Chapter 49

Thinking and Learning Styles

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Learning and thinking styles are important for several reasons. To educate highly able students, we want to know whether their style of work is distinctly different from that of others. Moreover, when we usher students in a particular domain, we want to know whether there is a particular style of work the learner has to adapt to. Finally, each individual might have a unique profile of styles and preferences that warrant consideration for instructional differentiation and optimal match. For these reasons, educators need to know the basics of what research says about thinking and learning styles.

What Do We Mean By Thinking/Learning Styles?

Style, in a broad sense, refers to a distinctive manner of behaving, conducting, or expressing oneself. To the extent that individuals habitually and consistently display certain ways of thinking or certain manners of mastery, we call these thinking or learning styles. Thinking and learning styles are often grouped together because the two concepts overlap with each other: efforts of learning involve thinking, and thinking often leads to new learning. Various styles can be classified based on different facets of cognitive functions. For example, *cognitive style* concerns *modality* (e.g., auditory versus visual learners), *encoding* (e.g., image versus verbal representation of learning material), *mode of information processing* (e.g., holistic versus analytic), and *executive function* or *cognitive control* (e.g., sharpening versus leveling). Learning styles concern characteristic ways of processing new information (e.g., learning as reproducing what is learned versus as transforming it into a form that allows flexible use) and organizing new information (e.g., relying on externally provided

structure versus imposing structure of one's own), among others. At a more intellectual level, thinking styles may involve preferences for tackling problems in a more analytic, judicial way than creative or practical manners (Sternberg, 1996). Some styles have clear personality underpinnings, such as impulsivity versus reflectivity, while others indicate specific preferences for a particular type of work or activity. For instance, Kolb (1971; Kolb, Boyatzis, & Mainemelis, 2001) proposed two dimensions along which people differ: the observation-experimentation continuum and the data-theory continuum. Namely, some individuals prefer activities that involve reflective observation of what is out there, while others prefer active experimentation; some prefer to pursue theoretical ideas and others prefer to work with data to solve practical matters. Although strictly speaking these "styles" are preferences given a set of choices, the literature often groups them together as part of the learner's profile.

Teachers often like to invoke the concept of style in explaining individual differences they observed in their students. Yet, people typically don't differentiate the scientific concepts of thinking and learning styles from related folk beliefs. Although not all folk beliefs are wrong, these beliefs often remain implicit and unexamined. For example, some people do not differentiate style and ability; for them, multiple intelligences (Gardner, 1983) are synonymous to multiple thinking styles. Some believe that styles work like personality traits or fixed characteristics of the person, rather than one's characteristic way of dealing with a specific type of task environment. Although these assumptions are not necessarily "wrong," they are nevertheless oversimplistic.

What the Research Says About Thinking and Learning Styles: Three Questions

The first question we can ask is whether gifted children as a group have unique thinking and learning styles, as some scholars argue that high intelligence (giftedness) indicates a style of work (see Cronbach, 1977). The research evidence is mixed regarding this question. In general, we should think of gifted children as diversely inclined in terms of their habitual ways of thinking and learning, although some stylistic dimensions might be viewed as "gifted" par excellence (Borland, 1988); that is, it is not the amount of abilities individuals have but the way they approach a task that constitutes giftedness. The following are some conclusions and principles that represent current thinking and the state of knowledge:

- Gifted learners (as defined by IQ) are more "legislative" and tend to impose structure on learning materials, rather than relying on structure provided by adults, including educators (Dai & Feldhusen, 1999;

Kanevsky, 1990; Snow, 1994; Sternberg & Grigorenko, 1993). They are also more field-independent, that is, not easily distracted by irrelevant background information (Davis, 1991). A related claim partly supported by research is that gifted children tend to be *intuitive* learners; that is, they tend to see the intangible and envision connections and possibilities that are not obvious (see Piirto, 1998, pp. 108–109).

- Some gifted children distinguish themselves from others in showing a characteristic tendency toward divergent thinking; that is, they tend to deviate from "conventional" ways of thinking and produce thoughts in many directions, although findings are mixed as to whether children's divergent thinking is associated with creative productivity in adulthood (see Runco, 2005).
- Style and ability have a complex relationship; some stylistic dimensions, such as field dependence-independence and cognitive complexity-simplicity, have ability underpinnings (Davis, 1991); we still don't know how to tease apart the stylistic and ability aspects of intellectual functioning, although attempts have been made (see Lohman & Bosma, 2002). One stylistic dimension that might underlie fluid intelligence is cognitive control for both automatic and controlled cognitive processes (Braver, 2012). Patterns of strengths and weaknesses involve various configurations of abilities, which reveals intricate style-ability interaction (Lohman, 1994; Renzulli & Dai, 2001). Recent studies by Lubinski, Benbow, and their colleagues indicate that interindividual differences (e.g., the math-verbal SAT disparity within the person predicts occupational preferences; see Lubinski & Benbow, 2006 for a review), suggesting that ability patterns may lead to different preferred styles of work: those stronger in math tend to prefer analytic work on objects and data, and those stronger in verbal ability tend to work more holistically with human affairs.

The second question we can ask is, "Does a domain of talent require a particular way of feeling and thinking and mental representation?" This question is important because failure to adapt to possible stylistic ways of a domain may impede one's progress in that domain. Some domains (e.g., arts versus sciences, history versus chemistry) may require specific styles of functioning; for instance, Miller (1996) found that for many great physicists, including Einstein, spatial imaging was a quite dominant mode of thinking, leading to many new theoretical formulations. Labouvie-Vief (1990) suggested two modes of meaning making that shape differential developmental trajectories: In the *mythos* mode (speech, narrative, plot, or dialogue), experience is holistic and based on close identification between the self and the object of thought, whereas in the *logos* mode (reckoning, explanation, rule, principle, reason), knowing is objective and detached, and can be rendered purely analytic, mechanical, and computable. As a result, some children will find a better match between their styles of

functioning and some privileged domains. Sometimes a more "natural" style of processing stands in the way of progress in a more "professional" way of thinking and feeling. Bamberger (1986) studied a group of musically talented adolescents and observed difficulties they encountered in changing their intuitive way of processing music. Their experiences can even be characterized as a crisis in their efforts to switch to a more analytic style that would allow them to look at the music composition from a more critical stance.

The third question we can ask is what styles are educationally meaningful and informative from an instructional perspective so that an optimal match can be sought to maximize learning. Several candidates stand out as more relevant than others and are discussed in the sections that follow.

Analytic Versus Holistic Processing

This is the most researched dimension of cognitive styles. Some researchers even argue that many other dimensions can be grouped around this overarching one (Riding & Rayner, 1998). For example, Riding and Rayner also identified "verbal learners" versus "visual learners" based on their dominant preferred media of representation. But one can argue that it also reflects a preferred mode of information processing: visual learning is more holistic and verbal learning is more analytic. Holistic learners tend to process information by considering all available facts simultaneously; as a result, they tend to become synthesizers, focusing on how things fit together. Analytic learners tend to restructure the task in a way that allows them to tackle one thing at a time. This dimension is educationally important because instruction often involves analysis and synthesis, and there could be style compatibility in the process.

Intellectual Styles

Sternberg (1997) identified legislative (imposing rules by themselves), judicial (taking a critical stance), and executive (following well-defined procedures) styles as three self-governing styles (see Dai & Feldhusen, 1999). It is important to know that these styles likely reflect personality as much as ability. Sternberg (1996) also articulated three main dimensions of intellectual functioning: analytic, practical, and creative. Grigorenko and Sternberg (1997) found that after controlling for cognitive abilities, intellectual styles account for additional amounts of variation in achievement; more importantly, equally able thinkers tend to do better when assessment matches their strengths, styles, and preferences (Sternberg, Torff, & Grigorenko, 1998; see also Sternberg & Zhang, 2001). Pedagogy, as well as assessment format, need to be sensitive to the styles students bring into the instructional setting.

Styles and Preferences in Creative Problem Solving

If intellectual styles are psychologically more complex than cognitive styles, styles and preferences in creative problem solving refer to a class of preferred

modes of mental operation that are even more complex. Treffinger and Isaksen (2005) identified three dimensions of style: (a) Orientation to Change: some are more of a trailblazer (explorer), and others are better at following through with better articulation and technical precision (developer); (b) Manner of Processing: some prefer to work collaboratively (external) and others prefer to ponder a problem or solution by themselves (internal); and (c) Ways of Deciding: some are more person-oriented, making decisions together, and others are task-oriented, preferring to make decisions on their own. Teaching that is tailored to individuality clearly needs to heed these complex styles and preferences, as they partly determine what will transpire in teaching-leaning dynamics.

General Implications of Research on Thinking and Learning Styles

Given the fact that the nature of various styles proposed in the literature is not completely understood, teachers and parents need to keep the following two points in mind when using the concept of style as an intellectual tool for guiding practice and making educational decisions.

Be aware of possible biological underpinnings of a specific style. Some neurological research using EEG measures has yielded interesting findings regarding enhanced right hemispheric functions in gifted male adolescents (e.g., O'Boyle, Benbow, & Alexander, 1995). Although whether it has to do with style issues remains to be seen, it yields important insights about possible *qualitative* differences in cognitive functions (i.e., a matter of *how*). Evidence from gifted individuals with dyslexia and other learning disabilities implicates stylistic functioning of these individuals, suggesting that a mechanism of *compensation* may underlie the unique *self-organization* of brain functions.

Be aware of the role of adaptation and socialization. Pedagogical practices may reinforce certain styles but suppress expressions of other styles, for better or for worse. One can also ask how frequently teachers encourage intellectual risk taking by facilitating "educated guesses," instead of expecting "correct answers" in classrooms. Besides, findings from Bamberger (1986) and Lubinski and Benbow (1992) have suggested that certain styles may be developed as a result of adaptation to domain constraints and the norm of a field or subfield (e.g., professional psychologists versus experimental psychologists). Thus, style is not only a matter of individual differences; it is developmentally shaped through experience and adaptation.

What Are Some Challenges in Understanding Thinking and Learning Style?

There are three challenges inherent in the style research. The first is to differentiate style from ability. The initial impetus of the style research is dissatisfaction with the ability research, which measures differences in performance *outcomes* and *levels* but does not seem to yield much insight into differences in *processes*. Unlike ability constructs, style is about *performance*, rather than *competence* (Lohman & Bosma, 2002). To be useful and nonredundant, style concepts have to be empirically and theoretically distinguished from ability concepts. Style concerns *how* a task is performed, and ability addresses *how well* a task is performed. Given a problem, two persons may perform equally well, yet display different ways of accomplishing the task; for example, some may enlist images while others use verbal representations, and some may grasp the problem holistically while others break the task down to several components. We infer competence (i.e., ability) from performance outcomes, and style from underlying processes (e.g., dispositions). Intelligence can be conceptualized both as a capacity (competence) and as a style. As Cronbach (1977) argued, "intelligence is not a thing; it is a style of work" (p. 275). Albeit the distinction, it is not easy empirically to separate style and ability in performance-based measures, which tend to elicit maximal performance (ability) rather than typical engagement (style). Measurement innovations are needed to advance this line of research (Lohman & Bosma, 2002).

The second challenge is to reconcile two traditions of the style research. In general, *cognitive style* research is rooted in the long objective-analytic tradition, and typically uses performance measurements (e.g., Witkin & Goodenough, 1981), while *learning style* research takes a more phenomenological approach, assuming an experiential basis for learning preferences, and relying on self-report and interview data (e.g., Boulton-Lewis, Marton, & Wilss, 2001). Compared to their cognitive style counterparts, researchers on learning style tend to be more pragmatic and concerned with different learners' preferences for various learning activities and contexts (e.g., Dunn, Dunn, & Price, 1989). Thus, while performance-based cognitive styles are criticized for being close to abilities (Sternberg & Grigorenko, 2001), learning style theories are criticized for relying on introspective self-report measures, which are in many ways flawed (Klein, 1995). Learning styles, although often intuitively accessible to lay audience, are also criticized for the lack of a solid psychological foundation and empirical support.

The third challenge, probably the most critical, is to grasp the nature of a style, and the question of how it functions. Some researchers believe that cognitive styles are hardwired in one's personality and therefore are fairly fixed, and even have a physiological substrate (Riding, 2001). Others treat style as

reflecting how the person interacts with a class of tasks, and thus say it cannot be separated from specific functional environments; in other words, style is sensitive to context and subject to change (Biggs, 2001). Whether we consider style as baggage one brings to performance or learning contexts or as an emergent characteristic that is inherently contextual has profound implications for how we measure and assess styles in research and how we provide proper instruction and counseling in practical settings.

What Are Limitations of the Style Research That Educators Need Be Aware of?

Most of the style research in the field has used gifted and "nongifted" comparative designs. Kanevsky (1995) cautioned that "the pursuit of consistent group differences that can be used to distinguish gifted and non-gifted students will continue to be frustrated by the uniqueness of innate abilities and experiences" (p. 63). This caution also applies to research on style issues in the field. Group comparisons between gifted and nongifted students are still a dominant design in research. It can easily lead to simplistic but unwarranted conclusions (Kanevsky, 1995). Group comparison designs also sabotage the impetus for style research, which was initially intended to break a mental set or fixation with differential conceptions and measurements of ability in that psychometric measures only assess *products*, not *processes*, assuming competence as reflecting *capacity*, not *performance*. Besides, although links between specific ability and style constructs can be made through investigation, the unqualified, default assumption that intellectually gifted students (based on IQ or achievement) are a homogeneous group and differ from the rest of the students in terms of cognitive and learning styles is *unwarranted*. Comparative research will do well to bear in mind within-group variations when investigating between-group differences. Ultimately, to investigate style is to examine an intimate form of individuality that can only be observed through carefully designed tasks and settings.

There is also a lack of integration between research on style and broader issues of gifted education and talent development. Taken together, the style research in the field is largely descriptive, sporadic, and isolated. If this trend continues, it is inevitable that style will become a peripheral concern in the field, as it is always a difficult topic to research, and its relevance and importance to giftedness and gifted education will remain opaque.

Major Resources and References

Messick (1994) provided an overview of the style construct in the history of psychological research. Riding and Rayner (1998) gave a more comprehensive treatment on the topic of cognitive and learning styles. For more recent, updated reviews of mainstream perspectives on thinking and learning styles, see an edited volume by Sternberg and Zhang (2001) and a coauthored book by Zhang and Sternberg (2006). Of particular interest to giftedness, Kogan (1983) provided a developmental view on cognitive style, with a focus on risk taking and creativity. Milgram, Dunn, and Price (1993) published an edited volume entitled *Teaching and Counseling Gifted and Talented Adolescents: An International Learning Style Perspective*, although it was criticized for making many claims that were not empirically supported. More recently, Kozhevnikov (2007) reviewed literature and proposed an integrated framework of cognitive style, suggesting that cognitive styles represent heuristics that can be identified at multiple levels of information processing, from perceptual and automatic processes to metacognitive processes and conscious executive allocation of cognitive resources, based on the regulatory function they exert on cognitive processes. This conception gives the hope of unifying the conceptual framework for research on learning and thinking styles.

Summary of Main Points

- Certain styles may be considered "gifted" par excellence; promising candidates include cognitive control, legislative style (domain-general), and hemispheric lateralization (domain-specific). Abilities and styles have intricate, complex relationships; intraindividual rather than interindividual differences in patterning and self-organization may contribute to a particular style or preference.
- Certain domains and fields may require specific modes or styles of functioning that require adaptation. Therefore, one should see style as a pervasive factor in talent development; changes in stylistic processing may indicate a developmental trajectory. This conjecture highlights the role of both environmental structuring (socialization) and active personal adaptation (changing styles over time).
- Certain ability/interest/style constellations may indicate specific niche potential and career trajectories. Instructional adaptations should include considerations of students' stylistic functioning; match and mismatch of the learner's and teacher's style affects learning-teaching dynamics and educational outcomes.

- Matching the learner's styles with curricular goals and pedagogy on the one hand and helping the learner adapt to new styles of functioning on the other are two main complementary teaching strategies.
- In counseling and guidance, various style concepts can be used, not as a tool to pigeonhole students, but as a heuristic devise to raise self-awareness, clarify options, and facilitate students'/clients' academic and career decision making.
- Albeit the importance of style issues, there are many unanswered questions due to conceptual and methodological difficulties involved in the style research. A complete understanding of stylistic functioning involves integration of biological disposition, socialization, and dynamics of person-situation (or task) fit.

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Robin K. Dickson, Ph.D., is an assistant professor working with a hybrid Ph.D. program in educational psychology and educational technology the College of Education at Michigan State University. A graduate of the University of Virginia's Curry School of Education in educational psychology with emphasis on gifted and talented education, Dickson pursues her passion for understanding how rich learning environments nurture creativity and high achievement. At the Michigan Virtual School, she helped create "virtual summer camps" and online afterschool programs for middle school students in mathematics and science, as well as enrichment opportunities in research for high school students. Dr. Dickson's current work focuses on how hybrid and online programs, from K–12 through Ph.D., can use new technologies and social media to empower a diversity of learners. She conducts evaluations of gifted and talented programs in K–12 schools, has spoken at state and national conferences, and published numerous book chapters and articles.

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Katherine Gavin, Ph.D., is an Associate Professor at the Neag Center for Gifted Education and Talent Development at the University of Connecticut. The main focus of her research is the development and evaluation of advanced math curriculum for elementary students. Dr. Gavin received the 2006 National Association for Gifted Children Early Leader award and the Neag School of Education Distinguished Researcher Award from the University of Connecticut. She has published more than 100 articles, book chapters, and curriculum materials on mathematics education with a focus on gifted students. She has more than 30 years experience in education as a math teacher, curriculum coordinator, math department chair, and assistant principal. She works with teachers nationally and internationally who are interested in developing mathematical thinking and talent in their students.

Marcia Gentry, Ph.D., directs the Gifted Education Resource Institute at Purdue University where she enjoys working with doctoral students, engaging in research, providing direct services to gifted youth, and working with educators from around the world to improve services for gifted, creative, and talented youth. Her research has focused on the use of cluster grouping; the application of gifted education pedagogy to improve teaching and learning; student perceptions of school; and on nontraditional services and underserved populations. Dr. Gentry developed and studied the Total School Cluster Grouping Model and is engaged in continued research on its effects concerning student achievement and identification and on teacher practices. She is currently directing several research projects aimed toward discovering and developing talents among students from underrepresented populations. She remains active in the field through service to the National Association for Gifted Children and the American Education Research Association and by writing, reviewing, and presenting research aimed to improve education for children, youth, and teachers.

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Jae Yup Jung, Ph.D., is a senior lecturer in the School of Education and a Senior Research Fellow at the Gifted Education Research, Resource and Information Centre (GERRIC) at The University of New South Wales, Australia. His major research interest is in the decision making of gifted and nongifted adolescents on topics such as careers, university entrance and friendships, usually incorporating motivational and cultural perspectives. He has published in a range of journals including *Gifted Child Quarterly*, *Journal for the Education of the Gifted*, *Roeper Review*, *Journal of Career Assessment*, *Journal of Career Development*, and *Research in Higher Education*.

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James C. Kaufman, Ph.D., is professor of educational psychology at the University of Connecticut. He is the author/editor of more than 20 books and 200 papers on creativity. Kaufman is the President of APA's Division 10 and was the cofounding editor of *Psychology of Aesthetics, Creativity, and the Arts*. He is currently the founding editor of *Psychology of Popular Media Culture*. His awards include the Daniel E. Berlyne Award and the Paul Farnsworth Award from APA's Division 10, the E. Paul Torrance Award from the National Association of Gifted Children, the Mensa Education & Research Foundation's Award for Excellence in Research, and the Early Career Research Award from the Western Psychological Association.

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Matthew Makel, Ph.D., is a gifted education research specialist at the Duke University Talent Identification Program. He received his Ph.D. from Indiana University. His research examines the nature and development of the abilities, perceptions, and environments of academically talented youth to better understand the factors that lead to the expression of talent. He focuses primarily on academic self-concept, implicit beliefs, long-term outcomes, replication, talent development, and time allocation. He also seeks to communicate and translate research findings to nonresearchers.

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Matthew McBee, Ph.D., is assistant professor of experimental psychology at East Tennessee State University where he teaches courses on statistics, experimental design, and quantitative research methodology. He is interested in many aspects of gifted and talented education, with a particular focus on the

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Kimberly McCormick, Ph.D., is an assistant professor of learning and assessment in the Teacher Education Department at Salisbury University. She holds a bachelor's degree in elementary education from Butler University and a master's degree in educational psychology with a specialization in gifted and talented education from Ball State University. She attended graduate school at Indiana University, where she earned a Ph.D. in learning and developmental sciences with a specialization in educational psychology. She teaches courses in educational psychology, assessment, and gifted and talented education. Her research interests include gifted and talented education, connecting student engagement to the academic and social needs of gifted and talented students, and understanding and measuring student engagement in schools.

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Sidney M. Moon, Ph.D., is professor of gifted, creative, and talented studies and Associate Dean for Learning and Engagement in the College of Education at Purdue University. She has been involved in the field of gifted, creative, and talented studies for 31 years. In that time, she has contributed more than 75 books, articles, and chapters to the field. Sidney is active in the National Association for Gifted Children where she has served as Chair of the Research and Evaluation Division, a member of the Board of Directors, and Association Editor. Currently, she is serving as treasurer of the American Educational Research Association Special Interest Group (SIG), Research on Giftedness, Creativity, and Talent. Her research interests include talent devel-

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Stuart Omdal, Ph.D., was an elementary teacher for 15 years, both in the regular classroom and as a gifted education coordinator facilitating the Schoolwide Enrichment Model. Since completing graduate school at the University of Connecticut in 1995, he has been a professor of gifted education at the University of Northern Colorado (UNC). He is the Director of the Summer Enrichment Program and Director of the Center for the Education & Study of Gifted, Talented, Creative Learners at UNC. His professional interests include creativity in education, twice-exceptionality, underachievement of students from nondominant cultural and language groups, and the implementation of Response to Intervention in gifted education. He is on the board of directors for the Association for the Education of Gifted Underachieving Students (AEGUS) and the Colorado Association for Gifted and Talented

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Jane Piirto, Ph.D., is Trustees' Distinguished Professor at Ashland University. She is the author of 17 books, both scholarly and literary, including *Talented Children and Adults: Their Development and Education* (three editions), *Understanding Creativity, Understanding Those Who Create* (2 editions),

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Sally M. Reis, Ph.D., is the Interim Vice Provost for Academic Administration, a Board of Trustees Distinguished Professor, and Teaching Fellow in Educational Psychology at the University of Connecticut where she also serves as Principal Investigator at The National Research Center on the Gifted and Talented. She was a teacher for 15 years, 11 of which were spent working with gifted students on the elementary, junior high, and high school levels. She has authored more than 130 articles, 14 books, 60 book chapters, and numerous monographs and technical reports. Dr. Reis serves on several editorial boards and is the past president of the National Association for Gifted Children.

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Joseph S. Renzulli, Ph.D., is a professor in the Department of Educational Psychology at the University of Connecticut and was selected as a Board of Trustees Distinguished Professor. He holds dual directorships at the Neag Center for Gifted Education and Talent Development and the federally funded The National Research for the Gifted and Talented. He is noted for developing the three-ring conception of giftedness and the Schoolwide Enrichment Model. His research has focused on the broadening the process of identification and the development of giftedness in young people and on organizational models and curricular strategies for total school improvement. A focus of his work has been on applying the strategies of gifted education to the improvement of learning for all students. He is a Fellow in the American

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