The Scientific Study of Giftedness

Richard E. Mayer

As you look at the crisp night sky, you see that one star stands out – brighter than all others. Perhaps, so it is with giftedness: As you look into a classroom, you see that one student stands out – brighter than all others. Although astrophysicists can explain the nature of an extraordinary star, psychologists continue to struggle with how to conceptualize giftedness. Conceptions of Giftedness provides an up-to-date and diverse collection of ideas about what giftedness is and how gifted students should be educated.

There are many ways to conceptualize giftedness, ranging from practical conceptualizations based on years of experience in working with gifted students to political conceptualizations based on moral principles. However, the distinguishing feature of the scientific study of giftedness is that theories are tested against evidence that has been collected using sound methodologies. The theme of this chapter is that there is value in the scientific study of giftedness, that is, in using an evidence-based approach to assessing the usefulness of various theories of giftedness and in assessing the effects of various academic programs for gifted students.

Five Questions about Giftedness

In the book’s introduction, the editors – Robert J. Sternberg and Janet E. Davidson – begin by listing five questions about giftedness that each author was asked to answer. I attempt to answer the five questions – which are listed in Table 24.1 – based on work presented in these chapters. Then, I briefly offer my opinion concerning future directions for the field.

What Is Giftedness?

Although the authors differ on how to define giftedness, they often agree on the dimensions along which the definition must fit. The top portion
Richard E. Mayer

TABLE 24.1. Five Questions About Giftedness

<table>
<thead>
<tr>
<th>Question</th>
<th>Tentative (Short) Answer</th>
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<tbody>
<tr>
<td>1. What is giftedness? Is giftedness general or specific?</td>
<td>Extraordinary achievement in a field</td>
</tr>
<tr>
<td>Is giftedness potential or achieved?</td>
<td>Specific</td>
</tr>
<tr>
<td>Is giftedness learned or innate?</td>
<td>Achieved</td>
</tr>
<tr>
<td>Are noncognitive factors involved in giftedness?</td>
<td>Both</td>
</tr>
<tr>
<td>Is giftedness based on racism, sexism, or elitism?</td>
<td>Yes, such as determination and commitment</td>
</tr>
<tr>
<td>2. How do conceptions of giftedness differ from one another?</td>
<td>On each of the points listed above (in Question 1)</td>
</tr>
<tr>
<td>3. How should gifted individuals be identified?</td>
<td>Accomplishment in the upper 5 percent of peers</td>
</tr>
<tr>
<td>4. How should gifted individuals be instructed in school and elsewhere?</td>
<td>Acceleration</td>
</tr>
<tr>
<td>5. How should the achievement of gifted individuals be assessed?</td>
<td>Compare programs’ effects on student performance in randomized experiments</td>
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of Table 24.1 lists some questions for framing the debate concerning the definition of giftedness.

Is Giftedness General or Specific? First, is giftedness general or specific, that is, are people gifted in general or only with respect to a specific domain? The consensus among the contributors is that giftedness is specific. For example, Cross and Coleman state that “to be gifted means gifted at something”; Feldhusen notes that giftedness “must be in a particular domain”; Robinson calls for viewing giftedness with respect to what is “required by essential core curriculum”; Plucker and Barab define giftedness as extraordinary achievement “within a specific context”; Monks and Katzko define giftedness as exceptional achievements “in one or more domains”; von Karolyi and Winner define giftedness as exceptional ability “in any domain”; and Brody and Stanley define giftedness as “advanced mental age in specific areas.” In particular, many contributors focus on giftedness within academic domains, which Cross and Coleman call “school-based conceptions of giftedness”; Renzulli calls “schoolhouse giftedness,” and Robinson calls “academic giftedness.”

Although many contributors focus on giftedness in specific school subjects, some offer a broader vision that includes creative production as either a complement or alternative to academic giftedness. For example, Renzulli distinguishes between two types of giftedness – “schoolhouse giftedness” and “creative–productive giftedness,” whereas Callahan and Miller make...
a similar distinction between “academic activism and problem-solving innovators.” Going somewhat further, Runco argues that creativity and originality are the defining features of a gifted person, and Cross and Coleman state that “giftedness is a combination of advanced development and creativity.” In spite of these more inclusive conceptions, the dominant conception of giftedness presented in this collection is that giftedness should be defined with respect to specific domains, particularly school subjects. Given that the field of giftedness research is still striving to emerge as a scientifically rigorous field of study, I agree that it makes sense to focus initially on the study of giftedness in specific academic disciplines.

Is Giftedness Potential or Achieved? Perhaps the most contentious definitional issue concerns whether giftedness refers to potential – the ability to attain high achievement in the future – or achievement – demonstrated high performance in the present. On the side of potential, Monks and Katzko define giftedness as “an individual’s potential for exceptional or outstanding achievement …” and VanTassel-Baska’s definition includes the “promise for original contributions to a field.” On the side of achievement, Plucker and Barab define giftedness as “extraordinary achievement,” Ziegler defines giftedness in terms of “particularly effective actions,” and Walberg and Paik argue that “accomplishment rather than potential is the best indication of giftedness.”

Is there a compromise in which the definition of giftedness includes “evidence of potential as well as performance” (as suggested by VanTassel-Baska)? Cross and Coleman offer a compromise in which giftedness is “an age-specific term” that refers to potential for younger students and performance for older students. Similarly, Subotnik and Jarvin suggest three age-based stages of giftedness – an early stage in which ability develops into competence in a domain, a middle stage in which students demonstrate precocious achievement of expertise, and an adult stage marked by eminence in performance, such as scholarly productivity or artistic contribution. Thus, an interesting compromise that makes sense to me is to view giftedness as an age-specific term that refers to potential for the beginning stage, achievement for the intermediate stage, and eminence for the advanced stage.

The potential-versus-achieved debate is also reflected in the way that some scholars use “ability” or “talent” in their definitions of giftedness. For Robinson, giftedness involves “unusually high ability”; for Simonton, giftedness involves “exceptional abilities or capabilities”; and for Brody and Stanley, giftedness involves “exceptional ability.” Such definitions appear to favor the potential view of giftedness because ability refers to the potential to learn and develop; however, in some cases, the scholars propose using achievement tests to measure these abilities, an approach that seems to favor the achieved view. A compromise is that giftedness is reflected in
precocity – developing or learning at a faster rate than one’s cohort. For example, Feldhusen notes that gifted students “learn rapidly and get far ahead of age mates,” Cross and Coleman state that gifted students “have demonstrated rapid learning in comparison to peers,” and von Karolyi and Winner observe that gifted students are “ahead of schedule in their interest and mastery of a particular domain.” In my view, including precocity in the definition of giftedness – at least in the first stage – makes sense and offers a way of using observations of achievement as indications of gifted potential.

Is Giftedness Innate or Learned? A long-standing debate among giftedness researchers concerns whether gifted individuals are born or made. On the side of the innate view, from the very beginning in the 1800s, Galton (1869) argued that giftedness was inherited. Current proponents of the innate view include Simonton’s claim that giftedness involves “natural endowment” that is “in some way innate.” Similarly, von Karolyi and Winner reject the idea that giftedness depends mainly on sustained practice because precocity appears prior to practice. Robinson reports a study in which infants who were assessed to have high intelligence tended to achieve extremely high IQs as adults. On the side of the learned view, all of the authors recognize that people’s experiences are crucial for their development as gifted individuals. For example, in Reis’s case studies of 22 gifted American women, the distinguishing characteristics included nurturing families and childhood experiences that did not undermine self-confidence. Feldhusen notes that giftedness requires a large knowledge base that is achieved through sustained practice, and Walberg and Paik report on case studies of eminent people that show “huge advantages to starting a scientific career early.”

A reasonable compromise is to acknowledge that giftedness depends on both natural endowment and life experiences – that is, giftedness is both innate and learned. The development of giftedness depends on appropriate experiences – including social support and a rich learning environment – as well as above average natural ability.

Are Noncognitive Factors Involved in Giftedness? Mainly on the basis of case studies of gifted people, many of the authors point to the role of noncognitive factors in fostering the development of giftedness. Reis notes that in a biographical study of 22 gifted American women, noncognitive factors such as intensity about one’s work, belief in one’s self, determination, and motivation were common themes. In a study of the biographies of eminent people, Walberg and Paik found that common traits were force of character, independence, and a tendency to “find books more interesting than people.” Renzulli makes the case that task commitment (or diligence) is as important as intellectual ability and creativity in determining
The Scientific Study of Giftedness

giftedness. von Karolyi and Winner claim that gifted students have a “rage to master” in their domain. In summary, there is ample reason to further investigate the idea that noncognitive factors – such as determination – play an important role in giftedness.

Is Giftedness Based on Racism, Sexism, and Elitism? Some of the authors raise the specter that racism, sexism, or elitism may be tied to the concept of giftedness. Borland argues that the fact that minority students are underrepresented in gifted programs is evidence that “the practice of gifted education is rife with inequities that have been extremely difficult to eliminate.” According to Borland, the underrepresentation of poor children and children of color in gifted programs “perpetuates vicious inequities in our society.” Gordon and Bridgall similarly call attention to the “under representation of students of color among populations of gifted students,” but they also point to a gifted program that has been successful in recruiting such students. Reis observes that “fewer women than men achieve at levels that would enable them to be identified as gifted” and notes that the reasons for the discrepancy include “life events especially involving relationships with partners, loved ones, and children.”

In contrast, Robinson argues that the underrepresentation problem reflects a larger social problem that is not unique to gifted programs: “We all regret the imbalance of racial, ethnic, and socioeconomic groups in special classrooms, but the solution requires the involvement of the whole society.” In short, the fact that students show different levels of accomplishment does not in itself constitute evidence that gifted programs are inherently racist, sexist, or elitist. Instead, the guiding principle is that all students deserve the opportunity to develop to their full potential. Brody and Stanley note that all students do not achieve equally in all areas, even when they are given equal opportunities. Thus, the goal of gifted instruction as well as all education should be to help students develop as fully as they can.

Overall, giftedness can be defined as extraordinary achievement in a field. This definition is consistent with the idea that giftedness is specific rather than general, achieved rather than potential, both learned and innate, related to noncognitive factors such as determination, and not based on racism or sexism.

How Do Conceptions of Giftedness Differ from One Another?

The second section of Table 24.1 concerns differences among conceptions of giftedness. All authors point to difficulties in conceptualizing giftedness, but there appear to be three approaches to how to deal with the difficulties. In one camp, for example, are those who claim that the concept should be dropped altogether. Borland takes the hard stand that “the concept of the
Richard E. Mayer

gifted child is logically, pragmatically, and morally untenable” and “the concept of giftedness has outlived whatever usefulness it once may have had.” Robinson states that “the term gifted and the term talented have outlived their usefulness” and that “we have little consensus about what constitutes these concepts.”

In another camp are those who note the overwhelming conflicts in conceptualizing giftedness. Freeman observes that “there are perhaps 100 definitions of giftedness around,” whereas Monks and Katzko state that “a concise definition is almost impossible.” Gagné adds that “conceptions abound and often contradict one another.” In a particularly blatant example, Gagné points out that talent sometimes is used to mean the potential to become gifted, whereas at other times it is used to mean a gifted level of achievement or performance.

Finally, in a third camp are those who, although cognizant that the field is emerging, have attempted to offer useful conceptualizations. Renzulli, for example, recognizes that “we will always have several conceptualizations . . . of giftedness” but goes on to offer a “three-ring” conceptualization based on “above average mental ability, creativity, and task commitment.”

I find myself in the third camp. In response to the first camp, I do not think it makes sense to ignore individual differences and especially to ignore the overwhelming evidence that people learn at different rates and to different levels of mastery. However, a careful reading of the critiques of the concept of giftedness suggests that the main criticism is not that people are all the same, but rather that there is not a hard-and-fast dividing line between the “gifted” and the “nongifted.” In response to the second camp, I do not think it makes sense to give up on trying to understand giftedness just because it is a difficult task. Again, a careful reading of these critiques is not that we should give up, but rather that we should acknowledge the complexity of the issue. The third camp makes the most sense to me, and many of the authors have made progress in defining giftedness – as I document in the foregoing section.

How Should Gifted Individuals Be Identified?

Potential or Accomplishment. The third portion of Table 24.1 concerns how to identify gifted people. Monks and Katzko offer an important justification for finding an appropriate identification method: “If we follow the principle that everyone is to be given the opportunity to develop his/her full potential and talent, then identification is essential.” In seeking to accomplish this goal, the authors tend to focus on two methods for identifying gifted individuals – potential and accomplishment. For example, Jeltova and Grigorenko distinguish between potential giftedness (i.e., potential) and actual giftedness (i.e., accomplishment).
On the one side are those who favor identifying gifted people on the basis of ability or achievement test scores. Potential (sometimes called talent) involves possessing outstanding natural abilities as measured by standardized test scores that place a student among the top of age-peers in a field. Cognitive ability tests – including intelligence tests – have been widely used to identify gifted individuals, including Terman’s (1925) famous studies of gifted individuals. Robinson calls for “selecting students on the basis of cognitive abilities and skills” as measured by “traditional psychometric ability and achievement measures and other observations that are codified by objective criteria.” Sternberg describes tests that measure cognitive abilities related to giftedness – namely, the Sternberg Triarchic Abilities Test. Similarly, Brody and Stanley identified gifted mathematics students on the basis of exceptionally high performance on mathematics and verbal achievement tests. Gagné noted that gifted individuals can be identified on the basis of talent, which can be defined as outstanding mastery of knowledge and skills that place a student among the top of age-peers in a field. Feldhusen notes that “high IQ” was one of the original measures of potential giftedness.

In contrast, on the other side are those who favor identifying gifted people on the basis of extraordinary performance. Accomplishment refers to the idea that gifted individuals exhibit extraordinary performance on some objective measure. In their youth, gifted people are precocious – showing extraordinary speed and commitment in mastering a domain – and, in adulthood, they are high achievers – showing extraordinary levels of productivity. For example, Jeltova and Grigorenko favor identifying gifted individuals based on performance on academic tasks compared with other students. An example of such an approach involves Olympiads – academic contests similar to spelling bees – in various scholarly disciplines, which are widely used in Russia. Heller, Perleth, and Lim explore the use of talent searches. Walberg and Paik call for objective measures of accomplishment in children (such as winning a science fair) and objective measures of eminence in adults (such as exceptional productivity in one’s field). VanTassel-Baska calls for assessing performance using portfolio assessment or performance assessment, but others have criticized such measures for not being sufficiently reliable.

Several authors explicitly criticize standardized ability tests. Plucker and Barab argue that such tests “tell us very little about giftedness … because they examine behavior out of context.” Cross and Coleman argue that “performance is the key” and state that they “would abandon the widespread use of ability measures in the identification of children who are gifted.”

Is there a resolution to the apparent disagreement between assessment based on potential versus assessment based on accomplishment? In my opinion, the most convincing elements in both views are performance,
domain specificity, and objectivity. The most useful measures of accomplishment focus on objective performance within a specific field – such as a high school student winning a science fair or an adult winning a Nobel Prize. The most useful measures of potential also focus on object performance within a specific domain – such as a middle school student scoring at the 98th percentile on a mathematics achievement test intended as a college entrance exam. In short, gifted individuals should be identified on the basis of extraordinary performance on authentic tasks. For children, extraordinary performance can be manifested as precocity in a field, and for adults, extraordinary performance can be manifested as productivity in a field.

**How Should “Extraordinary” Be Operationalized?** If giftedness is defined as extraordinary achievement in a field, then it is important to specify what level of achievement constitutes an extraordinary level. Most often, giftedness is defined as achievement in the upper 5 percent of one’s cohort, although the percentage ranged from 1 to 20 percent among the chapter authors. On the conservative side, Robinson focuses on students whose scores are in the upper 1 percent to 3 percent in relation to peers, and Brody and Stanley focus on the upper 3 percent. On the liberal side, Gagné chooses to focus on the upper 10 percent and Gordon and Bridgall select the upper 15 percent. In between, Freeman defines “extraordinary” achievement as performing in the upper 5 to 10 percent in relation to one’s peers, and Renzulli notes that the percentage used to characterize gifted achievement ranges from 1 to 20 percent in the literature. Thus, a reasonable compromise is to identify gifted students as those performing in the upper 5 percent of their cohort.

**How Should Gifted Individuals Be Instructed in School and Elsewhere?**

**Acceleration versus Enrichment.** The fourth section of Table 24.1 concerns gifted instruction. There is overwhelming consensus among the authors that gifted students need instruction that is accelerated and differentiated, that is, instruction at a faster rate and at a higher level than standard instruction. In contrast, the authors offer little support for instructional programs based on enrichment – in which gifted instruction is at the same rate as regular instruction, but offers extra activities. Cross and Coleman observe that “acceleration has been shown to be a stronger intervention for advanced development than enrichment.” Based on their well-known program to teach “mathematically precocious youth,” which serves thousands of students in 23 sites around the nation, Brody and Stanley rely on acceleration because “children learn at different rates” and “effective teaching involves a match between the child’s readiness to learn and the level of content presented.”
Gordon and Bridglall describe the Meyerhoff Scholars Program for gifted students, which includes acceleration as a key ingredient. VanTassel-Baska notes that gifted instruction should differ from regular instruction with respect to rate of instruction and complexity of the material.

Gifted instruction needs to be differentiated even among gifted students. Callahan and Miller propose that academic activists – extremely high-achieving students – need acceleration, whereas problem-solving innovators – extremely creative students – need highly challenging environments. Importantly, gifted instruction can help students who might not be labeled as gifted. Renzulli reports a study in which students in the upper 20 percent benefited just as much from gifted instruction as did those in the upper 5 percent.

In summary, the consensus is that gifted individuals should receive differentiated curriculum and instruction, relying on acceleration.

**How Should the Achievement of Gifted Individuals Be Assessed?**

The final section of Table 24.1 concerns how to assess the success of gifted students. Although many authors do not directly address this question, the responding authors seem to have reached consensus that the effectiveness of gifted programs should be assessed by measuring the learning outcomes of students who have been instructed in various programs. This answer has two important elements: (a) The independent variable should be the type of instructional method; and (b) the dependent measure should be objective measures of learning outcomes, such as performance on authentic tasks.

However, in spite of some agreement about the need for experimental assessments of gifted programs, there is also criticism that this need is not being adequately met. Freeman states that she “has not yet found a single scientific comparison between specified gifted programs.” Borland claims that “there is little evidence that [gifted] programs are effective.” Robinson notes: “There do not seem to exist the precise data we would wish” concerning “performance in academically rigorous programs for gifted students.”

In short, gifted programs should be compared with each other using randomized experimental designs, with student performance on academic tasks as a major dependent measure.
Richard E. Mayer

**Table 24.2. What Is Needed and Not Needed in the Scientific Study of Giftedness**

<table>
<thead>
<tr>
<th>Need Less Like This</th>
<th>Need More Like This</th>
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</thead>
<tbody>
<tr>
<td>Vague and conflicting definitions</td>
<td>Consensus definitions</td>
</tr>
<tr>
<td>Unspecified measures</td>
<td>Straightforward objective measures</td>
</tr>
<tr>
<td>Broad, untestable models</td>
<td>Clear testable theories</td>
</tr>
<tr>
<td>Sweeping speculations</td>
<td>Conclusions based directly on evidence</td>
</tr>
<tr>
<td>Anecdotes</td>
<td>Valid scientific data</td>
</tr>
<tr>
<td>Descriptions of programs</td>
<td>Controlled evaluations of programs</td>
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*Giftedness* provide an overview of the state of research and theory on giftedness. The book shows that the study of giftedness is an old research area dating back to Galton’s (1869) pioneering work in the 1800s, but that today, those studying giftedness are grappling to build a new research area that is coherent and sound. In my opinion, a major potential contribution of this book is to stimulate thinking and discussion about the nature of giftedness and how it can be studied scientifically.

On the negative side, the inconsistencies among the contributing authors highlight just how much work remains to be done. In my opinion, this book helps demonstrate the need for giftedness to continue to develop into a scientific field of study in which practical issues are addressed in the context of scientific evidence and testable theories. It is clear that everyone has opinions about giftedness and how it should be addressed in schools; however, for the field to continue to move forward, what is needed is to move from the realm of opinions and speculations to the realm of the scientific study of giftedness. My reading of the book indicates that there is much to be done in six major areas: creating consensus definitions, devising objective measures of giftedness, generating testable theories, drawing evidence-based conclusions, gathering scientifically reliable data, and conducting scientifically valid evaluations. Table 24.2 lists what is needed and what is not needed in the scientific study of giftedness.

First, what exactly do we mean by terms such as *gifted* and *talented*? Instead of generating definitions based on various philosophical perspectives, we need consensus definitions based on objective evidence and reasoned argument. In the foregoing section titled “What is giftedness?” I tried to make progress toward a consensus definition based on the idea that giftedness is exceptional performance in a particular domain. Such a definition may be useful because it can lead to objective measurements that have validity, particularly within authentic academic disciplines.

Second, how should we measure giftedness? Instead of unspecified measures of giftedness, we need straightforward measures of giftedness that are objective, valid, and reliable. In the foregoing section on how gifted
individuals should be identified, I offered suggestions for how to create such measures of accomplishment based on the existing work in the field.

Third, how does giftedness happen? Instead of generating broad conceptual models that do not lead to testable predictions, what is needed are clear, testable theories of giftedness. Renzulli’s three-ring model is an example of a long-term effort to achieve this goal, although more work is needed to clarify the underlying cognitive mechanisms.

Fourth, what do we know about giftedness? Instead of offering sweeping speculations and unsupported claims, we need conclusions based directly on scientific evidence. Many of the authors noted the need for basing educational practice on research evidence.

Fifth, how should giftedness be studied? Instead of anecdotes about gifted people, what is needed is valid scientific evidence. Carefully conducted case studies certainly have much to contribute, and several such studies are presented in this volume. However, hypothesis-based experimental tests based on relevant empirical data are hard to find.

Sixth, how should gifted students be taught? Instead of descriptions of gifted programs, what is needed is a commitment to conduct controlled evaluations of programs in which gifted programs are compared with each other and to conventional instruction. Several authors point out that the literature currently does not contain many such studies.

In summary, research on giftedness will advance to the degree that it matures as a scientific field of study. The characteristics of the scientific study of giftedness are that giftedness be clearly defined and measured, that theories of giftedness be clear and testable, that conclusions about how to identify and teach gifted students are based on evidence, that research methods that generate valid and reliable data are used, and that gifted programs are evaluated in controlled experimental trials.

References