BRIDGING COGNITION AND PERSONALITY
IN EDUCATION: THE ROLE OF STYLE IN
PERFORMANCE AND DEVELOPMENT

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ABSTRACT

In an attempt to illuminate the interrelatedness of noncognitive and
cognitive domains — or, more pointedly, of affection, conation, and cognition
— emphasis was placed on variables that not only operate across these domains
but are also potentially integrative. Prominent among such variables are
personal styles, particularly cognitive styles. The properties and problems
of cognitive styles are examined, with special emphasis on field independence
versus field sensitivity and on two stylistic dimensions of attentional
scanning. The role of cognitive styles as both competence variables and
performance variables is addressed, along with the difficulty of disentangling
style from ability because of reciprocal determinism in their development.
The educational implications of cognitive styles are explored, especially as
they bear on the problem of the match between student characteristics and
educational experiences and on the value-laden nature of style-based
pedagogical decisions.
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The Role of Style in Performance and Development

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Although education has been mainly concerned over the years with developing  
the perceptive and cognitive functions of the human mind, it has also been  
sporadically responsive to nagging concerns about emotional and motivational  
bases of learning and behavior (Messick, 1988). Thus, in principle if not in  
practice, the purview of education encompasses the development of personality  
as well as of intellect. However, it has proven exceedingly difficult to  
articulate educationally relevant processes fostering both personality and  
intellect, primarily because these two overarching concepts are extremely  
complex as well as vague and amorphous.  

As an instance of this complexity, for different individuals (or for the  
same person at different times), different motives may underlie the same  
behavior and the same motive may be expressed in different behaviors. As  
another instance, personality attributes may function as outcome variables, as  
controlling variables, as organizing variables, and as moderator variables in  
educational settings (Messick, 1987). Outcome variables serving as legitimate  
objectives of education include positive feelings toward continuing learning,  
toward the self as a learner, and toward particular subject matters such as  
science, mathematics, or literature (Krathwohl, Bloom, & Masia, 1964). As  
controlling variables, personality factors may determine a person’s  
characteristic regulation and control of attention, impulse, thought, and  
behavior. That is, they may help to establish and regulate the direction,

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duration, intensity, range, and speed of cognitive functioning as well as its initiation, maintenance, disruption, and termination. As organizing variables, personality attributes may contribute to the selection, combination, sequencing, and mode of both substance and process. In regard to moderator variables, the choice of which cognitive processes are implicated in a particular intellectual performance and to what degree may be a function of the individual’s level of relevant personality traits or states, such as anxiety.

The cognitive processes themselves are considered to be part of intellect. But in light of the organizing, controlling, and moderating influences of personality, at the very least the interrelationships of these ostensibly distinct domains need to be addressed. Also considered part of intellect are structures of intellective abilities and organized bodies of knowledge, as well as metacognitive or executive functions for the allocation and deployment of these cognitive resources.

Given this level of complexity and overlap, we need to make some functional distinctions both within and across the domains of personality and intellect so we may delineate salient features and cross-cutting variables having educational import for human performance and development. We turn now to an exploration of such distinctions.

**Bridging Personality and Intellect**

A number of distinctions have been drawn in the psychological literature that are pertinent to differences between personality and intellect. We begin with some primitive contrasts and then address the issue of domain coverage to highlight what the simple contrasts may leave out.

**Cognitive versus Noncognitive Processes**

A basic distinction is often drawn between cognitive processes (identified with the realm of intellect) and noncognitive processes (identified with the realm of personality). However, the label "noncognitive" applied to such personality characteristics as attitudes and motives is an unfortunate misnomer because many personality traits usually involve important cognitive components. Indeed, several major theories of these variables in personality
and social psychology invoke such terms as cognitive dissonance (Festinger, 1957), cognitive balance (Heider, 1958), personal constructs (Kelly, 1955), and attributions (Kelley, 1973; Weiner, 1990).

Some putative noncognitive variables themselves appear to be at least as much cognitive as not: for example, interests, attitudes, values, and cognitive styles. Because of the information-processing requirements of task performance, including the task of self-description, this cognitive cast is even more prominent in the measurement of these so-called noncognitive variables than in their conception. Similarly, the so-called cognitive variables of intellective abilities, information-processing skills, and subject-matter knowledge frequently entail motivational, attentional, and affective aspects.

Hence, the distinction between cognitive and noncognitive processes is not categorical, but one of degree in the relative balance between intellective and other personality determinants of individual differences. Thus, this cognitive versus noncognitive contrast must be immediately qualified — with the insistence that the label "cognitive" does not imply only cognitive and that "noncognitive" does not imply the absence of cognition (Messick, 1979). Nevertheless, it seems clear that this simple contrast has been popularly embraced in the literature, probably because it highlights major distinctions worth noting and in spite of the fact that the resulting classifications are fuzzy or overlapping and in many instances misleading. As a corrective, what is needed to address bridges between personality and intellect in education are distinctions that are more differentiated within domains.

Distinct Structures of Individual Differences

Factor analyses performed separately in the personality and intellective domains yield differentiated structures permitting detailed comparisons of domain differences as well as similarities. The structures in both domains tend to be hierarchical, although they differ in the likely number of strata and in whether or not a single overarching dimension emerges at the pinnacle of the hierarchy.

The Big Five factors of personality. There has been contention over the years as to the number of key second-order factors subtending the personality sphere. Major rivals include the Big Three dimensions of extraversion,
neuroticism, and psychoticism championed by Eysenck (1970, 1981); the Big Five factors of extraversion, agreeableness, conscientiousness, neuroticism (or emotional stability), and openness to experience or culture delineated from lexically based analyses (Goldberg, 1990, 1992; John, 1990; Norman, 1963); and, eight second-order factors derived by Cattell (1973) from the 16PF Questionnaire and other sources.

Although there has been a recent groundswell of enthusiasm for the salience and ubiquity of the Big Five, the sufficiency of this formulation has also been roundly criticized on a number of grounds. To begin with, critics feel that it is unlikely that the rich panoply of personality characteristics could be fully spanned by only five dimensions. This criticism may become muted by the groundbreaking work of Hofstee, De Raad, and Goldberg (1992), wherein manifold personality characteristics are subtended by the ten circumplexes generated by the two-way combinations of the Big Five factors.

The Big Five structure has also been criticized on grounds that, apart from extraversion and neuroticism, the factors lack theoretical, experimental, or biological underpinnings (Eysenck, 1990, 1991, 1992). Furthermore, the representativeness and psychometric soundness of Big Five factor analyses have also been questioned in terms of insufficient sample sizes, inadequate sampling of variables, and unsatisfactory simple structures (Boyle, Stankov, & Cattell, 1995). Moreover, the predictiveness of the Big Five variables for real-life criteria has not matched that of more extensive predictor batteries (Hough, 1992; Mershon & Gorsuch, 1988). This predictive shortfall may reflect, in part, the fact that first-order factors subsumed by the Big Five also entail valid variance not captured by the higher-order factors. Both broad and narrow factors are needed to predict performance, a point made more clearly and forcefully with respect to the roles of broad and narrow abilities in predicting intellectual task performance (Gustafsson, 1989). Finally, and most profoundly, the psychological basis of the Big Five enterprise has been challenged on a number of fronts, not the least of which is the unlikelihood that lexical analysis can substitute for clinical acumen in delineating fundamental psychological dimensions (Block, 1995).

Nonetheless, the momentum built up for the Big Five structure may ultimately prove acceptable on practical grounds. As Hofstee (1994) put it:
There are over 115 chemical elements, and more are still being discovered; what makes us think that we could do with five? . . . The only sensible argument is parsimony. A lot of nature can be caught with a few elements, like oxygen, nitrogen, hydrogen, and carbon. Personality factors likewise obey the law of diminishing returns. (pp. 335-336)

Thus, if the appeal of the Big Five is their ubiquity and salience, not their comprehensiveness or completeness, a critical question is what important aspects of personality functioning do they leave out? We will return to this question after a brief examination of the structure of the intellective domain.

The three-stratum structure of intellect. Factor analyses of intellective tasks have yielded a continuing contention between conceptions favoring only one or a few major dimensions of intelligence and those favoring multiple dimensions. Early in the century, Spearman (1923, 1927) championed a single energizing dimension of transferable reasoning skills, labeled \( g \), and later tolerated four or so additional group factors. A subsequent distinction between fluid \( (g_f) \) and crystallized \( (g_c) \) types of \( g \) has been central to theories of intelligence from Cattell (1963) to Sternberg (1985). Proponents of multiple dimensions range from Thurstone’s (1938) emphasis on seven primary mental abilities to Guilford’s (1985) preference for 150 factors.

Apart from Howard Gardner’s (1983) insistence on seven separate and independent intelligences, there is a growing consensus that multiple abilities are organized in a three-stratum hierarchy with \( g \) at the apex (Carroll, 1993; Messick, 1992). The major issue is the number and nature of the second-stratum factors. Cattell (1971) emphasized seven higher-order dimensions of \( g_f, g_c, \) general visualization \( (g_v) \), memory \( (g_m) \), fluency of retrieval \( (g_r) \), cognitive speed \( (g_s) \), and ideational flexibility or dissolvent thinking \( (g_d) \), the tendency to undo past cognitive structures). A general auditory factor \( (g_a) \) was isolated later (Horn & Stankov, 1982; Stankov & Horn, 1980).

In his monumental reanalysis of hundreds of factor studies, Carroll (1993) placed the three-stratum theory of intelligence on solid empirical footing, confirming all of the Cattellian second-stratum dimensions except flexibility (which in Carroll’s analyses merged with the idea production of \( g_I \) in a
second-stratum factor that he called "Broad Retrieval Ability") and adding a factor for processing speed. Carroll's (1993) empirical hierarchy, unlike Cattell's (1971) triadic theory, is capped by a single third-stratum $g$ factor. Carroll (1993) finds evidence for a third-stratum $g$ distinct from $g_f$, but a number of other persuasive studies suggest that $g_f$ rises in the hierarchy to coalesce with $g$ (Gustafsson, 1988, 1989).

Although the three-stratum conception of intellect, being based on reanalysis of over 400 factor studies, is comprehensive and empirically compelling, it is clear that important aspects of intellect are left out—namely, organized bodies of subject-matter knowledge and experiential learning underlying thinking and problem solving in academic and everyday contexts. This omission broaches the need for another way of cutting through the intellectual and personality realms to clarify what important aspects of human functioning the three-stratum intellectual hierarchy and the Big Five personality factors may leave out or obscure. One such approach has ancient roots, a checkered past, and surprising durability in the history of western thought.

A Tripartite View of Mental Life

One way to evaluate the sufficiency of the three-stratum theory of intellect and the Big Five factors of personality is to inquire whether methods other than factor analysis yield clinical, experimental, or biological evidence supporting similar distinctions or instead suggest fundamentally different concepts (Block, 1995; Snow, 1995). Such an approach was undertaken in detail by Burt (1949) and by Howard Gardner (1983), the former to buttress a multi-stratum hierarchy of mind and the latter to support independent mental modules (Messick, 1992). A more primitive, but nonetheless revealing, approach to domain coverage recalls a classical distinction that still has to be comprehended in modern psychological taxonomies.

The Aristotelian image of the psyche was divided into three parts: affection, conation, and cognition. Hilgard (1980) dubbed these three the "trilogy of mind," which suggests three entities that are in some sense complete in themselves yet are closely related and reveal common themes. A better term might be the "trinity of mind," which suggests the union of three aspects in one personality.
In a recent, more articulated revival of this tripartite conception, the three Aristotelian categories were each further split into two (Snow, Corno, & Jackson, 1996). Thus, affection was divided into emotion and temperament, conation into motivation and volition, and cognition into declarative knowledge and procedural skills. This partitioning yields a fairly comprehensive six-column array that was not derived from factor analysis but upon which factor structures may be superimposed. For example, the three-stratum hierarchy of abilities further articulates the column for procedural skills, adding detailed ability dimensions of comprehension, reasoning, visualization, audition, memory, fluency, mental speed, and judgment.

However, the separate column for declarative knowledge makes it clear that the three-stratum hierarchy gives short shrift to organized bodies of knowledge that are also a basic part of intellect. Furthermore, perhaps an additional column between volition and declarative knowledge would be useful to highlight metacognitive processes, which overlap with the self-regulatory functions of volition as applied in cognition (Kuhl & Kraska, 1989), while mobilizing and deploying ability and knowledge resources. This additional column would emphasize the point that planning, monitoring, evaluative, and executive functions entail aspects not only of declarative knowledge and procedural skills but also of volition, thereby affording them a metacognitive character distinct from other aspects subsumed by the original columns for either volition or cognition.

Similarly, an additional column between temperament and motivation might prove useful to encompass the dimensions of character, that is, those personal attributes underlying consistent reactions in relation to mores and moral issues. Although the impact of social values on behavior may be viewed in basically motivational terms and sometimes as reflections of temperament, the domain of character (and of character disorders) has a sufficiently rich history and identity to warrant separate treatment. The Big Five personality factors fall partly under temperament (extraversion and neuroticism) and partly under character (agreeableness and conscientiousness), with the fifth factor (openness to experience) "sneaking across the border between personality and intelligence" (Hofstee, 1994, p. 337).

Speaking of borders between personality and intelligence, one view is that intellect includes procedural skills, declarative knowledge, metacognitive
processes, and volition while personality encompasses emotion, temperament, character, and motivation. This view is basically differential in its outlook, emphasizing structures of individual differences in each domain. Important as this is to the study of personality, there is a complementary view that is more integrative, that claims personality as the overarching concept subsuming all of the subsystems of affection, conation, and cognition (Pervin, 1990).

In this all-encompassing view, the major concern is not just the characterization of functional subsystems but how they relate to each other and ultimately become organized into a functioning whole (Tomkins, 1981). In earlier writings, I maintained that "understanding this integration is the central issue for personality theory and research. Indeed, it almost constitutes a definition of what is meant by personality – that is, personality is the integration of differentiated psychological subsystems as distinctly manifested in each individual" (Messick, 1987, p. 36). The fundamental feature of this systems view of personality is not the semiautonomous functioning of the subsystems, important as this is, but rather their dynamic interplay leading to a kind of reciprocal determinism – to mutual feedback and influence in the developmental emergence and conjoint functioning of affective, conative, and cognitive processes and traits.

From this systems purview, our concern is not just with variables that bridge affection, conation, and cognition but also with variables that are potentially integrative, because their educational import may be far-reaching. One such type of cross-cutting variable, identified as promising in this regard in both taxonomic efforts (Snow, et al., 1996) and research surveys (Messick, 1984, 1994b; Shipman & Shipman, 1985), is personal style, especially cognitive style. We turn now to an examination of cognitive styles as cross-cutting and integrative variables in intellect and personality and to their potential roles in educational practice.

Stylistic Dimensions of Personality

The concept of style refers to stable individual differences in the manner or form of psychological functioning as distinct from substantive content or the level of functioning. Because personal styles are consistencies in the
way psychological substance is processed rather than to consistencies in the substance itself, they may entail mechanisms for the organization and control of processes that cut across substantive areas (Messick, 1987). To the extent that personal styles display generality in the organization and control of attention, thought, feelings, and motives, they constitute important variables for our purposes because they bridge cognitive, conative, and affective modes of functioning. Being self-consistent regularities in the manner or form of human activity implies that to some extent styles are both integrative and pervasive.

Several kinds of styles have been distinguished empirically, including expressive styles, response styles, cognitive styles, learning styles, and defensive styles (Messick, 1994b). Because of the potential range of their implications for education, the remainder of our discussion highlights cognitive styles; the straightforward but more focussed educational implications of learning styles are summarized elsewhere (Messick, 1994a).

**Varieties of Cognitive Style**

Cognitive styles are usually conceptualized as characteristic modes of perception, memory, thought, and judgment reflective of information-processing regularities that develop in congenial ways around underlying personality trends (Messick, 1984). They are inferred from consistent individual differences in ways of organizing and processing information and experience. They appear to serve as higher-order heuristics that organize more specific strategies, propensities, and abilities into functional patterns characteristic of the individual.

More specifically, cognitive styles are best delineated in contrast with abilities (Messick, 1984). Abilities are enabling variables or competencies; cognitive styles are performance variables or propensities. Abilities are concerned with how much, cognitive styles with how. Unlike abilities, which are unipolar and value directional, cognitive styles are bipolar and value differentiated. That is, high amounts of ability are always preferable to low amounts and are uniformly more adaptive, while each pole of a style dimension has different adaptive implications. Moreover, an ability is usually limited to a particular domain of content or function, such as verbal or memory ability, whereas a cognitive style cuts across domains of ability,
personality, and interpersonal behavior. Finally, cognitive styles are both organizing and controlling variables, serving both to organize cognitive resources and to regulate cognitive processing in adaptation to environmental demands. This is in contrast to other stylistic variables called cognitive controls, which are primarily regulative in nature and are often also unipolar and value directional, mimicking abilities in these regards (Messick, 1984). An example of the latter is constricted as opposed to flexible control or the degree of an individual’s susceptibility to distraction and cognitive interference. A number of cognitive styles have been identified empirically, several of which, pertinent to our discussion, are briefly characterized in Table 1.

**TABLE 1**

**Dimensions of Cognitive Style**

**Categorizing Styles** have taken two forms, one involving category-width preferences and the other conceptual differentiation:

Category-width preferences, also referred to as “breadth of categorization” and “equivalence range,” entail consistent preferences for broad inclusiveness as opposed to narrow exclusiveness in establishing the acceptable range for specified categories (Fillenbaum, 1959; Pettigrew, 1958). The narrow categorizer is thought to be conceptually conservative, preferring or tolerating errors of exclusion; whereas the broad categorizer is thought to be more tolerant of deviant instances and errors of inclusion (Bruner & Tajfel, 1961; Wallach & Caron, 1959).

Conceptual differentiation entails the tendency to categorize perceived similarities and differences among stimuli in terms of multiple differentiated concepts or dimensions, as in generating many categories in free object-sorting tasks (R. W. Gardner & Schoen, 1962). It is distinct from category-width preferences, in that conceptual differentiation refers to the relative multiplicity of distinctions a person makes among concepts, whereas category width refers to the perceived or preferred extent of a single concept’s range of reference.

**Conceptualizing Styles** are differential tendencies to form concepts in terms of thematic or functional relations among stimuli as opposed to analysis of descriptive attributes or the inference of class membership. The emergence of these three conceptual modes is developmentally ordered in the sequence just given, but they remain as alternatives in the individual’s cognitive repertoire and are differentially expressed as preferred conceptual styles (Kagan, Moss, & Sigel, 1963; Kogan, 1976; Wallach & Kogan, 1965).

**Cognitive Complexity versus Simplicity** refers to individual differences in the tendency to construe the world, particularly the world of social behavior, in a multidimensional and discriminating way. A complex individual’s conceptual system is highly differentiated (consisting of a large number of distinct dimensions or concepts), finely articulated (each dimension capable of discriminating the strength or magnitude of varied instances or stimuli), and flexibly integrated (the dimensions being multiply interrelated and amenable to the formation of alternative perspectives or configurations) (Harvey, Hunt, & Schroder, 1961; Messick & Kogan, 1966; Miller, 1978). Cognitively simple individuals, being primed for consistencies and regularities in the environment, are more confident and discerning in processing consonant information; whereas cognitively complex individuals, being attuned to diversity, are more certain and effective in processing dissonant information (Bieri, Atkins, Briar, Leaman, Miller, & Tripodi, 1966).
TABLE 1 (cont’d)

There is also evidence that, under some circumstances, cognitive simplicity contributes to decisiveness of judgment and complexity to indecisiveness (Schroder, Driver, & Streufert, 1967).

Converging versus Diverging represents the degree of an individual’s relative reliance on convergent thinking (pointed toward logical conclusions and uniquely correct or conventionally best outcomes) as contrasted with divergent thinking (pointed toward variety and quantity of relevant output). The two poles of this dimension have also been viewed as reflecting rival systems of defenses related to a science versus arts bias (Hudson, 1966, 1968).

Field independence versus Field Dependence refers to a consistent mode of approaching the environment in analytical as opposed to holistic terms, which is reflective of restructuring skill versus responsiveness to Gestalt field-effects (Messick, 1994b; Pascaual-Leone, 1989; Witkin & Goodenough, 1981). The field-independent person is characterized as analytical, self-referent, and impersonal in orientation and the field-dependent person as global, socially sensitive, and interpersonal in orientation (Witkin, 1978).

Leveling versus Sharpening entails a tendency to minimize as opposed to exaggerate stimulus differences in memory. Levelers tend to blur similar memories and to merge perceived objects or events with similar but not identical events recalled from previous experience; differences between remembered objects tend to be lost or attenuated. In contrast, sharpeners are less prone to confuse similar objects and may even magnify small differences between similar memory traces, thereby exaggerating change and heightening the differences between the present and the past (Holzman, 1954; Holzman & Gardner, 1959, 1960; Holzman & Rousey, 1971; Israel, 1969).

Reflection versus Impulsivity refers to individual consistencies in the speed and accuracy with which alternative hypotheses are formulated and information processed under conditions of uncertainty. Impulsive individuals tend to respond quickly with the first seemingly reasonable answer, whereas reflective individuals tend to evaluate various possibilities before deciding (Block, Block, & Harrington, 1974; Kagan, Rosman, Day, Albert, & Phillips, 1964; Salkind & Wright, 1977). One view of this style holds that reflective individuals tend to analyze stimuli into component features, whereas impulsives treat the stimulus as a whole (Zelniker & Jeffrey, 1976, 1979). Another view maintains that impulsives are not only holistic but also less strategically oriented and less resource intensive in using their cognitive repertoire in information processing (Kemler Nelson & Smith, 1989).


- **Sharp-focus versus broad-focus scanning** contrasts a narrow, illuminative attentional beam with a broad-bandwidth beam that may involve either attenuated or integrative information processing.

- **Signal versus information scanning** contrasts serial and selective perusal for signal detection with parallel-processing of targeted and incidental information.

These two scanning styles are operative in memory as well as perception and are differentially related to personality (Messick, 1989, 1996).

Although theoretically appealing as manifestations of personality in cognition, the measurement and research base of cognitive styles has been inconsistent and spotty (Messick, 1994b). According to Lohman and Rocklin (1995),
Surely part of the difficulty is that styles are, by definition, situationally labile in a way that abilities are not. But a larger difficulty stems from the application of an inappropriate measurement model. . . . Most measures of cognitive styles have inappropriately followed the ability-factor model, which is better suited to value directional questions about unipolar dimensions. . . . Isolated from the mainstream of differential psychology, promising style constructs were gradually grounded into traits already known to ability theorists, but by other names. When the redundancy was finally discovered, ability theorists claimed priority, and style theorists were left with the residue. (p. 464)

Hence, most of the controversy in the cognitive style literature is traceable to perceptions of inappropriate or inadequate measurement, sometimes cogent but often unfounded, as well as to inappropriate or incomplete analysis (Messick, 1994b). For example, repeated attempts were made to tap certain styles, especially field independence versus field dependence, by means of maximum performance tasks more appropriate to the measurement of abilities. Worse still, only a single measure of one stylistic pole was included in many studies as opposed to measures of both poles or to difference scores contrasting the two poles. Thus many studies of field independence included only the Embedded Figures Test (which taps the restructuring pole) or else the Rod-and-Frame Test (which taps the opposing pole of responsiveness to Gestalt field effects) rather than including difference scores contrasting restructuring skill with field sensitivity (Messick, 1994b).

Furthermore, many factor analyses included measures of only one stylistic pole, which makes it difficult to separate ability from style in interpreting the resulting truncated factors. Moreover, even when multiple measures of both poles were included, factor analyses usually stopped with the identification of the two unipolar factors (which were typically negatively correlated) rather than undertaking hierarchical analyses in which bipolar cognitive style factors could emerge at the second-order level (Messick, 1989).

To elaborate, optimal measurement of ability is in terms of maximal performance, assessing how well individuals can perform at their best, with the emphasis on accuracy and correctness of response. Optimal measurement of style is in terms of either typical or contrasted performance, with the emphasis on either customary or predominant processing mode. Inherent in the
concept of typical performance is the notion that what an individual customarily does when the ability to do otherwise can be demonstrated or presumed is a natural indicator of personal style. For example, because individuals presumably have the ability to use either broad or narrow categories in making perceptual judgments, the consistent tendency to utilize one or the other is interpreted in stylistic terms. A number of the style dimensions summarized in Table 1 aspire to assessment of typical performance. Moreover, for some styles the issue, as in much measurement in cognitive psychology (Lohman & Ippel, 1993), is not so much a quantitative score as a qualitative one that classifies responses as exemplifying a particular pattern or process, as is the case in the measurement of the conceptualizing styles in Table 1.

Inherent in the concept of contrasted measurement is the notion that stylistic propensities may be inferred from asymmetries in performance on measures of the two poles of a style dimension, even if the measures are of the maximal performance variety (Messick, 1994b). Such asymmetries in performance yield an ipsative or intraindividual pattern indicating the relative strength of one tendency or ability vis-à-vis another in the individual’s cognitive repertoire. Indeed, this type of intraindividual contrast was earlier proposed by Broverman (1960a, 1960b) as a fundamental approach to measuring cognitive styles. This ipsative or contrasted-measurement approach suggests that a cognitive style represents a relative balance in the alternative means by which an individual processes information and organizes experience, not the presence of one means and the absence of the other (Brodzinsky, 1985; Hudson, 1966, 1968). This notion of relative balance implies that individuals in the middle of the style distribution have both tendencies in their repertoire to varying degrees and may thus be relatively mobile in expressing opposite stylistic tendencies under different circumstances; only those at the extremes of the bipolar continuum would be relatively fixed in their cognitive style.

Ipsative or contrasted measures may be constructed in a variety of ways — for example, by pitting one ability against another, as in convergent versus divergent thinking (Hudson, 1966, 1968); pitting one cognitive control against another, as in relational versus analytical conceptualizing (Wallach & Kogan, 1965); contrasting a cognitive control with an ability, as in
compartmentalization versus spontaneous flexibility (Messick & Kogan, 1963); or, pitting one stylistic component against another, such as emphasis on accuracy as opposed to speed in assessing reflection versus impulsivity (Salkind & Wright, 1977). The pitting of one ability against another as an indicator of cognitive style merits further comment. Specifically, the intraindividual pattern of relative strengths and weaknesses in ability may serve as an indicator of style because the ability pattern itself may be the residue of earlier strategic choices (Wachtel, 1972).

This rationale is essentially similar to that underlying the clinical interpretation of WAIS subscore profiles in personality terms (Rapaport, Gill, & Schafer, 1945). In the course of development, ipsative ability differences eventuate as the individual repeatedly invests in particular skills (such as verbal as opposed to spatial, or vice-à-versa) in the service of preferred adaptive strategies, which become ingrained stylistically. This stance is consistent, for example, with Broverman’s (1960a) finding that relative proficiency in verbal skills as well as relative proficiency in spatial ability was predictable from cognitive styles. The individual may also actively downplay certain skills for defensive purposes, as in the hysterical’s impaired memory as a defense against disturbing ideas (Shapiro, 1965).

From this perspective, by virtue of mutual feedback and a kind of reciprocal determinism, ability and style become intertwined developmentally (Bandura, 1986; Gardner, Jackson, & Messick, 1960). One consequence of this dynamic interplay underlying varying directions of development is that the meaning of a cognitive style (or ability) in personality terms is moderated by the style’s relative position within the individual’s profile of invested cognitive resources. By emphasizing the individual’s pattern of stylistic dimensions as a kind of personality signature, as opposed to focussing separately on isolated dimensions such as scanning or leveling, Klein (1958) anticipated this ipsative perspective on cognitive style, maintaining that a person’s overall stylistic makeup should be taken into account in interpreting a style’s meaning and import.

We turn now to a more detailed examination of two cognitive styles having implications for educational practice, styles for which there are either a considerable body of research based on contrasted measurement (although also in the midst of confounded research based on measures of only one stylistic
pole) or else hierarchical factor analyses revealing bipolar stylistic dimensions at a higher-order. These are the styles involved in field independence and in attentional scanning.

**Restructuring Skill versus Sensitivity to Field Effects**

Field independence refers to a consistent mode of approaching the environment in analytical terms: a tendency to articulate figures as discrete from their backgrounds and a facility for differentiating objects from embedding contexts. This decontextualizing skill—or, more generally, restructuring skill—is indexed by the Embedded Figures Test, in which the respondent must locate simple figures embedded in complex designs. Field dependence refers to a countertendency of strong responsiveness to Gestalt field effects, yielding a propensity for experiencing events holistically in terms of their dominant structure (Witkin & Goodenough, 1981). This field sensitivity is indexed by the Rod-and-Frame Test, in which a luminous rod surrounded by a luminous tilted frame is to be set to the true vertical in an otherwise darkened room. The cognitive style of field independence versus field dependence is tapped by contrasted measures pitting restructuring skill against field sensitivity (Messick, 1994b).

Major correlates of this cognitive style span intellecutive tasks such as block design and picture arrangement from the Wechsler intelligence scales as well as such personal/social attributes as articulated body concept and self-concept, self-reference versus interpersonal orientation, and type of dominant defense mechanism and pathological symptom (Witkin, 1965; Witkin, Dyk, Faterson, Goodenough, & Karp, 1962). The field-independent person came to be characterized as analytical, self-referent, and impersonal in orientation and the field-dependent person as global, socially sensitive, and interpersonal in orientation (Witkin, 1978).

The essence of this complex of stylistic attributes was ultimately summarized in terms of autonomy as opposed to reliance on external information sources (Witkin & Goodenough, 1981). Field independence versus field dependence was then interpreted as a bipolar dimension of cognitive restructuring skill versus interpersonal competency, the former associated with greater autonomy and the latter with greater reliance on external referents. Because each of these stylistic poles now has positive features
under different circumstances, the dimension was viewed as value neutral or, rather, as value differentiated as opposed to value directional.

However, the presumed interpersonal competence of field-dependent persons appears to be an unsubstantiated extrapolation from their documented interpersonal orientation. Although there is ample evidence that field-dependent persons are interpersonally oriented (Witkin & Goodenough, 1977, 1981), there is sparse evidence that they possess interpersonal skill, apart from a few studies showing their better incidental (but not directed) memory for faces (Messick & Damarin, 1964; Hoffman & Kagan, 1977) and their greater adeptness in conflict resolution (Oltman, Goodenough, Witkin, Freedman, & Friedman, 1975).

The most compelling evidence on this issue of interpersonal competence is embodied in the extensive longitudinal personality correlates of field independence versus field dependence reported by Kogan and Block (1991). In these data, there is no indication that the interpersonal orientation of field dependents yields effective interpersonal skill, or what Howard Gardner (1983) calls interpersonal intelligence. Furthermore, although not their most salient characteristics, field-independent persons do exhibit positive social qualities that are hardly suggestive of either indifference or ineptness in social affairs. Hence, this cognitive style should be conceptualized and measured not as restructuring skill contrasted with interpersonal skill but rather with field sensitivity (Messick, 1994b).

Among the manifold correlates of field independence versus field dependence are a number having important educational implications. For example, accuracy on the Rod-and-Frame Test has been interpreted in terms of the tendency to select a relevant strategy to overcome salient but irrelevant strategies triggered by compelling field effects (Linn & Kyllonen, 1981). Many of these research-based educational implications have been reviewed by Davis (1991), updating a prior summary by Witkin and his colleagues (Witkin, Moore, Goodenough, & Cox, 1977).

Overall, field-independent learners appear to be more efficient in the selection and implementation of executive strategies that coordinate information processes, especially those used in selectively attending to relevant cues, as well as in storing and retrieving information from memory. Field-dependent learners appear to be more responsive to salient cues, whether
relevant or irrelevant, and less strategic in orientation, even when appropriate strategies are available in their cognitive repertoires (Linn, 1978).

In Davis's (1991) summary, aptitude-treatment interaction studies, as usual, proved to be mixed: Some studies found no difference for cognitive style; some reported that field-independent students outperformed their field-dependent peers regardless of instructional treatment; and, some exhibited significant interactions, as when field-independent students achieved best with deductive instruction and field-dependent students achieved on a par with field independents in instruction based on examples. Furthermore, some evidence suggests that matching students and teachers in cognitive style can influence achievement, sometimes positively for field-dependent students but negatively for field-independent students and sometimes the reverse. It was also found that making teachers aware of the teaching and learning implications of the field-dependence dimension led to adaptations in teaching style attuned to student stylistic differences, which in turn created a more conducive classroom climate.

**Dual Dimensions of Scanning**

Individual consistencies in attentional processes in perception and memory underlie stylistic dimensions of attentional scanning at the first-order factor level; bipolar patterns of these dimensions yield higher-order factors of scanning cognitive style (Messick, 1989). In particular, two second-order bipolar factors have been identified that contrast sharp-focus versus broad-focus scanning and signal versus information scanning. These stylistic factors are operative in memory as well as perception and are differentially related to personality. Although these two second-order style dimensions appear to be comparable in the two sexes, the contributing first-order structures as well as some personality correlates are divergent, suggesting differential underlying dynamics as a function of gender.

To give some sense of the nature of these second-order scanning styles, we next briefly describe the kinds of tasks from which they were derived. In addition to marker tests for verbal and quantitative abilities, the battery included measures of perceptual speed and closure, breadth of categorizing, inkblot perception, and a variety of personality scales. Measures were
included for facility in detecting stimuli or stimulus classes both in
unorganized or randomly structured fields (such as locating four-letter words
in arrays of letters, or finding misspelled words or words containing the
letter "a" in long lists of words) as well as in organized fields (such as
finding a simple pattern embedded in a complex figure or locating faces
camouflaged in pictorial scenes). Many of the tests were scored not only for
the number of correct responses but also for the number of wrong and omitted
responses. Given that scanning propensities may be operative in memory
retrieval as well as in perceptual search -- that is, in the manner
in which internal fields of memory, meaning, and knowledge are surveyed --
measures were also included for remoteness of word association as well as for
fluency in ideational production of class instances (such as round things or
blue things).

A concerted effort was made to differentiate between two possible modes of
attention, namely, serial scanning for signal detection and parallel-process
scanning that apprehends incidental information in the field. This effort
used search tasks that required the respondent to find stimuli or signals
embedded in meaningfully organized visual fields -- for example, to locate
faces camouflaged in pictorial scenes. Upon completion of the search task,
the stimulus materials were removed, and the respondents were then asked
specific questions about the content of the pictorial scenes. Persons who
take in incidental information about the field in the process of scanning
could thus be differentiated from those whose attention is apparently limited
selectively to detecting the hidden signals. Measures such as the Stroop
Color-Word Test (MacLeod, 1991) were also included, wherein parallel-
processing of irrelevant stimuli interferes with task requirements and must be
actively inhibited for effective task performance.

Of the two bipolar scanning styles identified, one of them pitted signal
scanning for both unique targets (such as the letter "a") via perceptual
search and class instances (such as round things) via memory search against
information scanning at the opposite pole, which had loadings for measures of
incidental knowledge. This cognitive style of signal versus information
scanning, more fundamentally, appeared to be reflective of serial versus
parallel processing (Messick, 1996). It is reminiscent of the distinction
between successive and simultaneous cognitive processing studied by Das and
his colleagues (Das, Kirby, & Jarman, 1979; Das, Naglieri, & Kirby, 1994) and
of Luria's (1973) theory of brain functioning upon which those studies are
based.

The other bipolar scanning style is interpretable as sharp-focus versus
broad-focus scanning in both male and female samples. In males, the broad
bandwidth appears to involve attenuated processing because several wrong and
omit scores on closure tests load in this direction, as do measures of
rigidity and authoritarianism. One of the contributing first-order factors
loading in the broad-focus direction involves quick closure via broad
estimation, which is facilitative on tasks where approximations are adaptive
but in other instances also carries the maladaptive baggage of premature
closure. Hence, this cognitive style is better characterized for males as
sharp- versus loose-focus scanning or focussed versus unfocussed scanning
(Messick, 1989).

In contrast, the broad bandwidth pole in females appears more integrative:
It was negatively correlated with rigidity and authoritarianism and positively
correlated with self-sufficiency and measures of affective as opposed to
effective interests. These correlates suggest that this factor might be
better characterized for females by something like tight- versus open-focus
scanning. Another difference between males and females is that all but one
first-order factor for females cut across both perception and memory, whereas
for males separate factors emerged for scanning external perceptual fields and
internal memory fields, mediated by the isolation of affect (Messick, 1989).

Because these two scanning styles represent different propensities for
serial as opposed to parallel information processing and different modes of
searching external perceptual fields as well as internal fields of memory,
meaning, and knowledge, they have manifold implications for learning and
instruction. One of the most fundamental implications bears on the question
of whether cognitive styles are performance variables or competence variables,
or both, and on the possibility that style and competence become inextricably
intertwined in the course of development. We turn now to a brief discussion
of this issue because of its implications not only for the persistent
difficulty in disentangling measures of style and ability, but also for the
likelihood that style and ability might be effectively conjoined (or
confronted) in educational practice.
Style in Performance and Development

Before exploring the role of style in intellective performance and cognitive development, it must be emphasized that the points to be made are not limited to the styles of field independence and scanning, even though these two style areas have dominated the discussion thus far. Rather, the ramifications apply to a broad array of cognitive styles, such as those summarized in Table 1. Indeed, those styles were included in Table 1 because they are functionally related to different phases of an input-output sequence of information processing or problem solving (Kagan & Kogan, 1970; Messick, 1984), which serves to set the stage for our present discussion.

Specifically, broad- versus sharp-focus scanning and signal versus information scanning are implicated in information search; category width and conceptualizing styles in encoding; leveling versus sharpening in memory storage and retrieval; cognitive complexity versus simplicity in problem representation; field independence versus field dependence in problem structuring and restructuring; converging versus diverging in hypothesis generation; and, reflection versus impulsivity in strategy selection and decision making. But such association is by no means one-to-one, because some cognitive styles influence information processing sequences at several points. For example, as has been seen, intensity and extensiveness of scanning affects information search of both external stimulus fields and internal fields of memory, meaning, and knowledge.

Because cognitive styles reflect consistencies in the manner or form of cognition as distinct from the content or level of cognition, they have come to be viewed as performance variables rather than as competence variables (Globerson, 1989; Neimark, 1981). From this perspective, cognitive styles reflect not competence per se but, rather, the utilization of competence. That is, styles moderate access to competence as well as its strategic deployment in meeting task requirements (Neimark, 1985).

As a case in point, Neimark (1981) argues that low success rates of field-dependent persons on Piaget’s formal operational tasks, which by their nature are ambiguous and unstructured, do not reflect deficiencies in formal thinking but instead a performance artifact due to misleading field effects. Others who agree with the performance-artifact explanation emphasize differences in
strategy or cue selection as well as the propensity of field-dependents to underutilize their repertoire of executive planning resources (Globerson, 1989; Linn, 1978; de Ribaupierre & Pascual-Leone, 1979).

However, stylistic modes of conceptualizing, categorizing, attentional scanning, leveling or sharpening in memory, restructuring, and so forth influence the nature and quality of stimulus information available for thinking and problem solving, thereby affecting not just the manner but the material of cognition. These style-based differences in the substance of cognition shape the nature of ability and knowledge structures that an individual forms as well as their higher-order organization. Thus cognitive styles are both performance and competence variables combined: Styles influence not only the use of cognitive structures but also their development (Brodzinsky, 1985; Kogan, 1985; Messick, 1984, 1987). As a consequence, cognitive styles have potentially profound implications for learning and the structuring of knowledge.

Hence, cognitive styles, by influencing both the expression and the development of competence, pose both a problem and a challenge for the theory and measurement of personality and intellect. Cognitive styles pose a problem precisely because they bear on both performance and competence. As performance variables their contaminating effects, if any, must be taken into account in the measurement of abilities and educational achievement. An important issue is whether style differences are an irrelevant contaminant in ability measurement as opposed to representing an intrinsic aspect of the particular competence construct. However, disentangling the contributions of styles from abilities in performance is both difficult and daunting. This is so because their interplay occurs not only at the level of outcomes but also, as has been seen, at the level of process as well as of development.

As competence variables, the role of cognitive styles in the development and structuring of abilities and knowledge requires an intricate theoretical rationale relating intelligence and personality. Finally, as bridging variables across cognition, conation, and affection, styles offer a challenge because stylistic self-consistency may afford an integrative purview for addressing both the richness and the individuality of human personality and intellect.
Style and the Problem of the Match

As potentially integrative bridging variables across cognition, conation, and affection, one might expect cognitive styles to have profound implications for educational practice – for the better if taken into account and for the worse if ignored. For example, cognitive styles might provide a basis for tailoring instructional methods to student styles to optimize learning or, contrariwise, a basis for mismatching to stimulate flexibility in thinking. Enriching teacher awareness of cognitive styles might lead to increased flexibility in their own teaching styles and enhance understanding of student stylistic differences, leading to improved student-teacher communication. Enhancing student awareness of cognitive styles might expand their horizons about the range of alternative thinking strategies potentially available to them, leading to enriched and more powerful cognitive repertoires.

Furthermore, because cognitive styles are related to vocational preferences and to choice of major field as well as to choice of specialization and to relative performance within fields (Witkin, et al., 1977), knowledge of student cognitive styles should contribute to improved educational guidance and decision making. Capitalizing upon styles and coping with their habitual restrictiveness should become explicit goals of education, broadening the range of desired outcomes beyond knowledge acquisition to include the student's manner of thinking and flexibility of thought. As a final instance, because educational environments make stylistic demands as well as intellective demands (Chickering, 1976), by taking cognitive styles into account one might better tune stylistic environmental demands to student styles to optimize the conditions of learning (Messick, 1984; Witkin, et al., 1977).

Yet, the educational promise of cognitive styles has only been sporadically realized in practice, which requires some examination of possible reasons why. One reason is that cognitive style measurement is still haphazard and unstandardized. Sometimes different instruments are employed to assess ostensibly the same style when in fact they reflect distinctive styles, as in the confusion between measures of category-width preferences and conceptual differentiation. Sometimes only one measure is used to tap a bipolar style that requires contrasted measures of the two stylistic poles. An instance
previously discussed is the isolated use of the Embedded Figures Test to assess field independence versus field dependence, thereby obfuscating score interpretation by confounding restructuring ability with analytical style. Increased appreciation of the need for contrasted measurement of bipolar cognitive styles, as well as the measurement of typical performance, should greatly reduce this measurement turmoil, as should increased use of techniques from cognitive psychology for the qualitative assessment of process (Lohman & Ippel, 1993; Messick, 1994b). But even then, much style measurement will require subjective scoring by trained raters and often individual test administration that sometimes involves laboratory procedures. As is usually the case, complex and time-consuming measurement tends to slow down practical application.

However, a more fundamental reason is that the problem of the match between student stylistic characteristics and instructional methods or teaching styles or environmental demands has not yet been satisfactorily dealt with. A possible exception has to do with the cognitive level of the match, wherein the complexity of instructional demands is tuned to the student’s zone of proximal development (Vygotsky, 1978). Significant interactions showing improved learning for contrasted groups have been obtained when students were matched to instructional environments in terms of cognitive complexity (Hunt, 1975; Miller, 1981). More typically, on those occasions when matches were attempted, they were between types of student characteristics and aspects of instructional methods or materials or teachers or environments, but rarely matches with all of these in concert. Hence, many educationally relevant aspects of the conjoint match varied out of control, which led to inconsistent and unstable outcomes.

The basic issue, however, is not just that the problem of the match is technically intricate, but that it is profoundly value laden. The question of what should be matched is the problem of prescription; the question of how to match is a problem of educational technology; the questions of purpose and locus of choice are problems of social values and ethics. The already enormous problems of educational prescription, technology, and decision-making prerogatives become even more troublesome when cognitive styles are part of the mix. This is so because cognitive styles are conceived theoretically to be value differentiated and to embrace personal-social as well as cognitive
functioning. Hence, pedagogical value judgments bearing on styles, especially those entailing the selection of alternative prescriptions, may not only reflect relative priorities with respect to knowledge and skill acquisition, but also potentially absolute choices with respect to personal orientation and social interaction.

More specifically, the matching of instructional environments to student cognitive styles may not only enhance learning but also strengthen the style, while mismatching may not only lead to flexibility but to confusion and clashes of styles. To the degree that cognitive styles are bipolar — that is, have negatively correlated poles — then decisions to foster attributes in one direction could precipitate a lessening of attributes in the other direction. Thus, if efforts to enhance field independence, for example, might lead to an erosion of interpersonal orientation, then the making of pedagogical value judgments that strengthen or change cognitive styles comes close to a judging of social values (Ramirez & Castañeda, 1974).

One way out of this apparent dilemma — that pedagogical choices with respect to cognitive styles may represent social value choices — is to focus on superordinate educational goals, such as enhanced flexibility in using multiple thinking modes as a means of stimulating the positive features of each stylistic pole. For example, recognizing that the simultaneous integration of the strengths of two stylistic poles may be extraordinarily difficult if not impossible, Entwistle (1982) stressed the advantages of systematic alternation of complementary modes of thought, with the hope that this would increase flexibility of thinking and reduce the restrictiveness and preemptiveness of habitual thinking. As always, however, we must evaluate the potential dangers and trade-offs in such an enterprise, because efforts to foster multiple modes of cognition may hamper some students from soaring in the unfettered application of their predominant style (Messick, 1970, 1976a).

Another way out of the dilemma is to ensure that the students themselves, as the ethically ultimate arbiters of their own personal values, should be meaningfully involved in making critical educational choices or, at least, in learning how to make critical choices. Thus, in attempts to resolve the issue of where the locus of choice should ethically reside, the notion of self-matching to educational treatments — with appropriate guidance or supervision — emerges as a promising and ethical strategy, even in elementary education.
This strategy would, of course, require some special educational groundwork to facilitate the development of self-management skills, self-directed learning, and informed student choice, especially as the latter bears on the distinction between what students need and what they want (Glaser, 1973, 1977; Hunt, 1975; Messick, 1976b). Self-matching works best, of course, if students know what is good for them, which on available evidence is not often the case. What is critical, however, is that they be able to learn from experience and feedback to make better choices in support of their needs as well as desires.

In a sense, this notion of self-matching brings us full circle. The prospect of self-matching and student choice leads naturally to questions of the determinants of that choice. And as we have seen, prominent among the determinants of personal choice are cognitive styles. Hence, it would seem that increasing flexibility of style via self-matching to educational alternatives would be an iterative process at best, with progress being made, if at all, by successive approximations. These suggested resolutions of the dilemma of the match by no means exhaust the possibilities nor are they intended to be alternatives. Rather, they are viewed as constituents in multiple attacks on the problem of developing and using flexible modes of cognition, conation, and affection for the improvement of learning as well as of personal effectiveness and well-being.
References


International handbook of personality and intelligence (pp. xi-xv). New
York: Plenum.

differences in affective and conative functions. In D. C. Berliner & R.
Calfee (Eds.), Handbook of educational psychology (pp.). New York:
Macmillan.

Spearman, C. (1923). The nature of intelligence and the principles of
cognition. London: Macmillan, Ltd.


Stankov, L., & Horn, J. L. (1980). Human abilities revealed through auditory
tests. Journal of Educational Psychology, 72, 21-44.


Thurstone, L. L. (1938). Primary mental abilities. Psychometric Monographs,
No. 1.

Tomkins, S. S. (1981). The rise, fall and resurrection of the study of


Psychological Bulletin, 68, 417-429.

Wachtel, P. L. (1972). Field dependence and psychological differentiation:

conservatism as determinants of psychological similarity. Journal of
Abnormal and Social Psychology, 59, 43-50.


(Ed.), Handbook of personality: Theory and research (pp. 465-485). New
York: Guilford Press.


Worcester, MA: Clark University Press.


