States of Excellence

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Research from the individual-differences tradition pertinent to the optimal development of exceptional talent is reviewed, using the theory of work adjustment (TWA) to organize findings. The authors show how TWA concepts and psychometric methods, when used together, can facilitate positive development among talented youth by aligning learning opportunities with salient aspects of each student's individuality. Longitudinal research and more general theoretical models of (adult) academic and intellectual development support this approach. This analysis also uncovers common threads running through several positive psychological concepts (e.g., effectance motivation, flow, and peak experiences). The authors conclude by underscoring some important ideals from counseling psychology for fostering intellectual development and psychological well-being. These include conducting a multifaceted assessment, focusing on strength, helping people make choices, and providing a developmental context for bridging educational and industrial psychology to facilitate positive psychological growth throughout the life span.

Since the beginning of recorded history, the extraordinary gifts that some individuals possess and the ways these gifts are nurtured have fascinated people. This may be particularly true for those intellectual attributes that manifest precocity in rate of development and terminal level of performance. How does such precocity emerge? Are there ways to cultivate its manifestation? Are there barriers in place that attenuate its development into exceptional adult attainment? These are among the most critical questions being addressed by investigators interested in talent development.

Although there are many ways to approach these issues from various disciplinary perspectives, in this article we show how traditional individual-differences measures, used within the theory of work adjustment (TWA; Dawis & Lofquist, 1984) framework, can facilitate optimal development of talent. We also synthesize basic but widely scattered findings in the psychological literature to reveal the many converging lines of evidence that support this practice. Detailing exact interventions or procedures for adjusting educational curricula (Benbow & Lubinski, 1996; Benbow & Stanley, 1996; Lubinski & Benbow, 1995; Winner, 1996) is, however, beyond our scope here. Rather, we limit ourselves to demonstrating how findings in positive psychology provide foundational support for tailoring a school's curriculum to match individual differences among talented students. We begin with a review of early approaches to talent development within the individual-differences tradition; this sets the stage for using ability and preference assessments to design optimal learning environments for intellectually talented youth.

Early Work

Around the time the science of applied psychology began, scholars were intrigued by the possibility that in-depth studies of exceptionally able students might help answer the questions posed above. Even staunch empirical outlets like the *Journal of Applied Psychology* devoted space to some case history reports (e.g., Coy, 1918; Garrison, Burke, & Hollingworth, 1917, 1922; Hollingworth, 1927). These students were seen as so fascinating and their intellectual development as so remarkable (and of eventual value to society) that they were worth idiographic ($N = 1$) profiling. What these case histories revealed, among other things, was that the terms *intellectually gifted* or *highly talented* are imprecise. The breadth of diversity found within this special population was profound across both intellectual and nonintellectual attributes. The students were anything but a categorical type. Hence, no single environmental manipulation would address the needs of all talented youth. There was no "silver bullet."

Upon reflection, this finding was unsurprising. One third of the total range on any given normally distributed dimension is found within the top one percent (a common arbitrary criterion for classifying an individual as "gifted"). Scores marking the top one percent on general intelligence, as measured by conventional psychometric (IQ) assessments, begin at an IQ of approximately 137. Yet, IQs can extend beyond 200. Individual differences within the upper segment of this over 70 point IQ range lead to huge differences in the educational environments required for ensuring optimal development.

Although Leta Hollingworth's (1942) volume *Children Above 180 IQ* helped solidify this conclusion, there were other voices. Many early pioneers of applied psychol-

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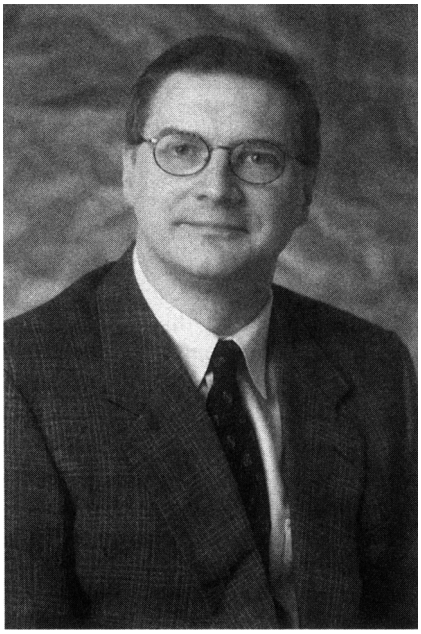

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ogy stressed the heterogeneity in gifted populations; they pointed out the concomitant necessity of and benefits for structuring these students' educational curriculums at a level and pace commensurate with their rate of learning. Thus, by the 1950s, when the Bingham Lecture Series entitled "The Discovery and Development of Exceptional Abilities and Capacities" began (all of the lectures in this series were published in the *American Psychologist*), almost every contribution to the series underscored the empirical evidence for this perspective (e.g., Ghiselli, 1963; Paterson, 1957; Stalnaker, 1962; Terman, 1954; Wolfle, 1960). Moreover, most contributors promoted educational acceleration to respond to the unique educational needs of these gifted children. It is important to point out before leaving this topic, however, that *educational acceleration* is a misnomer, as students are not hurried along but rather placed in existing curricula roughly at the point where they are naturally functioning. Thus, we prefer the term *appropriate developmental placement* because it is a more accurate descriptor of the process. Regardless, the academic, emotional, and social advantages of "educational acceleration" for the highly talented have been confirmed in every decade since the 1920s (Benbow & Stanley, 1996; Pressey, 1946a; Seashore, 1922; Terman, 1925, 1959).

Over most of the 20th century, however, assessing intellectual precocity largely pertained to using *general* intellectual abilities for forecasting *general* academic achievement and placement. Although this was an important first step, which has been validated over long time frames (Cronbach, 1996; Holahan & Sears, 1995), it is not useful for tailoring educational interventions toward specific needs. Recent advances stemming from more refined individual-differences measures appear to offer much more.

Modern Empirical Advances

During the past two decades, some consensus has emerged regarding the nature and structural organization of cognitive abilities (Carroll, 1993; Gustafsson & Undheim, 1996), interests (Day & Rounds, 1998; Holland, 1996), and personality (Goldberg, 1993; McCrae & Costa, 1997) in adult populations. More recently, verisimilitude for these models has generalized to intellectually gifted young adolescents. It seems that the intellectually precocious are precocious in many ways. For them, results of conventional psychometric assessments of cognitive abilities, interests, and personality appear to be similar to those of adults (Achter, Lubinski, & Benbow, 1996; Achter, Lubinski, Benbow, & Eftekhari-Sanjani, 1999; Benbow, 1992; Benbow & Lubinski, 1997; Lubinski, Benbow, & Ryan, 1995; Lubinski, Schmidt, & Benbow, 1996; Schmidt, 1998; Schmidt, Lubinski, & Benbow, 1998). Because of this, psychometric assessments initially designed for adults can facilitate positive development among gifted youth.

Abilities

Most importantly, the hierarchical organization of cognitive abilities—a general factor supported by a number of group factors (e.g., mathematical, spatial, verbal)—reveals the same structure among intellectually talented young adolescents as it does in random samples of adult populations. The intellectually talented tend to develop the eventual adult structure at an early age (hence, the label precocious). Moreover, although we have known for decades that individual differences within the top one percent of general intelligence have important educational implications, we now know that the same is true for some specific abilities (Benbow, 1992). Mathematical, spatial, and verbal reasoning abilities have differential and incremental validity for predicting relevant educational–vocational criteria beyond general intelligence (Achter et al., 1999; Humphreys, Lubinski, & Yao, 1993).

Stanley (1996; Keating & Stanley, 1972) was among the first to extend the early efforts of Hollingworth and Terman, who focused on intensity appraisals of general intelligence (IQ), to appraising specific abilities (group factors). Through his Study of Mathematically Precocious Youth (SMPY), beginning in 1971, Stanley documented the importance of more refined intellectual assessments. SMPY used the College Board Scholastic Aptitude Test (SAT) to examine the intensity of precocity among 12-year-olds who were "bumping their heads" on the ceilings of age-calibrated tests routinely administered to them in their schools. Prior to the 1970s, having 12- or 13-year-olds take the SAT for educational planning was essentially unheard of, but today, largely in response to Stanley's groundbreaking work, approximately 200,000 seventh and eighth graders take the SAT annually and have their abilities profiled.

Organizers of talent searches seek out seventh and eighth graders scoring in the top two to five percent on age-calibrated standardized tests to take the SAT (or other college entrance exams; Benbow & Stanley, 1996). Inter-

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Photo by Peyton Hoge Photos

estingly, these students generate SAT score distributions indistinguishable from random samples of high school seniors (Benbow, 1988). Similarly, the SAT is differentially valid for these students, just as it is for college-bound high school students. Students whose talents are primarily in mathematical relative to verbal reasoning tend to gravitate toward quantitatively demanding areas, whereas students primarily talented in verbal relative to mathematical reasoning tend to seek out disciplines more in line with their intellectual strength. Of course, there are exceptions.

When gifted students are placed in environments corresponding to their abilities (e.g., summer residential programs conducted by talent-search organizers), amazing achievement can emerge. For over 25 years it has been shown that highly able students routinely assimilate a full year of a rigorous high school course (e.g., chemistry, Latin, mathematics) in three weeks. These accomplishments have been replicated widely and are well documented (Benbow & Lubinski, 1996; Benbow & Stanley, 1996). Such programs receive positive subjective reports from participants (Benbow, Lubinski, & Suchy, 1996) and demonstrate positive long-term benefits (e.g., Swiatek & Benbow, 1991a, 1991b). We believe, however, that even better outcomes can be achieved if preferences are also considered when matching students to educational environments.

Preferences

Recent empirical findings allow us to refine appropriate developmental placement beyond multiple abilities. That is, just as work over the 1970s and 1980s documented the utility of assessing specific abilities among the gifted (for educational planning), research during the 1990s demonstrated the same potential for certain nonintellectual attributes. Educational and vocational interests seem to be sufficiently differentiated (Achter et al., 1996), longitudinally stable (Lubinski et al., 1995, 1996), and construct valid (Achter et al., 1999; Schmidt et al., 1998) to be useful for this special population by the time its members reach the age of 12 years. We can forecast not only what gifted youth are likely to be best at but also what they are most likely to enjoy. Because exceptional achievement is more likely to emerge when individuals follow their "passion," this advance has important implications for nurturing positive development.

Holland's (1996; Day & Rounds, 1998) robust hexagonal model for describing the structure of adult vocational interests can be applied to intellectually gifted adolescents (Lubinski et al., 1995; Schmidt et al., 1998). The acronym *RIASEC* in Holland's model is the dominant outline of vocational interests today. RIASEC stands for *realistic* (works with things and gadgets, works outdoors), *investigative* (academically orientated, interested in scientific pursuits), *artistic* (prefers unstructured environments and opportunities for self-expression), *social* (enjoys people contact and working with and doing things for people), *enterprising* (is persuasive or a corporate climber, takes on leadership roles), and *conventional* (conforms to office practices, prefers structure and knowledge of what is expected). These dimensions are multifaceted and, for many purposes, important to decompose (Schmidt et al., 1998). However, as a general outline, RIASEC works well for adults and intellectually talented adolescents in locating environments where passions are likely to be reinforced and actualized.

Although cognitive abilities are more multidimensional than general intelligence supported by quantitative, spatial, and verbal abilities, and although interests extend beyond the six RIASEC dimensions discussed here, these personal attributes are among the most significant personal determinants of educational and vocational choice (Dawis, 1992; Lubinski, 1996). Collectively, they provide a way to think about the multifaceted nature of cognitive and motivational issues found in highly able adolescents. For this special population, we suggest that educational counseling begin with assessment of at least these individual differences. Some may argue that to do so at an early age pigeonholes students, but that is not necessarily so. Rather, these dimensions are tools for evaluating choices and opportunities for personal development that are present at an earlier age. Although interest profiles can and do change among the gifted from early adolescence to adulthood, there is enough stability and validity to consider them flexible guideposts. In the contexts of other attendant life pressures, some of which may conflict (e.g., peers, parents, teachers) with one's self-concept (see below), this information may be clarifying. Because intellectually talented adolescents appear to think seriously and meaningfully about educational and career choices at an earlier than typical age (Achter et al., 1996), these assessments provide a conceptual framework for evaluating their experiences across contrasting learning and work settings. Next, we provide a synthetic model for combining ability and inter-

est information in a cohesive and theoretically meaningful way.

TWA

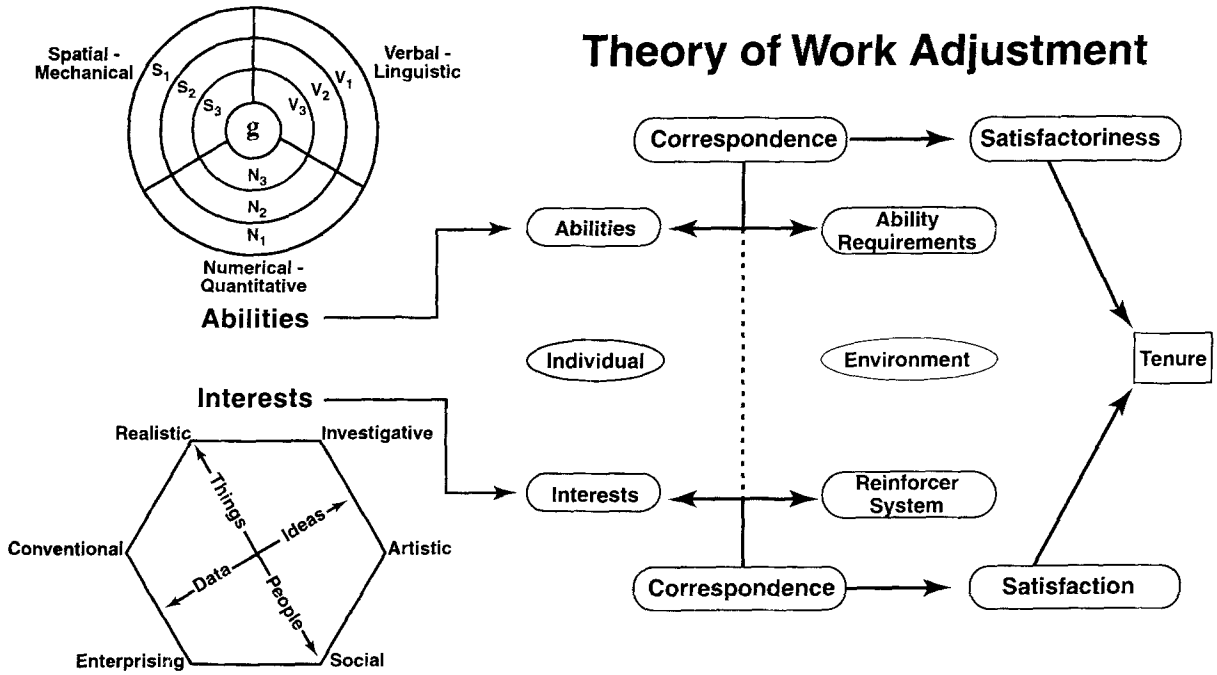
TWA was designed for adult populations and the world of work. TWA is useful for organizing psychometric findings on ability and interest dimensions to facilitate optimal development (see Figure 1). To the left of the conventional TWA model in Figure 1 (Dawis & Lofquist, 1984), we have two well-supported models of cognitive abilities and interests. On the top left side is a familiar arrangement of the major dimensions of cognitive abilities: numerical–quantitative, spatial–mechanical, verbal–linguistic, and their communality, general intelligence (using radex scaling; Lubinski & Dawis, 1992; R. E. Snow & Lohman, 1989). On the bottom left side of Figure 1 is Holland's (1996) RIASEC model.

Because the same variables determine educational and vocational adjustment and, as we saw above, because intellectually talented young adolescents are developmentally mature, we combined information from both sources to view the gifted more multidimensionally. Specifically, we have aligned cognitive abilities and interests with TWA and extended this amalgamation to the educational planning for precocious youth (Achter et al., 1996; Benbow & Lubinski, 1997). Next, we describe how TWA works.

According to TWA (Dawis & Lofquist, 1984; Lofquist & Dawis, 1991), educational and vocational adjustment involves two major dimensions of correspondence: *satisfactoriness* (competence) and *satisfaction* (fulfillment). The former is determined by the correspondence between abilities and the ability requirements of the environment. The latter is determined by correspondence between personal needs and rewards provided by the environment. To the extent that satisfactoriness and satisfaction co-occur, the person and environment are said to be in harmony. Both are motivated to continue to interact with one another, because it is to their mutual advantage, and *tenure* (a longitudinally stable person–environment relationship) occurs. Take, for example, the situation of students who are heavily recruited (by environments) and the educational institutions that are highly sought after (by students). Both work hard to "find" each other (Zuckerman, 1977), and both work hard to "keep" each other.

One important feature of TWA is that it places equal emphasis on assessing the person and assessing the envi-

Figure 1
The Theory of Work Adjustment (TWA) Combined With the Radex Scaling of Cognitive Abilities (Upper Left) and the RIASEC Hexagon of Interests (Lower Left) for Conceptualizing Personal Attributes Relevant to Learning and Work



Note. The dotted line running down the individual and environment sectors of TWA illustrates that TWA places equal emphasis on assessing the personal attributes (abilities and interests) and assessing the environment (abilities requirements and reward structure). RIASEC is an acronym for realistic, investigative, artistic, social, enterprising, and conventional; vocational interests covary to the extent to which they share proximity. For cognitive abilities, V = verbal–linguistic, N = numerical–quantitative, and S = spatial–mechanical content; subscripts with these letters represent the level of complexity, with larger subscripts reflecting greater complexity. g = general intelligence. Cognitive abilities covary to the extent that they share content and complexity.

ronment. Ideal environments are those that match the personal attributes of individuals. Optimal development occurs when people's needs are met and their abilities are appropriately challenged. Students who are primarily strong in verbal reasoning versus quantitative or spatial reasoning tend to gravitate toward domains (e.g., disciplines, occupations) that require appreciable levels of their most salient talent. For example, fields like engineering tend to attract people with primary strengths in spatial visualization and quantitative reasoning abilities, whereas the humanities tend to attract people with primary strengths in verbal abilities (Achter et al., 1999; Humphreys et al., 1993). Sometimes, however, interests can motivate educational and vocational choices that do not draw on strengths. It is not unusual for people to strongly desire to do things that they cannot do (e.g., singing when they lack a fine voice); simultaneously, most people are competent at many things that they would prefer not to do. Yet, for most well-adjusted students and employees, their ability and preference constellation aligns with the ability requirements and rewards of their learning or work purview.

TWA is also helpful in illuminating other psychological concepts useful in analyzing how people approach contrasting learning and work environments (Dawis, 1996a) such as self-concept, self-efficacy, internal locus of control, and self-esteem. All of these concepts involve perceptions of self. To a large extent, what we mean by a self-concept reflects our perceptions of our abilities and skills and our beliefs about our needs and values. Self-concept is dependent on behaviors we value (competencies) and people or things we care about (personal needs). Behaviors, people, and things we are indifferent to are irrelevant to our self-concept. Beliefs about the extent to which our abilities are effective (i.e., self-efficacy beliefs) in meeting our needs are critical to our self-concept. This, in turn, involves the perception of the locus of control for reinforcement (i.e., events that meet needs). An internal locus of control develops to the extent that individuals perceive themselves as instrumentally effective in getting their needs met.

One's personal evaluation of how these aspects of self interconnect, or the evaluation of self, engenders feelings of satisfaction or dissatisfaction with oneself, which constitute one's level of self-esteem. Providing intellectually talented students with valid psychometric information about their abilities and interests imparts critical information on how one's self-concept is being defined. Making developmentally appropriate learning opportunities available for the gifted, opportunities that are congruent with valid information and responsive to the students' differential learning rates, is likely to lead to feelings of satisfaction with self and the development of an internal locus of control. Hence, TWA provides students with tools for not only a better understanding of themselves (and their contrasting reactions to different environments) but also a framework for taking charge of their personal development.

Empowerment in the area of personal development has long been one of the major goals of educational and vocational counseling from the individual differences tradition (Dawis, 1992, 1996b; Lubinski, 1996; Tyler, 1992). Assessing the salient personal attributes of clients, focusing on strengths (while acknowledging relative weaknesses), and using these aspects of self to solidify life values (Tyler, 1992; Williamson, 1965) are the conceptual antecedents from which TWA evolved. Knowledge about enduring psychological characteristics is critical in evaluating contrasting environments for development and making decisions about which opportunities are likely to be most personally meaningful. When these ideas are combined with developmental work on *niche building* (Bouchard, 1997; Scarr, 1992, 1996)—how people seek out and strive to create learning, social, and work environments corresponding to their personal attributes (Bouchard, 1997)—we begin to gain a purchase on how precocious cognitive development unfolds. Perhaps we also come to understand how it should be nurtured.

Intellectual Development: TWA Informed by PPIK Theory

Ackerman (1996; Ackerman & Heggestad, 1997) has proposed an intriguing model of adult intellectual development that is relevant to our discussion. It orchestrates abilities-as-process with personality and interest dimensions to conceptualize the acquisition of cognitive content (i.e., knowledge) throughout the life span. Here, content denotes the pedagogical aspects of learning (i.e., knowledge), whereas process is more restricted to the psychological power of intellect (i.e., general intelligence, or possibly working memory capacity; Carpenter, Just, & Shell, 1990; Kyllonen & Christal, 1990). Ackerman's (1996) theory is called PPIK, because it integrates intelligence-as-process, personality, interests, and intelligence-as-knowledge. Interests and personality attributes serve to channel the development of knowledge structures down differential paths (e.g., C. P. Snow's, 1967, two cultures, "humanists" vs. "scientists"), whereas intelligence-as-process determines the complexity of knowledge assimilated (i.e., one's general potential for intellectual sophistication).

Teaming interests and personality dimensions with intelligence-as-process has empirically confirmed differential predictions regarding the developmental trajectory of *crystallized abilities* (i.e., specific knowledge structures). Moreover, this model is also insightful for understanding why individuals with similar cognitive profiles can and frequently do vary widely in the particulars of their knowledge base. They do so because they differ on noncognitive personal attributes relevant to the development of specific skills and knowledge; they also have different opportunities. To support these ideas, Ackerman (1996; Ackerman & Heggestad, 1997) has compiled ability–interest, ability–personality, and interest–personality correlates from the psychological literature on adult populations. Through narrative review, meta-analytic inquiry, and investigations of self-reported strengths, four (across-attribute) ability–inter-

est–personality *trait complexes* were identified: social, clerical/conventional, science/math, and intellectual/cultural.[1]

The science/math and intellectual/cultural trait complexes provide empirical support for C. P. Snow's (1967) two cultures: Intellectual/cultural, for example, consists of light correlations between measures of verbal ability and aesthetic and investigative interests, whereas science/math consists of light correlations between math and spatial abilities and realistic, investigative, and social (reversed) interests. This patterning has recently been replicated in intellectually gifted young adolescents (Schmidt et al., 1998). These trait complexes, although comprising modest positive and negative correlations (.25–.30), nevertheless generate ostensibly different subpopulation "types" when identification is restricted to one specific ability (mathematical, spatial, or verbal reasoning) and selection is stringent (see below).

According to PPIK theory, for most students, throughout the preadult years, general intelligence tends to override other predictors of academic performance because academic criteria are relatively uniform from kindergarten through 12th grade (i.e., all students are exposed to essentially the same educational curriculum). However, as people mature, they are allowed to make more choices and move more freely into and out of various environmental niches as a function of their own choices. In contrast to adolescence, adulthood brings more freedom of choice, and people begin to specialize. According to a number of developmental theorists (Bouchard, 1997; Reiss, Neiderhiser, Hetherington, & Plomin, 2000; Rowe, 1994; Scarr, 1992, 1996), choices are made to conform to one's relatively enduring personal attributes. As people select niches tailored to their enduring psychological characteristics, the particular competencies and knowledge structures acquired become more dependent on the level and patterning of cognitive abilities, interests, and personality.

Moreover, with adulthood people not only become freer to make choices about their development, but the intensity of their development also comes more under their control. How people develop becomes less dependent on a standard curriculum and more a function of the types of environmental niches chosen to migrate from, enter into, and operate within. This is precisely why PPIK theory holds appeal for intellectually talented youth: With relatively little effort, they are able to master the typical educational curriculum quickly, relative to their chronologically age-matched peers. This opens up an array of possibilities for further development. Yet, precisely how the gifted choose to develop (when developmentally appropriate learning opportunities are freely provided) is not (and should not be) random: It is psychologically systematic. The development of gifted students tends to be driven by the same underlying individual differences found in adults and is predictable with conventional psychometric tools. Making explicit the attributes that structure these students' development is likely to help them make better choices and reduce the number of false starts.

Further, PPIK theory shows how TWA works within a developmental context to explain the emergence of eminence. Because eminent individuals tend to find their career paths early and must spend huge amounts of time mastering their domain (Roe, 1952; Walberg, 1969; Zuckerman, 1977), using TWA to help talented youth make wise decisions becomes good practice. To be sure, not all talented youth become eminent—and many should probably not be encouraged to do so—but those who do tend to begin the talent development process early. To more fully appreciate creative, high-achieving individuals, however, we need at least one other class of variables: *Conative* determinants are critical for understanding truly exceptional accomplishments.

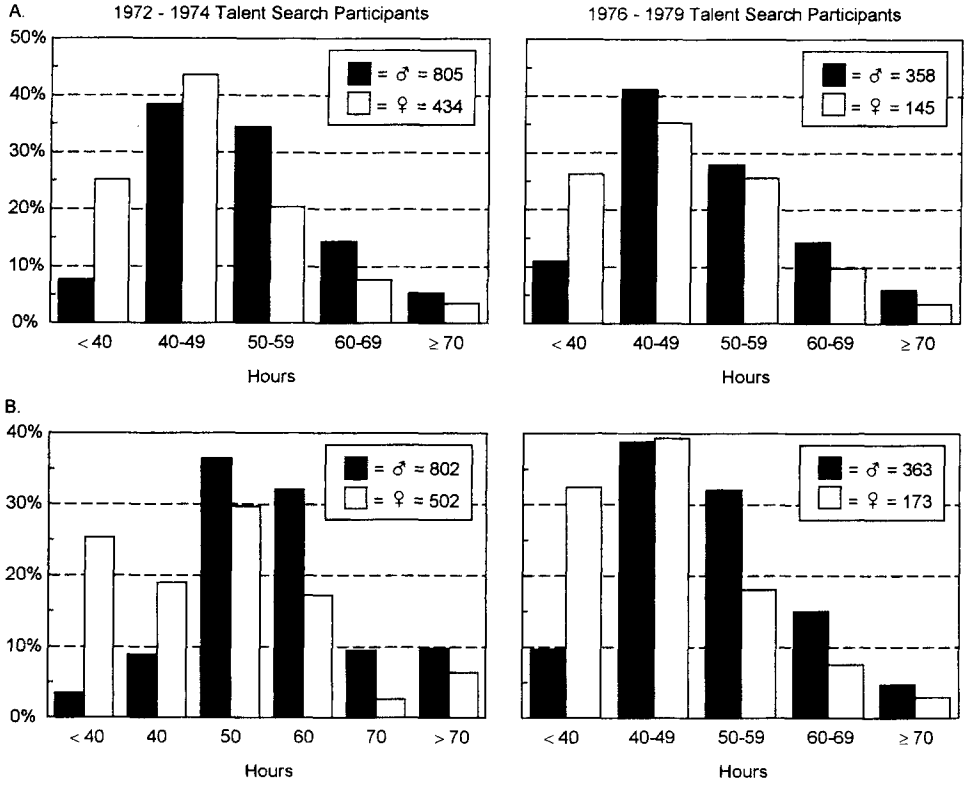
Magnitude of Development

Both TWA and PPIK theory stress conative factors for conceptualizing individual differences in development. These determinants are related to individual differences in drive and energy—not the substance of behavior per se but rather its intensity and temporal dynamics. Familiar labels include *capacity for work*, *industriousness*, *perseverance*, and *zeal*. Across almost all disciplines and occupations, conative attributes are among the most conspicuous factors that distinguish truly exceptional performers from their professional peers. Even in less glamorous arenas, this class of variables is important in understanding performance more generally (e.g., under- and overachievement in routine educational settings).

Clearly, there are individual differences in the amount of energy that people can or are willing to invest in their development. To assess these differences, Ackerman has discussed and developed a measure for a construct he calls *typical intellectual engagement* (Goff & Ackerman, 1992). In a similar vein, TWA has offered four aspects of personality style (Dawis & Lofquist, 1976) to characterize the temporal characteristics of behavior: *celerity*, *endurance*, *pace*, and *rhythm*. In both PPIK theory and TWA frameworks, concentrated effort, time on task, and energy invested play a large role in the development of expertise and knowledge structures. In the psychological literature, consideration of conative variables goes back to at least Webb's (1915) formulation of *will*, but Galton (1869) also discussed zeal and the capacity for work as critical components for truly exceptional performance. Essentially all modern psychologists studying the topic of talent development have noted the intense devotion to practice, study, and work that exceptional performers manifest (Ericsson, 1996; Eysenck, 1995; Gardner, 1993; Jackson & Rushton, 1985; Simonton, 1988, 1994). Yet, the magnitude of individual differences manifested on these volitional attributes is frequently underappreciated.

[1] Trait complexes are akin to R. E. Snow's (1991; R. E. Snow, Corno, & Jackson, 1996) *aptitude complexes* for examining different treatment modalities in educational settings and Dawis and Lofquist's (1984) *taxons* of ability and preference constellations used to conceptualize the person component of the interaction between individuals and environments. All of these ideas highlight the importance of combining affective and cognitive variables for both basic and applied research as well as practice.

Figure 2
Two Questions About Work Taken From the Study of Mathematically Precocious Youth's 20-Year Follow-Up Questionnaire



Note. Participants were identified at age 13 as having quantitative reasoning abilities within the top one percent of their age group. At age 33, they were asked (A) how many hours per week they typically worked, by gender (excluding homemakers), and (B) how many hours per week they were willing to work, given their job of first choice, by gender. Please note that the 1972–1974 participants were given six temporal options, whereas the 1976–1979 participants were provided with five choices.

To highlight this point, we present Figure 2, which contains data from over 1,700 participants from SMPY's 20-year follow-up (Lubinski & Benbow, 1994). All participants were assessed with the SAT before they were 13 years old, during the 1970s; they scored in the top one percent in quantitative reasoning ability for their age group (many had even more exceptional SAT–Verbal scores). At age 33, the participants were asked how much they would be willing to work in their "ideal job" and how much they actually do work. These data reveal huge individual differences. For better or worse, these individual differences will surely engender different performance and work-related outcomes.

The Emergence of Eminence

When dealing with exceptionality, one is sometimes moved to consider different kinds of intelligence or different models, because the kinds of problems encountered when moving across contrasting disciplines (e.g., art, chemistry, and literature) are so different. Extraordinary accomplishments within these spheres serve only to underscore their uniqueness. They appear qualitatively different. Given this, might it make sense to think of Picasso, Curie, and Shakespeare as having different kinds of minds (Gardner, 1993)? What about Gandhi or Freud, with the unique problems they addressed and the way they approached life more generally? Perhaps different types of intelligence are necessary to conceptualize their spectacular achievements. There is probably some truth to this, especially given what we know about the cerebral organization and cognitive functioning of gifted individuals with different strengths and relative weaknesses (Dark & Benbow, 1991; Nyborg, 1994; O'Boyle, Benbow, & Alexander, 1995). Yet, it would still be good to see how far the psychology of individual differences can take us (Messick, 1992). It is quite possible that when exceptional performances undergo critical analysis, what is uncovered is not unique qualities but rather more of certain qualities (e.g., affective, cognitive, conative) that lead to qualitative differences in knowledge content and, perhaps, different types of eminence.

Consider the following illustration. If we assume true correlations between quantitative, spatial, and verbal rea-

soning abilities are all around .75, this leaves much room for profile variability. Indeed, appreciable variability is expected, particularly when selection is stringent and exclusively restricted to one ability dimension. For example, someone four standard deviations above the norm on verbal reasoning abilities, or who is the top 1 in 30,000, would clearly be in possession of the specific cognitive ability for greatness in law, literature, or philosophy, among other verbal–linguistic disciplines. Yet, this individual might not be distinct from many colleagues at major universities on other specific abilities. The mean expectation for this person's quantitative and spatial reasoning abilities (with $R_{VQ} = R_{VS} = .75$, and with V four standard deviations above the norm) is three standard deviations above the norm (i.e., $.75 \times 4 = 3$), or the top 1 or 2 in 1,000.

Now, to be sure, being among the top 1 or 2 in a group of 1,000 is impressive, but it is not nearly as impressive as being the top 1 in 30,000 and really is not so awfully rare at major universities. This amount of intellectual diversity is the expectation for anyone so verbally exceptional. It also would be the amount of diversity anticipated (under the same assumptions) for someone as exceptional in quantitative or spatial reasoning. Three groups of individuals, selected for their exceptionality in quantitative, spatial, *or* verbal reasoning appear quite distinct from one another—and in some important respects they are. However, their distinctiveness may overshadow their common generic stock.

Is it possible that creators of exceptional intellectual products are not nearly so enigmatic as typically supposed? Can measures associated with major dimensions of cognitive abilities capture their distinctiveness quantitatively? Might they also explain how quantitative differences in individual-differences profiles develop into qualitative differences in knowledge structures? Plausibility for this idea is intensified when it is recalled that specific abilities "pull" with them unique clusters of noncognitive personal attributes (Ackerman, 1996; Ackerman & Heggestad, 1997; Ackerman & Rolfhus, 1999), sometimes in diametrically opposed ways. Recall Ackerman's (1996) cultural/intellectual and science/math trait complexes, which have recently been replicated in gifted adolescents.

In Schmidt et al.'s (1998) study of gifted adolescents, spatial abilities covaried approximately .25 with realistic interests (working with things) and −.25 with social interests (working with people). If spatially talented students are selected, using a cutting score of merely two standard deviations above the mean, the following would be anticipated: The resulting sample will average half a standard deviation *above* the mean in interests in working with things ($2 \times .25 = .50$) and half a standard deviation *below* the mean in interests in working with people ($2 \times -.25 = -.50$). Collectively, these two patterns would cover a full standard deviation difference in interests for people versus things (see the RIASEC component in Figure 1). These differences would be conspicuous enough to motivate categorical considerations. They would certainly generate stereotypic impressions of "different types" if compared with members of highly talented groups selected on verbal or quantitative abilities, which covary more deeply with other interests. Now consider the result if the cutting score had been 4 rather than 2 standard deviations above the norm.

Selecting two groups at the extremes on any pair of the major markers of general intelligence (math/verbal, math/space, verbal/space) eventuates in multiple group differences on other major individual-differences dimensions. Moreover, such group differences are often sufficiently pronounced to stimulate reasonable observers to consider discontinuities. Yet, as we have seen, these constellations could stem from continuous gradations within an underlying multivariate space of systematic sources of individual differences with no discrete boundaries. It could turn out that exceptional achievements are "simply" outcomes of optimal blends of extraordinary levels of normative attributes (affective, cognitive, and conative) that found their way to developmentally supportive environments. These considerations prompt two questions: What is a supportive environment, and how do supportive environments operate to sustain positive psychological growth over extended time frames?

Correspondent Learning Environments Foster Psychological Well-Being; Discorrespondent Learning Environments Foster Psychological Pain

For environments to support the amount of psychological growth needed for the emergence of eminence, positive psychological experiences are required to nurture the development of expertise, skill, and knowledge structures through a fairly immediate mechanism. Several investigators have estimated that this development takes approximately 10 years of concentrated effort. For example, a decade of up to 70-hour work weeks is required before someone with the proper configuration of attributes (Eysenck, 1995; Jensen, 1996) develops the crystallized skills needed for moving the boundaries of a discipline forward (Ericsson, 1996; Gardner, 1993; Simonton, 1988, 1994; Zuckerman, 1977). How might these sustaining mechanisms operate? Consider the following: To the extent that students are placed in correspondent learning and work environments, they are more likely to experience a greater density of reinforcing events and, simultaneously, are less likely to experience punishing events, including boredom. These environments encourage maximal positive development. More specifically, they enhance the likelihood of experiencing psychological well-being (the affective concomitant of reinforcing operations) and attenuate the chances of experiencing psychological pain (the affective concomitant of punishing operations).

What events constitute punishment versus reinforcement depends on the individual. Just as learning environments may be considered highly challenging or boring depending on the student, the same environment may be seen as exciting or aversive from a motivational—reinforcement or punishment—point of view. This is why it is important to assess individual differences in abilities and interests initially. To the extent that satisfaction and satisfactoriness are not achieved, two forms of psychological

distress ensue: one associated with problems (when performance is unsatisfactory), the other associated with pain (when needs are not met). Therefore, psychological problems are characteristic of a lack of correspondence between the individual's abilities and the ability requirements of the environment, a mismatch causing problems for the individual and the environment. Psychological pain, on the other hand, results from a lack of correspondence between the individual's needs and the rewards mediated by the environment.

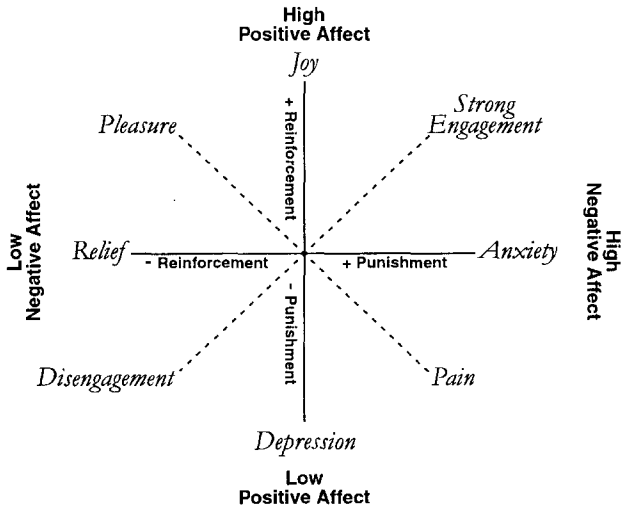
Figure 3 depicts a well-replicated two-dimensional framework for studying affect defined by positive and negative emotionality, two relatively independent dimensions (Tellegen, Watson, & Clark, 1999; Watson & Tellegen, 1985). Positive and negative emotionality are stable individual-differences dimensions associated with positive and negative affect, but nevertheless they can manifest wide state variations (Zevon & Tellegen, 1982). Fluctuations in affect systematically covary with reinforcing and punishing stimuli. These two dimensions are helpful for understanding changes in affect associated with reinforcement (well-being) and punishment (pain). One goal of educational and vocational counseling from a TWA framework is to maximize the former and minimize the latter.

Psychologically, there are at least two components to *pain* and two components to *well-being* (see Figure 3). Psychological pain follows two kinds of punishing conditions, namely, *positive* and *negative punishment*, which are the presentation of aversive stimuli (anxiety) and the removal of appetitive stimuli (depression), respectively. Psychological well-being, on the other hand, follows two kinds of reinforcing conditions, namely, *positive* and *negative reinforcement*, that is, the presentation of appetitive stimuli (joy) or the removal of aversive stimuli (relief).

TWA can help in identifying environments that are ideally tailored toward augmenting one's overall psychological well-being while simultaneously attenuating the likelihood of experiencing pain. More specifically, one's affect fluctuates as a function of the density of punishing and reinforcing events experienced. Correspondent learning environments tend to minimize the former and maximize the latter. Placing students in learning environments congenial with their abilities and interests has multiple direct advantages. For example, the curriculum moves at a pace commensurate with learning rates, so more learning occurs and motivation builds. Also, the topics of most interest are introduced at developmentally appropriate times, so more enjoyment is experienced, which augments motivation. Moreover, such environments also foster advantageous indirect benefits, by placing talented students who enjoy academic challenges in social milieus where they feel free to express their genuine love of learning and receive peer support rather than ridicule for doing so (Benbow & Stanley, 1996). In sum, satisfaction and satisfactoriness operate to maximize positive and negative reinforcement and minimize positive and negative punishment (see Figure 3). Herein is the mechanism that sustains commitment to developing skills over extended time frames. This applies not only to the development of eminence but also to less noteworthy accomplishments like securing an advanced degree.

Support for these ideas is found in the subjective reports of intellectually talented students who have had an appropriate developmental placement experience (Benbow et al., 1996; Benbow & Stanley, 1996).[2] The reports tend to be overwhelmingly positive. In addition, our experience over the past 10 years with summer residential programs for the gifted has revealed that 40% of the participants return the following summer for further educational experiences tailored toward their capabilities and interests. We

Figure 3
Consensual Mood Structure



Note. Adapted from Watson and Tellegen's (1985) outline of the structure of affect, with the additions of two contingencies of punishment (+ for positive punishment and − for negative punishment) and reinforcement (+ for positive reinforcement and − for negative reinforcement). These punishment and reinforcement contingencies illustrate how exogenous events serve to moderate affect. Specifically, this figure is adapted from "Toward a Consensual Structure of Mood," by D. Watson and A. Tellegen, *Psychological Bulletin, 85,* p. 221. Copyright 1985 by the American Psychological Association. Adapted with permission.

[2] For evaluating meaningful outcomes for gifted youth, some remarks about realistic criteria are in order. The study of extraordinary intellectual abilities invariably turns to genius, an infinitely small subset of the intellectually talented population (e.g., Einstein, Picasso, and Eliot). They represent approximately one in a million people. Even so, some have considered the forecasting of genius to be a critical goal of talent development procedures. However, this criterion is unrealistic. The base rate for genius is simply too miniscule (and the chance factors too harsh) to make doing so justifiable. What is more, all of the necessary endogenous and exogenous factors conducive for this degree of development have to co-occur in the proper zeitgeist; the culture has to be receptive to the products generated. To be sure, spurred on by optimism spawned by the early testing movement, Terman (1925; Terman & Oden, 1959) probably fostered this criterion himself by unfortunately calling his longitudinal study *Genetic Study of Genius*. We now know that there is much more to genius than simply ability. Models are available for better understanding how genius does indeed come about, however; interestingly, there is a consensus about certain attributes (Eysenck, 1995; Gardner, 1993; Jensen, 1996; Simonton, 1988, 1994; Zuckerman, 1977).

do, however, observe a robust gender difference that is nationally characteristic of summer residential programs for the gifted. Although both boys and girls evaluate these opportunities positively, girls tend to report more positive effects. Our interpretation of this finding is that peer pressure on gifted girls is harsher in contrast to the pressure experienced by gifted boys. Hence, when talented girls are placed in an environment where the pressure not to achieve is essentially absent, they not only enjoy the reinforcing experience but also are especially relieved by the absence of punishment. Indeed, they often report finally being able to "be themselves."

Conceptualizing States of Excellence

In Nicholas Hobbs's (1958, p. 595) list of criteria for becoming "the compleat counselor," he lists first "become a good general psychologist" and remarks, "I have been impressed over and over again by the frequency with which pure science psychology provides new directions for various kinds of applied endeavors." In this spirit, we attempt to tie the thread running through TWA's correspondence dimensions, satisfaction and satisfactoriness, to other concepts in psychological literature.

Satisfaction, Satisfactoriness, and Other Psychological Concepts

We suspect that satisfaction and satisfactoriness cut across multiple aspects of life; if we are correct their implications could be very broad. Lofquist and Dawis (1991) supported this idea by linking these two outcomes to Freud's *pleasure principle* (people seek to avoid pain and achieve gratification, or TWA's satisfaction) and *reality principle* (i.e., the demands and requirements of the external world, or TWA's satisfactoriness). Tellegen (1981) has spelled out a distinction between two similar mental sets: *experiential* (or respondent) and *instrumental* (or operant). As one might infer from Tellegen's distinction, which builds on a Skinnerian framework, *Premack's principle* runs through these concepts (and is also embedded in TWA): To predict which environments an individual is likely to enter, work in, and thrive in, you must not only know what they can do (their abilities, or capabilities), you must also know what they want (their interests, needs, or motives).

These distinctions all contrast a positive experience, highly reinforcing in and of itself (unconditionally, often outside of any pragmatic utility), with one of more striving, planning, decision making, and active pursuit. Other distinctions loosely coupled with the foregoing include Bakan's (1966) *communion* and *agency*, Fromm's (1979) *receptive* and *active modes*, Koch's (1956) *intrinsic* and *extrinsic modes*, Maslow's (1968) *B-Cognition* (for *being*) and *D-Cognition* (for *doing*), and Parsons and Bales's (1955) *expressiveness* and *instrumentality*. Can these sets of contrasting concepts help in better understanding the reports of world-class performers about their subjective experiences during or after a brilliant accomplishment? How about other subjective "highs" that co-occur with less spectacular achievements but nevertheless require vigorous concentrated efforts to develop?

The familiar illustration that comes to mind (found in some introductory psychology texts) is the side-by-side photographs used to exemplify self-actualization. One is of a young boy, proudly holding his pet rabbit and the blue ribbon they just earned at the fair. The photograph next to this is typically that of a Nobel laureate and the trophy for this achievement. The adjacent photographs poignantly illustrate how similar affective states can co-occur with highly disparate accomplishments. Yet, these achievements are developmentally appropriate and tailored to the abilities and interests of the participants; they also undoubtedly share similar affective qualities. Can the model we have been developing shed light on such phenomena? We think so.

Effectance Motivation

White (1959) has argued that prolonged bouts of problem-solving behavior directed toward a distant goal serve to generate acquired motives:

> I shall argue that it is necessary to make competence a motivational concept; there is a competence motivation as well as competence in its more familiar sense of achieved capacity. Moreover, when this behavior gives satisfaction it involves the transaction of person and environment (the effect each has on the other). (p. 318)

White (1959) refers to the development of the type of motivation (motivation that develops from having an instrumental effect on the environment) called *effectance*. Importantly, effectance is self-generated endogenously rather than being exogenously administered. It appears to be an emergent person–environment phenomenon:

> It is constantly circling from stimulus to perception to action to effect to stimulus to perception, and so on around; or, more properly, these processes are all in continuous action and continuous change. Dealing with the environment means carrying on a continuing transaction which gradually changes one's relation to the environment. Because there is no consummatory climax, satisfaction has to be seen as lying in a considerable series of transactions, in a trend of behavior rather than a goal that is achieved. It is difficult to make the word "satisfaction" have this connotation, and we should do well to replace it by "feeling of efficacy" when attempting to indicate the subjective and affective side of effectance. (pp. 321–322)

Hence, genuine feelings of self-efficacy are the result of many behavior-dependent products or, more specifically, products dependent on competent (effective) behavior. This supports Allport's (1946) insight: positive development unfolds not only because of what individuals do but also because of the effects their behaviors have on the environment. We hypothesize that teaming dominant abilities with regnant interests and concentrating development toward a correspondent goal enhances the development of effectance motivation.

Csikszentmihalyi (1993) has noted interconnections between his concept of *flow* and many other concepts, including Maslow's (1968) *peak experiences*. Could it be that underpinning much of what is meant by experiencing flow or having a peak experience is the subjective experi-

ence of effectance motivation—more specifically, an experiential state engendered when complex performances emerge in highly correspondent environments, performances that require an extraordinary commitment of concentrated effort to develop and for which these extraordinary efforts contribute to the development of sustaining *opponent processes* (Landy, 1978; Solomon, 1980)? This seems to follow from White's (1959) position on the development of effectance motivation, something not unlike a "mechanism becomes drive" phenomenon, which engages concurrently with or after a seemingly effortless but impressive performance.

Educational Implications

If the above analysis has merit, it suggests that educators should concentrate on developing students' satisfactory behaviors, which are structured around students' most salient attributes, and finding environmental niches within which they are likely to be genuinely reinforced (for developing their capabilities) rather than focusing on feelings (and reinforcing indiscriminately). Flow experiences would then engender cascades of indirect effects, not only for the gifted but for all students, because if this analysis is correct, it would be impossible to feel depressed or have low self-esteem while experiencing flow. Maybe educators who shifted away from the development of skills to the development of "positive feelings" did students a disservice. At least White (1959) appeared to believe that in their most genuine form, feelings of self-efficacy co-occur with or result from the development and execution of complex skills. Perhaps educators should concentrate on recognizing and reinforcing successive approximations toward instrumentally effective skills. That is, they should focus on developing the capacities to do the same thing a little better every day, or continuous improvement, which the Japanese call *kaizen* (Secretan, 1997, p. 49).

With respect to developing true excellence, there probably will never be any quick fixes. Excellence takes time. Perhaps it would be good for educators and policy makers to acknowledge this more frequently, as others already have. For example, when it was pointed out to Ignatz Jan Paderewski (the great Polish pianist) that he was a genius, his response was "Yes, and before that I was a drudge."

Educators probably should focus not on the aforementioned unconditional feeling states but rather on their conditional instrumental counterparts whose development naturally engenders them. Being interested in developing effective behaviors and reinforcing their occurrence is likely to foster positive psychological development. Being unwilling to differentiate between effective and ineffective performances and unwilling to differentially reinforce them is likely to foster something else.

Broader Issues in Counseling and Educating the Gifted

Factors other than empirical evidence often contribute to whether sound research findings are implemented in practice. In this regard, Hobbs's (1958) "The Compleat Counselor" is particularly worth reading. Not infrequently, attendant social issues determine how educational and psychological services are reacted to and distributed (Coleman, 1990–1991; Cronbach, 1975b; Humphreys, 1991). Hobbs (1958) recommended that we attend to issues such as the cultural climate and the tenor of the time. Appreciation of these determinants is not only likely to enhance our effectiveness as practitioners, but doing so may even attenuate the intensity of Cronbach's (1975a) pessimistic appraisal of empirical generalizations in the social sciences (i.e., their "short half-life"). Actually, the psychology of individual differences has amassed an impressive array of empirical generalizations (Lubinski, 1996, 2000), for which highly efficacious interventions that meet the special needs of intellectually talented students are but one example.

In many respects, society has had a volatile relationship with the gifted throughout most of this century (Benbow & Stanley, 1996). One likely reason for this is that educational systems are confronted with an array of overwhelming negative psychological exigencies. In the context of a society replete with drug running, teen pregnancy, and gross underachievement among various demographic groupings, the gifted do not surface as a priority. Relatively speaking, the gifted appeared to be doing just fine. However, they could have been doing much better (Benbow & Stanley, 1996), and society likely would have profited from it. During the 1950s, a lot was known about the special needs of gifted students (Witty, 1951), and distinguished educators and psychologists laced their professional writings with this information. They noted not only the direct effects of tailoring educational curriculum to individual differences in learning rates (Hollingworth, 1926, 1942) but also the positive indirect effects for society (Paterson, 1957; Pressey, 1946a, 1946b; Terman, 1954). In discussing the conspicuous neglect of gifted students and how it was in society's best interest to correct for this, Hobbs (1958) suggested that counseling psychologists should take a leadership role:

> The compleat counselor will also be asked to help in the development of new generations of people trained to levels commensurate with their abilities. We have been prodigal of talent in America, being content to let lie fallow or refuse to cultivate much of our human potential. But things were changing even before the launching of the satellites [Sputnik], and gifted children, after years of neglect in education, are all the rage. One cannot but welcome this change in attitude. Though we suddenly see in teachers' magazines and popular periodicals altruistically toned articles stating the case for the gifted child, we should recognize that this sudden interest in intelligence springs from concern with prospects for national survival. I would hope that our compleat counselor would be one of the most effective people in identifying talented youngsters and in helping to plan educational programs to ensure their fullest development. (p. 598)

These remarks point to some corollary social benefits of investing in gifted students while highlighting society's self-interest in responding favorably to their precocity; it is also the thoughtful thing to do for the individual gifted

child. This midcentury recognition of gifted students was stimulated by Witty's (1951) *The Gifted Child*, within which Hobbs (1951) made a forceful case for their underappreciation as a human capital resource:

> Citizens and experts alike have not generally become aware of the community's significance, for good or ill, in the life of the gifted child. Perhaps the most promising contribution that this volume can make is to bring the potentialities and the particular needs of the gifted child into prominence. (pp. 164–165)

Witty's (1951) volume was indeed successful in this regard (see Terman, 1954, p. 227) and became a landmark in the gifted literature.

Writings such as these and others were synthesized and enlarged in Williamson's (1965) *Vocational Counseling*. This volume provided a solid foundation (empirical, philosophical, and theoretical) for facilitating talent development for all students. It provided the connecting fiber binding applied individual-differences research in educational and industrial psychology, conjoined their powerful person–environment models, and traced their conceptual antecedents to Paterson, Schneidler, and Williamson's (1938) *Student Guidance Techniques* and Viteles's (1932) *Industrial Psychology*. Williamson (1965) is an excellent exemplar of positive psychology. He was especially insightful in his description of how to counsel and design learning environments for future intellectual leaders, particularly through the way he drew on philosophical concepts from the Greeks (e.g., *eudaimonia*, doing excellence).

Yet, looking back, it appears that the compelling exigencies of the 1960s and 1970s shifted focus. Neither Hobbs's (1958) recommendations nor Williamson's (1965) systematic compilation of prior decades of applied individual-differences research were widely assimilated by the next generation of scholars. Although important, the work of Hobbs and Williamson was not seen as a priority. Ironically, this turned attention away from those most equipped to solve the most challenging problems encountered in a highly technical, multicultural, ever-changing society. Nevertheless, research on talent development within this tradition—namely, the individual-differences tradition—has continued (Dawis, 1992; Lubinski, 1996): abilities, interests, and personality are assessed to build models for facilitating positive development (Benbow & Stanley, 1996; Dawis, 1996b; Scarr, 1996).

Today, we know much more about the dimensionality of relevant individual differences dimensions germane to the development of exceptional achievements, as well as how to utilize this information in practice (Benbow, 1991; Benbow & Lubinski, 1996, 1997; Benbow & Stanley, 1996; Lubinski & Benbow, 1995; Winner, 1996). This special issue marks a good time to take stock in what we now know about this special population and the magnitude of psychological diversity within it. In all likelihood, this population contains the most promising human capital for solving the social exigencies facing us. Moreover, the TWA framework provides a cogent model for conceptualizing how all applied psychological specialties, when seen in their most ideal form, might be construed: as sequential complements of one another covering the full range of life span development (through lifelong learning). Namely, when contiguously aligned, the applied psychological precincts appear to form a developmental continuum: educational → counseling → industrial. Child and adult clinical psychology also form a developmental continuum but focus on maladaptive behavior within or in transitioning between stages. Yet, all of these specialties share a common goal: the scientific study of implementing contrasting opportunities, based on individual differences, with the aim of maximizing positive psychological growth at different stages of life span development. That is the essence of talent development.

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