizes a set of seven thinking key dispositions. Ennis (1991, 1986) has characterized critical thinking as dispositional in nature, as have the Facione's (Facione & Facione, 1992). Costa (1991) puts forth a list of fifteen dispositional "habits of mind" that comprise effective thinking. While there are significant differences in the number and grain-level of the dispositions included on these lists, they are more similar in spirit than dissimilar, with all of them emphasizing such tendencies as open-mindedness, reasonableness, curiosity, and metacognitive reflection.

When we use the everyday language of dispositions, we think of traits such as open-mindedness or reflectiveness as marking trends but not strict laws. For example, if we consider a friend open-minded, we expect him to be open-minded most of the time but do not feel that a law of nature has been transgressed if occasionally he fails to behave open-mindedly, even though we know he has the ability to do so.

While informal language provides an accessible introduction to the notion of thinking dispositions, not all technical or theoretical definitions cleave closely to the everyday concept. In the philosophical literature, Gilbert Ryle talks about dispositions as properties that necessarily manifest themselves when other properties are met (Ryle, 1949). Brittleness, for example, is a tendency to shatter when struck. This departs from the everyday language sense of disposition because it stresses a necessary connection between certain preconditions and ensuing behaviors. In contrast, we think of tendencies like curiosity and open-mindedness as propensities rather than immutable behaviors.

In another departure from everyday language, Perkins, Jay, and Tishman (1993) have proposed a technical definition that identifies three logically distinct components that are necessary to instantiate dispositional behavior: ability, inclination, and sensitivity (Perkins, et al., 1993). Ability concerns the basic capacity to carry out a behavior. Inclination concerns the motivation or impulse to engage in the behavior. Sensitivity concerns likelihood of noticing occasions to engage in the behavior. For example, consider open-mindedness. In order to engage in an episode of open-mindedness one has to (a) have the basic capacity to see a situation from more than one perspective, (b) feel inclined to invest the energy in doing so, and (c) recognize an appropriate occasion to be open to alternative perspectives. This definition of dispositions is stipulative. It departs from an everyday sense of dispositions that separates abilities from dispositions because it includes ability as one of three components logically necessary to show that one has a disposition. While such a departure can be confusing, (Ennis, 1996), everyday usage of the term disposition is itself ambiguous. For example, although everyday usage

of the term *disposition* often draws a casual distinction between ability and disposition, generally by juxtaposing skill and will (as in “he is perfectly able to do well in math, he just doesn’t want to”), we nonetheless base our assessment of people’s dispositions on their visible patterns of enacted behavior, thereby tacitly assuming ability (Perkins, et al., 1993). To be sure, it is logically possible to have a disposition that is never instantiated, such as in the famous example of the man who is disposed to murder his wife, given the right situation, but never does so. But the failure to instantiate a disposition in cases like this has to do with the lack of an enabling opportunity. If an enabling opportunity arose, and a lack of ability still blocked the behavior in question, then authors would argue that it can’t logically be called a disposition, although it might rightly be termed a leaning or a desire.

The concept of thinking dispositions has its origins in theoretical analysis, but it also has empirical support. The following section reviews three relevant areas of research, beginning with—and discussing in most detail—a series of studies designed by the authors that focus directly on the triadic conception outlined above.

Research on Thinking Dispositions

Various investigations of thinking dispositions have grown out of attention to thinking on the part of philosophers and cognitive psychologists over the past 20 years. Three such areas of research are described here.

A triadic model of thinking dispositions

The previous section outlined a theoretical analysis of thinking dispositions that identified three separate but logically necessary components—ability, inclination, and sensitivity. In order to test and explore this conception, the authors conducted a series of four studies using a research paradigm designed to separate each component and measure its contribution to overall intellectual performance. The paradigm involved a series of three paper and pencil tasks, in which each task successively “stands in” for components of the triad.

Study 1. 64 eighth graders participated in study #1, which aimed to determine whether the elements of the triad were indeed psychologically separable. Subjects were asked to read several short stories, each of which embedded two shortcomings in characters’ thinking. Each shortcoming corresponded to one of two thinking dispositions: the disposition to seek alternative options, or the disposition to seek reasons on both sides of a case. The first task in the three-task series was designed to probe the element of sensitivity. Subjects were asked to underline any passages in the story where they perceived a thinking shortcoming and to explain their own thinking in the margin. For example, in one story, a character named Mrs. Perez fails to think carefully about an important decision. In one passage, she says: *‘I have no other choice. ‘There’s no other decision I can think of in this situation.* Subjects who performed well at this stage would underline this portion of text and explain in the margin what was wrong with Mrs. Perez’ thinking and how it could be better.

It was important to ensure that these supposed shortfalls in thinking were recognizable as such generally, not just by the experimenters. With this in mind, all stories were pilot tested to eliminate shortfalls that were not acknowledged upon discussion by students from the grades tested. Moreover, a selection of the stories was submitted to several academic experts in critical thinking who had no knowledge of these studies,

using a variant of the methodology described here. These experts detected and correctly characterized virtually all the intended shortfalls, and did not identify any unintended shortfalls.

Continuing with the methodology, the second task provided a measure of inclination. In it, the materials highlighted the potentially problematic thinking step, thereby providing a surrogate for sensitivity. Subjects were then asked whether they perceived the target shortcoming as problematic, and, if so, how they would deal with it. Returning to the passage in the Perez story, the problematic sentence was disembedded and subjects were told: “Some of Mrs. Perez’s friends think she should have tried to find more options. Other friends believed she tried hard enough to find options. Suppose you were in Mrs. Perez’s place. What would your thinking be like?”

In the third and final task, the target shortcomings in the short stories were isolated, and subjects were straightforwardly asked to generate ideas related to them, thereby measuring ability in the same way that typical test situations do—bypassing the need for sensitivity and inclination and directly instructing subjects to use whatever ability they possess. For example, in the Perez story, subjects were asked to list several options for what Mrs. Perez could do. This demand, which assumes task compliance as virtually all tests of ability do, revealed subjects’ basic ability to generate multiple options.

Subjects’ performance was measured by counting the number of “hits” across the three tasks. A hit consisted in a full performance at the target task. So, for example, a hit at task one meant that students underlined the target shortfalls and proposed remediations in the margins. A hit at task two meant that subjects showed an inclination to think through the shortfall and in fact did so by proposing remediations. A hit at task three meant that subjects displayed the requisite ability, which took the form of suggesting remediations in the form of additional options. Final scores were cumulative, adding scores from task 1 to new hits on task 2, and then adding new hits from task 3 to the scores from task 1 and 2.

If performance on these tasks simply required ability, subjects would do about as well as they could on the first task and not add many hits from task 1 to task 2 to task 3. In contrast, if sensitivity to targets and inclination to follow through were bottlenecks in performance, then subjects would be expected to show substantial gains in their cumulative hits across the tasks.

Findings from this study suggested that sensitivity, inclination and ability were separable. Interestingly, results indicated that subjects’ sensitivity to thinking shortfalls was surprisingly low. For example, on the sensitivity tasks for the options shortcoming, on average students demonstrated only about 13.5% of what their ability would let them do. On the inclination tasks, they demonstrated about 45% of what their ability would let them do. In other words, the demands of sensitivity seem to decrease task performance by 86.5%; whereas in contrast, the demands of inclination decrease task performance by about 55%. Typically, shortcomings in intellectual performances are attributed to either a failure of ability, or a failure of motivation (an aspect of inclination). These results are surprising because they suggest that low sensitivity, rather than low inclination, may be the larger obstacle to good thinking.

Study 2. In the second study, 94 sixth-graders participated in an easier-to-administer, streamlined version of the instrument in which the inclination task was

omitted. The justification for eliminating this measure was the finding described above suggesting that a lack of sensitivity was the principal bottleneck in performance. As in the previous study, two dispositions were examined: the dispositions to seek alternative options and the disposition to seek reasons on both sides of a case. These dispositions were investigated in the context of three problem types: decision making, problem solving, and casual explanations. Three scenarios were produced for each disposition-problem-type combination, yielding a total of 18 different scenarios, each with its own measure of sensitivity and ability.

Students' responses on both the sensitivity and ability portions of the scenarios were rated holistically along a continuum from 1 to 6. Low performances (scores from 1-2.5) were characterized by factors indicating poor thinking and minimal investment. Such responses ranged from a sparse response with little or no contextual relevance to a single workable or obvious option/reason involving poor or limited thinking. Medium responses (scores from 3-4) were characterized by modest investment and elaboration in the production of one or two grounded but not particularly nuanced or creative responses. These responses ranged from full responses demonstrating plausible options and reasons to those beginning to consider different dimensions of the situation. High performances (scores from 4.5-6) were characterized by rich elaboration, creativity, and the presentation of a range of ideas, solutions or options.

In a creating an overall composite score for both sensitivity and ability, three scenarios were eventually excluded from the instrument based on their poor correlations with other scenarios. The resulting instrument showed strong internal consistency in both the sensitivity measure (Cronbach's alpha = .93) and the ability measure (Cronbach's alpha = .90). Factor analysis revealed that there was only one underlying factor in the data for the sensitivity measure and one for the ability measure, despite the distinction in the design between seeking alternative options and seeking on both sides of a case.

Composite sensitivity scores ranged from 1-4.1 with a mean of 2.12 (SD = .56). Composite ability scores ranged from 1.33-4.53 with a mean of 2.98 (SD = .66). The difference between these mean scores exceeds one standard deviation, and the difference is statistically significant (f-ratio = 348.288, $p < .0001$). In examining the range of these scores, 91.5% of the sensitivity scores were considered low (2.5 and below) where as only 49% of the ability scores fell in the low range. We see in these findings the presence of a "dispositions effect" in which the detection and awareness of opportunities to act and to think is problematic for a vast number of students in our sample. While the majority of these sixth graders had the ability to perform at a satisfactory if not strong level, they were generally unable to detect and respond to shortcomings or problematic areas independently when presented in context. A further examination of the relationship between ability and sensitivity using linear regression indicates that as ability level increases one's sensitivity is likely to improve as well. Using ability as a predictor of sensitivity, we can conclude that, on average, a 1 point difference in ability is associated with a .62 point difference (in the same direction) in sensitivity (predicted $SENS = 3.78 + .62 ABIL$).

Study 3. The third study investigated the nature of sensitivity in more depth. What was going on when subjects fail to detect a thinking shortfall? One hypothesis was that subjects lacked the knowledge necessary to make the proper discriminations

between shortfalls. Another hypothesis was that subjects had the appropriate knowledge but simply did not approach the situation with an alertness to the shortfalls. A third hypothesis was that the shortfalls were difficult to detect even with the appropriate knowledge and alertness. In order to test these possibilities, an experiment was designed using stories like those in the previous studies. Two manipulations were devised and combined to create four conditions. The manipulations were as follows:

Saliency. In two of the four conditions the thinking shortfalls in the stories were underlined for subjects, thereby making the shortfalls visually salient. The subjects then simply had to explain them, with or without the help of priming (see below). If detection were the bottleneck for subjects in identifying and explaining shortcomings, then making them salient should allow subjects to perform well.

Priming. In two of the four conditions subjects were given a crib sheet of 5 numbered prompts, called “thinking handles,” to use during the test. For example, the thinking handles consisted of sentences a subject could choose like “this is a place where it is important to look for an alternative explanation” or “this is a place where it is important to make a plan.” Subjects were instructed to find places in the text to assign handles.

Subjects were 105 eighth graders, divided into the four conditions: both saliency and priming, saliency without priming, priming without saliency, and neither. Performance was measured according to detection and discrimination in the appropriate conditions. For detection, responses were scored according to whether or not subjects detected or underlined a thinking shortfall. Discrimination was scored according to whether a reasonable explanation was given in response to a thinking shortfall. Any explanation that captured a gist of the shortfall, however broadly, was considered reasonable.

The pattern of results is interesting. To begin with, contrary to the hypothesis that a failure to detect shortfalls is largely due to the lack of knowledge needed to make proper discriminations between shortfalls, priming did not increase detection. The mean rate of detection for subjects in the naturalistic group, i.e. the group in neither the priming nor saliency conditions, was 41%. The mean rate of detection for subjects in the priming without saliency condition, i.e. those who received a crib sheet for discriminating shortfalls, was 37%. The difference between these numbers is not significant at the .05 level.

In addition, results indicate that priming did not increase the discrimination rate for shortfalls detected naturalistically. Of the 41% of shortfalls detected by the naturalistic group, 88% of them were properly discriminated. Of the 37% of the shortfalls detected by the group who received priming without saliency, 81% were properly discriminated. Again, the differences in these scores are not statistically significant. This indicates that when subjects detect shortfalls on their own, they also do a pretty good job of discriminating them.

Results also suggest that subjects tend to do a better job of discrimination when they detect shortfalls naturalistically than when the shortfalls are made salient for them. The results that indicate this are as follows. In the saliency-only condition, i.e. the condition in which the shortfalls were made salient by underlining but no thinking handles were provided, subjects’ mean rate of discrimination was 67%. In contrast, in both of the no-saliency conditions—the naturalistic condition and the condition in which only

the thinking handles were provided—the rates of detection were 88% and 81% respectively. The difference between 67% and 81% is significant at the .05 level. As mentioned in the foregoing paragraph, the difference between 88% and 81% is not significant. This finding, that people seem to do a better job at discrimination when they detect shortfalls naturalistically than when the shortfalls are disembodied for them, makes common sense and suggests that the alertness required for naturalistic or “in the wild” detection may function as a kind of internal priming.

Study 4. The fourth study examined test-retest reliability of the sensitivity instrument. This involved stories like those used in Study 3, with no saliency or priming. The instrument was administered to groups of 5th- (N = 35) and 8th- (N = 20) grade students on two separate occasions, with 6 weeks between the test and retest for the 5th graders and 12 weeks for the 8th graders. There were no significant differences between the mean scores for either detection or discrimination across time in either group. The correlation of total detection scores at Time 1 and Time 2 was high ($r = .81$) in the 8th grade sample and modest to strong in the 5th grade sample ($r = .66$). The correlation of total discrimination scores at Time 1 and Time 2 was strong for the 8th grade sample ($r = .72$), and modest to strong in the 5th grade sample ($r = .68$).

The California Critical Thinking Dispositions Inventory (CCTDI)

The triadic model of dispositions is not the only approach to measuring dispositions. Researchers Noreen and Peter Facione have designed a Likert-scale, self-rating inventory aimed at measuring one’s strength or disposition to think critically (Facione & Facione, 1992). By measuring a test-taker’s opinions, beliefs, attitudes and general habits of mind across seven areas, called “sub-dispositions,” this instrument aims to measure the test-taker’s overall disposition toward critical thinking (Facione, 1997). The seven sub-dispositions are: truth-seeking, open-mindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness, and maturity of judgement (Facione, Sanchez, Facione & Gainen, 1995). From the perspective of the triadic model, the CCTDI does not deal with sensitivity but asked subjects to rate themselves on their inclinations.

The test developers took care to construct a reliable and valid instrument. Factor analysis supported the inclusion of items within each scale, with alpha reliabilities ranging from .60 to .78 (Facione et al., 1995). The internal reliability of the instrument overall was .91 (Facione et al., 1995). 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 measures of the CCTDI with a critical thinking skills test, the California Critical Thinking Skills Test (CCTST) and found a significant correlation of .67 between the two measures. Correlations between the sub-dispositions of the CCTDI and the measure of critical thinking ability imply that the disposition to truth-seeking may in fact be the most crucial disposition in predicting critical thinking skills, although Facione et al., are careful to point out that the findings from this analysis are preliminary (Facione et al., 1995).

Findings from research by Sanchez (1993) indicate that CCTDI measures are also positively and significantly correlated to measures of ego-resiliency ($r = .58$, $N = 198$, $p < .001$) (Facione et al., 1995; Facione, 1997). Ego resiliency can be defined in terms of cognition as the inclination to be engaged with one’s environment, to flexibly

alter perception and to adapt to the constraints of a situation (Block & Block, 1980; as cited in Facione et al., 1995).

The present authors explored the relationship between the Faciones' measures of thinking dispositions and the triadic model, focussing on sensitivity. The CCTDI was administered to a sample of 19 ninth grade subjects who participated in study #3. The subjects demonstrated similar patterns of performance as samples used by Facione and Facione (1992). Correlations between their detection and discrimination scores and their CCTDI scores were low, with the exception of scores on the inquisitiveness scale, which were significantly related to detection ($r = .58$) and discrimination ($r = .60$) at the .01 level. Analysis revealed that high levels of sensitivity seemed positively related to strong disposition toward inquisitiveness, which Facione et al., (1995), describe as "intellectual curiosity."

Argument evaluation and the disposition toward unbiased reasoning

Still another measurement initiative focussing on dispositions comes from researchers Stanovich and West (1997). They are interested in the disposition towards unbiased reasoning—a disposition they maintain is almost universally acknowledged as a key component of critical thought (Stanovich & West, 1997). This disposition is especially important in argument evaluation, where unbiased reasoning involves putting aside one's prior beliefs and objectively evaluating the quality of an argument. They carried out a program of research to explore whether the relative contribution of ability and disposition to argument evaluation can be separated, and the extent to which the variance in individual performance could be predicted by ability and dispositional measures (Stanovich & West, 1997)

An Argument Evaluation test was given to 349 college students. Subjects were asked to evaluate the strength and quality of a series of arguments and rebuttals about social issues, such as welfare spending and congressional salaries. They were expressly directed to focus on the quality of argument and to ignore their own beliefs. Before the test, subjects' prior beliefs related to the issues on the Argument Evaluation Test were surveyed.

SAT and vocabulary scores were used as measures of cognitive ability. Thinking dispositions were measured on 9 sub-scales: flexible thinking, openness-ideas, openness-values, absolutism, dogmatism, categorical thinking, superstitious thinking, counterfactual thinking, and outcome bias. Several of the subscales intercorrelated, allowing for a composite "actively open-minded thinking" score, which was derived by summing the flexible thinking and two openness scales and subtracting the sum of the absolutism, dogmatism, and categorical thinking scales. (The concept of actively openminded thinking was borrowed from Baron, 1985).

The quality of argument evaluation was determined by the degree to which subjects were able to reason independently of their own beliefs. Ability measures for the group that scored high on evaluating argument quality were significantly higher ($p < .001$) than the group that scored low. Thinking dispositions measures for the high-ability group were similarly higher. Yet there was still large variance within individual performance. Regression analysis showed that SAT scores (a proxy for ability) accounted for 12.4% of the variance, but that significant additional variance was explained by the composite "actively open-minded thinking" disposition (3.7% additional variance), as well as by negative thinking dispositions scored as outcome bias (1.7%

additional variance) and counterfactual thinking (1.4% additional variance). Two additional analyses—a regression analysis that looked at the component subscales of the composite dispositions score, and commonality analysis—were used to examine the covariance relationships between performance on the argument evaluation test, cognitive ability and thinking dispositions. All three analyses had similar results.

The analyses revealed that cognitive ability and thinking dispositions were separable predictors of performance on an argument evaluation tasks. Both constructs were significant and unique predictors of performance, and their unique variance as predictors was greater than the variance they had in common with each other.

General conclusions from research on thinking dispositions

The findings in the three sets of studies reviewed in this section speak to the questions framing this article. The set of studies conducted by the authors suggests that inclination and sensitivity make unique contributions to intellectual behavior that are separable from the contribution of ability. Interestingly, findings revealed that the contribution of sensitivity is larger than would have been predicted, and that it is sensitivity, rather than inclination, that appears to be the chief bottleneck in effective intellectual performance (operationalized as performance that achieves the norms set by the tasks in the studies). Factor analysis confirmed that sensitivity and ability are separate factors. The Facione writings suggest that a strong disposition toward critical thinking, specifically an inclination toward intellectual curiosity and inquisitiveness, is indicative of one's ability to think critically and act intellectually. Results of the preliminary research discussed here appear to support this conclusion. The Stanovich and West study adds more support to the claim that thinking dispositions contribute to intelligent behavior. Their research shows that the contribution of dispositions is separable from the contribution of abilities, and that measures of thinking dispositions can predict individual differences in intellectual performance. Additionally, the research indicates that a composite thinking disposition termed "actively open-minded thinking" can be measured and its effect on the quality of argument evaluation determined.

Research on General Dispositions Toward Cognitive Engagement

While cognitive psychologists traditionally have focused their attention on questions regarding the general nature of intelligence and identification of underlying laws and processes of cognition, many social and personality psychologists have sought to identify situational factors and individual differences affecting people's tendency to engage in productive patterns of thinking. In this section, we review three prominent and well-researched constructs within this sub-field of "motivated social cognition," the *need for cognition*, *mindfulness*, and *entity versus incremental learners*, examining their contribution to intelligent behavior, their stability over task and time, and their learnability.

Need for Cognition and related measures

Cacioppo and Petty (1982) introduced 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), which developed the notion of a need for understanding, and Fiske (1949), which postu-

lated the idea of an inquiring intellect. Cacioppo and colleagues (Cacioppo, Petty, Feinstein, & Jarvis, 1996) define need for cognition as an overarching construct in which 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 the generation of a product in the form of well-delineated theories or explanations. In addition, individuals high in need for cognition display a skeptical and discerning attitude toward information, seeing themselves as active agents in the constructing of meaning who enjoy dealing with ambiguity. The thinking of these individuals involves not only seeking out and evaluating information but monitoring and regulating one's mentation in a metacognitive sense.

Used in over 100 empirical studies (Cacioppo et al., 1996), the Need for Cognition Scale (NCS) has proven to be a robust and reliable instrument for the investigation of the need-for-cognition construct. The NCS is a self-report instrument in which respondents rate their tendencies, preferences, beliefs, and enjoyment of a collection of general thinking-oriented activities or practices on a Likert scale. A long form consisting of 45 items and a short form of 18 items exist (Cacioppo & Petty, 1982). Investigations have shown the construct to be stable over time and distinguishable from other indexes of ability such as IQ, ACT scores, and grades. Correlations with these measures are generally modest, ranging from $r = .17$ for grades to $r = .26$ for ACT scores. At the same time, the instrument has proven to be a good predictor of individuals' intelligent behavior in numerous and varied circumstances including attending to and evaluating the quality of arguments, recalling supporting evidence, dismissing spurious claims, and providing needed elaboration. In contrast to individuals low in need for cognition, high need individuals both notice more opportunities to think and are more inclined to do so.

Interesting contrasts to the need for cognition appear in research that focuses on dispositions to avoid cognition in the form of dogmatism (Troidahl & Powell, 1965) and the need for cognitive closure (Kruglanski, 1990). Kruglanski defines the need for closure as the desire for "an answer on a given topic, ... compared to confusion and ambiguity" (1990, p. 337). This desire is non-specific in nature and is not necessarily as related to developing understanding or finding suitable answers as much as it is to simply attaining an answer, any answer, quickly. Factor analysis of the Need for Closure Scale (NFCS) developed by Webster and Kruglanski (1994) have identified five factors associated with an individual's need for closure. These include a preference for order, preference for predictability, decisiveness, discomfort with ambiguity, and closed-mindedness. Research has shown that although the need for closure is often situational and can be induced (Kruglanski & Freund, 1983), it also represents a dimension of stable individual differences (Webster & Kruglanski, 1994).

As might be expected, the need for closure generally correlates negatively with the need for cognition. In two studies, the correlation between the instruments was $-.25$ (Petty & Jarvis, 1996) and $-.28$ (Webster & Kruglanski, 1994). However, the correlation between the decisiveness subscale of the NFCS and the NCS was positive, $r = .24$, in the Petty and Jarvis (1996) study.

Mindfulness

Another construct reflecting a disposition toward cognitive engagement is Ellen Langer's mindfulness. Like the need for cognition, the theory of mindfulness has been the subject of extensive research. Langer (1989) defines mindfulness as an open and

creative *state* in which individuals actively create new categories, draw meaningful distinctions, consider multiple perspectives, and are open to new information. In contrast, mindlessness is characterized by being trapped by one's pre-existing categories, narrow thinking, automatic responses to situations without an adequate awareness of context, and a tendency to view the world from a single perspective. Mindfulness is associated with a sense of personal agency and efficacy as well as a belief in a constructed and conditional reality whereas mindlessness is more associated with a commitment to absolutes.

Over the past two decades, a wealth of experimental research has accumulated to provide the foundation for the theory of mindfulness (Langer, 1989). Ellen Langer and her colleagues have been particularly inventive at designing studies that demonstrate the conditions under which mindfulness is more likely to flourish. For example, a collection of studies has shown that the presentation of information (i.e. facts, procedures, and descriptions) in an open, "conditional" or "this may be" form versus in a straightforward, "absolute" or "this is" form facilitates greater retention, understanding, and flexible use of that information (e.g. Langer, Hatem, Joss, & Howell, 1989; Langer & Piper, 1987; Ritchhart & Langer, 1997). The underlying explanatory theory postulates that conditional instruction opens up possibilities whereas absolute instruction tends to produce a more rigid mindset about the information. Thus, a mindful state contributes to intelligent behavior.

Most of the research on mindfulness has addressed mindfulness as a state induced by various circumstances. However, there have been efforts to devise measures that test mindfulness as a trait stable over time (Langer, personal communication, Feb. 5, 1998). As of yet, the psychometric work on these measures and the validation studies needed to support them have not been reported. However, there are ongoing efforts to study the cultivation of the trait of mindfulness (Ritchhart & Perkins, in press). Specifically, this work has focused on classroom practices that support and promote greater student mindfulness. An examination of the practices of teachers in classrooms in which students are exhibiting a high level of thinking and understanding has revealed three high-leverage practices supporting mindfulness: perspective taking, introducing ambiguity, and looking below the surface of ideas and concepts.

Entity versus incremental learners

Another look at the dispositional side of cognitive engagement comes from the work of M. Bandura & Dweck (1985) and Elliott & Dweck (1985). Their research findings suggested that a person's view of how intelligence works determines how persistently the person will invest in a challenging intellectual task (Dweck, 1986). *Entity learners* believe that intelligence is fixed and non-changing. They are motivated by successful displays of ability and attaining favorable judgements. They may quit when problems prove hard, assuming they are not smart enough. In contrast, *incremental learners* see intelligence as learnable. They are motivated to increase their knowledge and abilities, approaching challenging situations with persistence and a desire to learn (Bandura & Dweck, 1985; Elliott & Dweck, 1985; as cited in Dweck, 1986).

An incremental mindset has been shown to contribute to cognitive performance. When intellectual ability did not differ, the cognitive performance of students with an incremental view was generally stronger than that of students with an entity view. Also, students with an incremental view generally tended to select more difficult tasks on

which to work. Dweck (1986) explained that an individual holding an incremental view of intelligence and focused on learning is likely to be inclined to analyze a challenging situation and employ a variety of strategies to get around an obstacle. Thus, the incremental learners in these studies displayed a disposition toward increasing efforts and strategies and exploring situations which result in successful cognitive performances (Bandura & Schunk, 1981; Elliott & Dweck, 1985; Farrell & Dweck, 1985; as cited in Dweck, 1986).

In general, measures of IQ do not positively correlate with an incremental attitude, and in fact a negative correlation between an incremental attitude and IQ has been reported with especially bright girls (Crandall, 1969; Licht & Dweck, 1984; Licht & Shapiro, 1982; Stipek & Hoffman, 1980; as cited in Dweck, 1986). Despite this connection between these learning approaches and IQ during early childhood, empirical findings have shown that children with an entity view of intelligence limit their learning and subsequent achievement and thereby experience fewer gains in IQ over time than children with an incremental view (Kangas & Bradway, 1971; as cited in Dweck, 1986). While there is not much evidence addressing the stability of these attitudes over time, research has shown that creating an environment that supports risk taking and focuses on learning goals can lead students to develop an incremental attitude toward learning (reported in Smiley & Dweck, 1994).

General conclusions from research on dispositions toward cognitive engagement

In summary, the three areas of research on general dispositions toward cognitive engagement reviewed in this section tend to focus on broad overarching constructs at a macro level. In the case of need for cognition and mindfulness, these overarching dispositions are construed as encompassing many sub-dispositions such as open-mindedness, perspective taking, and a desire for deep-level understanding. Although the majority of research on these constructs has focused on their contribution to intelligent behavior and, in the case of need for cognition and mindfulness, their stability over time and task rather than their learnability, there is nonetheless a strong belief that patterns of thinking and behaving are in fact learned over time as a consequence of a developing sense of self-confidence within a positively reinforcing environment. In the case of an incremental view of intelligence, findings indicate that a positively reinforcing environment that includes a focus on learning goals and support for risk taking can enhance an incremental attitude.

A Dispositional View of Intelligence

As the preceding review has indicated, various dispositional constructs have been advanced by investigators as a way of broadening abilities-centric accounts of intelligent behavior—particularly of intelligent behavior “in the wild” rather than in test-like situations. Although virtually all the experiments reviewed here used test-like situations to investigate intelligent behavior, their designs attempt to simulate, in various ways, dispositional aspects of “in the wild” conditions typically left out of traditional intelligence-testing settings. The arguments based on these investigations are persuasive and have intuitive appeal in addition to empirical support. However, the viability of a dispositional approach depends in good part on answers to the five questions introduced at the outset of our review.

1. What kinds of thinking dispositions are there? Here the field offers an embarrassment of riches. Several investigators have presented different taxonomies of key thinking dispositions, while others have foregrounded single overarching dispositions such as mindfulness (Langer, 1989), or need for cognition (Cacioppo & Petty, 1982). However, the diversity is not as chaotic as it seems. Virtually all of the proposals reflect a small set of thinking values entrenched in Western society: skepticism, concern with evidence, creativity, open-mindedness, and so on. The more monolithic dispositions typically bundle several of these into one package.

That acknowledged, exactly which is the *right* set of dispositions or overarching single disposition? Current research offers no good answer to this question. Comparative conceptual analyses of alternative frameworks are rare in the literature (but see Ritchhart, 1997), and there are relatively few studies of correlations between measures of dispositions from the work of different investigators reviewed. Some studies have included conceptually distinct dispositions that collapsed into a single factor upon confirmatory factor analysis, whereas in other studies conceptually distinct dispositions have been sustained by confirmatory factor analysis. However, such confusing results aside, it is far from clear that a factor analytic approach is appropriate for deciding the matter. Dispositions may well be noisy social-cultural constructs rather than corresponding to distinct cognitive processes.

2. Are thinking dispositions mental attributes stable across tasks and time?

The present review mentions test-retest examinations on measures of four dispositional constructs. The authors' own research found correlations of the order of .81 and .72 for detection and discrimination scores respectively of ninth graders in a dispositional task. Our correlations for 5th graders were somewhat lower, .61 and .68, suggesting that dispositions may be more in flux for younger students. The Faciones claim test-retest reliability for their test of thinking dispositions, although correlations are not given. Studies of need for cognition have yielded test-retest reliabilities in the neighborhood of .88 (Sadowski & Galgoz, 1992). Finally, need for closure has also been shown to be a stable trait (Webster & Kruglanski, 1994). As to stability across tasks, most investigations have only involved single sets of criterial tasks. However, findings pertinent to question 3 below argue that some stability across tasks would be expected.

3. How much do dispositions contribute to intellectual behavior? This question has motivated most of the research reviewed. Studies have demonstrated over and over again that dispositional measures account for additional variance in intellectual performance beyond that explained by ability measures such as IQ or SAT scores, or, equivalently, show correlations with intellectual performance holding ability measures constant. Characteristically such effects emerge when subjects either have to detect occasions that invite thinking or have a fairly open choice as to how to invest their intellectual abilities. For an example of the first kind, our own research disclosed that students asked to examine critically stories with imbedded arguments missed most of the weak points, although when these were indicated without explanation the students usually were able to explain them. For an example of the second kind, incremental learners show increased effort and elaborated exploration of situations resulting in superior cognitive performance (Bandura & Schunk, 1981; Elliott & Dweck, 1985; Farrell & Dweck, 1985; as cited in Dweck, 1986).

4. How do dispositions relate to abilities? Besides examining dispositions' contribution to intellectual performance, investigators have studied direct correlations between measures of dispositions and abilities. In trend, measures of dispositions show a zero to low correlation with ability measures such as IQ and SAT scores. Correlations with ability measures are generally considerably lower than those found between the subtests of instruments measuring intellectual aptitude (see Brody, 1992). Also, a positive relationship between dispositions and intelligence may not be linear, which measures of correlation assume. It's reasonable to propose that at the lower end of psychometric intelligence the dispositional range is rather narrow, with a generally higher level of dispositions and a greater range as intelligence increases. This would produce a somewhat curvilinear pattern.

5. Can thinking dispositions be learned? A positive answer here is not necessary to defend dispositional constructs, but the question has great importance for education. It is plausible that dispositions are learnable, much as attitudes of various kinds seem to be acquired from family, ethnic, and classroom cultures. While there are a number of demonstrations that instruction can improve thinking and learning performance (see the reviews in Nickerson, Perkins & Smith, 1985; Perkins, 1995), very little evidence bears specifically on the learning of thinking dispositions. Most studies of thinking-oriented interventions use ability-oriented measures, and even when the testing involves ill-defined tasks, there is generally no effort to discriminate impact on dispositions versus abilities. In the present review, only two results of limited scope can be identified. Langer has performed experiments that involve "mindfulness training" and produce enhanced mindfulness, but only performance in the specific context is assessed (see for example Langer, Bashner, and Chanowitz, 1985). Second, research has demonstrated that an environment which encourages risk taking and foregrounds learning goals can cultivate an incremental attitude toward learning (Smiley & Dweck, 1994).

In summary, it should come as no surprise that this emerging perspective on intelligence "in the wild" offers much more information on certain of the five questions than others. Nonetheless, the pattern of answers is distinctly positive. It seems fair to conclude that a dispositional view of intelligence is a highly promising line of inquiry.

Conclusion

Although the term "thinking dispositions" is not widely used, the notion that intelligent behavior involves more than ability is hardly new. The roles of motivation, attitudes, values, sensitivities and beliefs in human intellectual functioning are of concern to many psychologists, and indeed to many theorists and researchers beyond the field of psychology. This article has mainly reviewed experimental studies specifically aimed toward revealing dispositional components of intelligent behavior. We would argue that another equally important line of research involves making connections and theoretical syntheses between a dispositional view of intelligence as reviewed here and other bodies of research and theory, both in the field of psychology and beyond.

For example, there is a great deal of research in the area of self-regulated learning (SRL) that bears on a dispositional conception of intelligence. SRL research focuses on how learners manage their behaviors in order to optimize intellectual performance. Although the SRL perspective is far from unified, it is fair to say that what it shares with a dispositional perspective on intelligence is an interest in better understanding the

learning behaviors that effective learners tend to use *on their own*, beyond artificial test situations. SRL research concerning concepts of self-efficacy and intelligence, intrinsic motivation and volitional styles, metacognitive strategies, and so on, all have important links to the perspective under review in this article (see for example the edited volumes of Zimmerman & Schunk, (1989), and Schunk & Zimmerman (1994)).

As mentioned earlier, much of the work on dispositions concerns the gap between descriptive and normative conceptions of intellectual functioning. This gap, between how people actually think and how they—or others—believe is the best way to think, was highlighted in the early work on heuristics and biases (e.g., Kahneman, Slovic, & Tversky, 1982). Although this literature tended to characterize this gap as caused by errors in reasoning, the “errors” it charts invite scrutiny from a dispositional perspective on intelligence—scrutiny that will likely both refine and challenge the explanatory work a dispositional perspective can do.

Looking a bit farther afield, connections can be made to theory and research on the roles of emotion in rationality and intelligence. The potential connections are complex and myriad, because emotions play many different roles in dispositional behavior. For example, they contribute to intellectual self-regulation and self-management, they play a role in triggering inclination and sustaining volition, and they play a role in choosing among intellectual goals and in determining degree of commitment to a course of action. These and related functions have been explored by researchers from fields ranging from neurophysiology to moral philosophy, and the potential for crafting generative connections between these literatures and a dispositional perspective on intelligence is great (for example, see Damasio, 1994; Goleman, 1995; Peters, 1974; Scheffler, 1977).

Besides these connections to theoretical inquiry and empirical research, there is also a notable connection to pedagogy. Scholars and educational practitioners have long viewed education as concerned with the cultivation of attitudes as much as abilities (Costa, 1991; Dewey, 1916; Scheffler, 1977). There is still a great deal to learn about how to teach thinking dispositions. However, as suggested in some of the studies reviewed in this article, environmental and cultural influences seem to play a key role, and indeed we have written on enculturation as an approach to cultivating dispositions specifically (Tishman Jay, & Perkins, 1993; Tishman Perkins & Jay, 1995).

These are just a few connections. There are many more, and we look forward to future inquiries that explore these and other connections with the depth they deserve. But the purpose of this article is narrower in scope: It is to make a claim for the viability of a dispositional perspective on intelligence by reviewing selected empirical research that we believe comprises an emergent and generative field of inquiry in its own right.

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