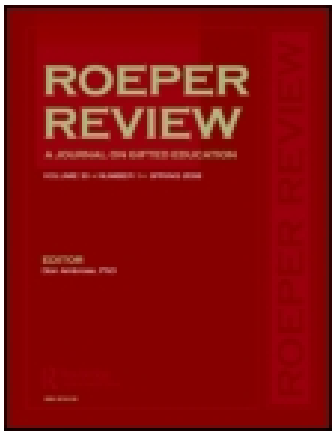

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Leta Hollingworth's contributions to above-level testing of the gifted

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time when things were both easier and better, one does not have to take such a simplistic view to suggest that much is yet to be learned from the study of our field's history. Not only did Hollingworth and her contemporaries wrestle with many of the problems that continue to confront us, but these individuals from our past can further serve, in many respects, as models for us today.

At the very least, attention to our history as a field would do much to rehabilitate the reputation of Leta Hollingworth. This is long overdue. For by any reasonable standard of quality and quantity, the work of Leta Hollingworth is second to that of no other individual who has turned his or her attention to the nature and needs of the gifted.

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Leta Hollingworth's Contributions to Above-Level Testing of the Gifted

Julian C. Stanley

Leta S. Hollingworth (1886-1939) pioneered in above age-and grade-level testing of boys and girls in the New York City area whose IQs were extremely *high. Her deep insights about measuring general and special abilities led to numerous current academic activities on behalf of intellectually highly talented young persons, especially including above-level curricula for them.*

Why should one administer to a student a test much too difficult for the typical person of her or her age or grade level? I call this "above-level" testing. As Leta Hollingworth realized from the start of her career even before the United States entered World War I, students who score perfectly on an in-grade or at-age test cannot be differentiated from each other by it. A current example may help clarify the urgency of above-level testing. The highest attainable score of the College Board's short (50-item, 30-minute) screening Test of Standard Written English (TSWE) is 60. Four percent of the more than a million college-bound high school seniors who took the test during the 1987-1988 academic year earned that top score (College Board, 1988). That was approximately 45,000 examinees, indistinguishable from each other by their TSWE score!

To a highly selective college or university that is screening prospective freshmen, 60 (the equivalent of 600 on the College Board standard scale) is "pretty good." A score of 70, unattainable on the TSWE, of course, would be much better, and 80 would be superb. How would one get this further information? Fortunately, the College Board offers a Test of English Composition, on which the top possible score is 800. The selective schools can use this additional information for

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choosing students who seem most likely to benefit from their rigorous academic offerings.

The problem is analogous to that of trying to measure the heights of men with a measuring stick only 5 feet 10 inches long. The solution is similar, also: Use a longer measuring instrument, say 7 feet long. You'll still underestimate the height of everyone more than 7 feet tall, but persons that tall will be exceedingly rare and can be measured again with a long-enough stick.

Of course, for some purposes, including much criterion-referenced testing, the extra precision may not be needed. For norm-referenced testing, it usually is. Most tests of cognitive aptitudes and achievements are at least modestly valid throughout their entire score range, so the extra information afforded by above-level testing is usually helpful. We especially know this on intelligence tests, where the difference between an IQ of 150 on the 1937 Stanford-Binet Scale and an IQ of 200 on it is (in interval scale terms) as great as that between 100 and 150. Of course, to be useful, the 50 points one youth scores above another must be employed for high-enough cognitive pursuits.

A Cognitive Prodigy

An illustration may make this more convincing. Eight years ago Dr. Camilla Benbow tested a 7-year-old boy and found his IQ to be 199. This youth also was tested by another examiner, who obtained an IQ of 203 for him. How is he scoring on the difficult aptitude and achievement tests nowadays? As a 14-year-old eleventh grader during the 1988-89 school year, he earned the highest possible scores on the College Board Preliminary Scholastic Aptitude Test (PSAT), 80 on Verbal and 80 on Mathematical. The PSAT is the qualifying test for National Merit Scholarships. Only seven other examinees in the entire country, all of them male eleventh graders, scored 80 on both. Undoubtedly, he was the youngest of the eight. At barely age 15 he scored 800 on the SAT-V and 770 on the SAT-M. During the most recent two years for which I have the figures, only 72 and 92 persons, respectively, of more than a million examinees each year scored 800 on the SAT-V.

His National Merit Scholarship type index, 2V + 1M, was 320 points above the 99th percentile (2050) of college-bound male high school seniors. These PSAT and SAT scores were earned with no coaching or special school curriculum. Truly, an IQ of 200 can be far more powerful than any of 150!

This boy's College Board achievement-test scores already have been truly spectacular. In addition, he attained the highest possible score on Advanced Placement Program (college-level) Chemistry and Latin examinations; 800 on College Board Mathematics Level II; 790 on College Board Chemistry and Physics; and 780 on English Composition. At present he is a 15-year-old high school senior, taking five Advanced Placement Program courses.

Hollingworth's Introduction of Above-Level Testing

Hollingworth's first use of above-level testing seems to have occurred in 1916, the year she received her Ph.D. degree. It was reported the following year in her first article about gifted children (Garrison, Burke, & Hollingworth, 1917). She already had published seven articles; this was the turning point in her interests.

By 1922, when she gave a five-year progress report on "Child E" (Hollingworth, Garrison, & Burke, 1922), evidence of her initial interest in "amentia," "feeble-minded women," "the mentally defective," and "echolalia in idiots" had vanished (H. Hollingworth, 1943, pp. 197–204). Henceforth, she worked chiefly with the *de facto* gifted, those with high IQ, preferably 180 or more on Lewis Terman's 1916 revision of the Binet-Simon Scale. She does not seem to have been attracted by handicapped or disadvantaged children of presumed great intellectual potential not well revealed by an intelligence test.

Hollingworth's First Above-180-IQ Examinee

Characteristic of Hollingworth, she began using Terman's revision the year it appeared. Her description of the situation is worth quoting (Hollingworth, 1926, p. 237):

E is a boy, born June 17, 1908. The occasion of first meeting with him was that a child of unusually superior intelligence was wanted for demonstration to a class of teachers, studying the psychology and treatment of exceptional children. Two of E's former teachers of the Horace Mann Kindergarten of Teachers College proposed E, and the child was accordingly brought for demonstration. He had never in his life had a mental test previously, being then 8 years 4 months old. His mental age was found to be 15 years 7 months, yielding an IQ of 187.

"E passed all the 12-year tests with facility and ease, giving responses of excellent quality" (Hollingworth, 1942, p. 141). He also earned 16 more months of mental-age credit at the 14-year level, 15 at Adult, and 12 at the top level, Superior Adult. Thus, even though not yet 8 1/2 years old, E found this wide-range intelligence test fairly easy even at the top. It did not have enough ceiling for him, so the IQ of 187 is almost certainly an underestimate. Also, it was more difficult to reveal an IQ that high on the 1916 version than on Terman's 1937 second revision, so E had almost unbelievable mental ability. For more about him see Montour (1976).

The Binet-type age scale might be considered the original examination suitable for extensive out-of-level testing. Of course, one could administer any test to persons of an age for which it typically is inappropriately easy or difficult.

Hollingworth saw clearly the need for extreme above-level testing

of unusually high-IQ boys and girls: "In the spring of 1920 E took the Thorndike Mental Tests for Freshmen, for entrance to Columbia College of Columbia University.... He was at this time 12 years 0 months old; the median age of his competitors was about 18 years" (Hollingworth, 1942, p. 147). Yet he ranked number 2 out of the 483 then entering Columbia College.

"On September 29, 1921 [at age 13 years 3 months], E was examined by means of the Army Alpha...for the purpose of recording his mental development" (Hollingworth, 1942, pp. 147-148). He found this test quite easy and scored extremely high on two successively administered forms.

"In April, 1927 [at age 18],...E took E. L. Thorndike's IER Intelligence Scale CAVD," top five levels. He scored 2.9 standard deviations above the average of "college graduates in first-rate professional schools, ranking with the best minds revealed in any groups so far tested. These groups may each be expected to include some of the best intellects existing. The comparative groups are, of course, considerably older than E....A score of 441 [which he earned] on the IER Scale corresponds to a score of about 116 on the...Thorndike Tests for College Freshmen. The top one percent of college graduates makes a score of 108 or better on the latter test. E, therefore, surely rates at least in the top one quarter of one percent of college graduates" (Hollingworth, 1942, pp. 148-149). At that time E was about the average age of college freshmen.

What a dazzling array of above-level testing E underwent! From it, Hollingworth concluded that his intellect had held up well. At age 8 he was 7.4 standard deviations superior in IQ "as compared with the generality of 8-year-olds. It seems likely that in these later measurements he rated at about the same status, in relation to the generality of 18-year-olds, since his status is plus [2.9 standard deviations] in relation to highly selected pupils of college graduates" (Hollingworth, 1942, p. 149).

Hollingworth's first case of a young person with an IQ above 180 in that psychometrically fateful year of 1916 whet her appetite for further above-level testing. Although, as a colleague of the great psychologist E. L. Thorndike at Teachers College of Columbia University, she was partial to his two tests and to the Army Alpha Examination developed during World War I, she did experiment much with others.

More Examples

At age 13 years 7 months while in the tenth grade, male child C took a battery of specific "aptitude" tests normed on freshmen (females) at Barnard College, a highly selective school. His scores ranged from 2.2 standard deviations above their average on Word Building to 0.6 s.d. below it on Verb-Object Associations. His median score was 0.08 s.d. above.

At the same age, C "was also given the Rosanoff High Standard Frequency Test (Word Association) based on Class A words only" (Hollingworth, 1942, pp. 115-116). He scored far above all norm groups, even master's-degree recipients and those adults starred in *American Men of Science.*

Child F, at age 19, took the Cooperative General Culture Test and scored higher than superior college graduates. His performance at age 20 on entering achievement tests at the University of Chicago startled even the experienced examiners there. "On the freshmen classification tests his performance was as follows: first in the vocabulary test; first in the reading test; second in the Intelligence Test of the American Council [on Education]; third in the English placement test; third in the physical science placement test...in the freshman class of about 750 students. In addition, he took four Comprehensives with the following grades; Biological Science, A; Humanities, B; Social Sciences, A; and Physical Sciences, D" (Hollingworth, 1942, p. 171). Thus, because of poor health a freshman for the third time, F completed his B.A. degree in just one year.

At age 11, Child G earned the highest score on the Terman Group Intelligence Test among the nearly 28,000 male and female graduates of elementary schools who were applying for admission to the high schools of New York City. Even this test may have been too easy for him. He also was tested extensively at ages 8 to 10 with a variety of aptitude and achievement tests; he scored extremely high on most of them.

One could give many more examples of how ingenious Hollingworth was in finding various intellectual standards of comparison for her above-180-IQ protégés. By comparison, Terman seems to have used mainly one specially constructed examination, his Concept Mastery Test, to assess the educational level of his gifted group at approximately age 40 (Bayley & Oden, 1955). Quite unfortunately, Hollingworth died before any member of her high-IQ group was more than 31 years old. Child I was only 10. It remained for her husband, psychologist Harry Hollingworth, to piece together material about the 12 above-180-IQ youths and publish it under her name three years after her death (Hollingworth, 1942).

Hollingworth's Influence on My Work

Leta Hollingworth was born in a dugout in rural Nebraska three months before my father was born on a farm in south Georgia. By the time I was born, she was already 32 years old. We never met. At the time she died, I was 21 years old and into my third year of teaching science and mathematics in a large urban high school. Yet her work and example have had a profound effect on my professional life.

In my graduate classes at Harvard, 1945-1948, her publications were sometimes cited. Foremost among them was the now-classic 1942 book, *Children Above 180 IQ Stanford Binet: Origin and Develop-*

ment. I feel sure that this led to my eighth published article, two years after leaving Harvard, a technical piece entitled "On the Adequacy of Standardized Tests Administered to Extreme Norm Groups" (Stanley, 1951).

Three years later came an address at the University of Chicago entitled "Identification of Superior Learners in Grades Ten Through Fourteen" (Stanley, 1954). Four years after than, my first article about the academically talented themselves appeared under the title "Providing for the Gifted by Means of Enrichment of the Curriculum" (Stanley, 1958). Then came "Enriching High-School Subjects for Intellectually Gifted Students" (Stanley, 1959a) and "Test Biases of Prospective Teachers for Identifying Gifted Children" (Stanley, 1959b).

Therefore, 10 years after leaving graduate school, I was off and running some of the time in the gifted-child field, but mainly with speculative, hortatory pieces rather than analyses of data. Not until 1971 did the cumulative impact of Hollingworth's influence on my thinking lead to extensive work with intellectually talented young people, which is still going on all over this country and in some foreign lands, especially the People's Republic of China (Stanley, Huang, & Zhu, 1986; Stanley, Feng, & Zhu, 1989).

In 1971 I founded the Study of Mathematically Precocious Youth (SMPY), aided mightily by a generous grant from the then-new Spencer Foundation. The grant did not start officially until September 1, but one of my beginning graduate students, Daniel P. Keating, and I spent all that summer reading or (often in my case) rereading about gifted children. Mostly, this was the work of Terman and Hollingworth. Then we cast around for a simple, objective way to identify youths who reason exceptionally well mathematically. We wanted to help them find special, supplemental educational opportunities to learn mathematics and related subjects such as physics and computer science faster and better than they could usually do solely in their schools.

After experimenting with several tests in our first talent search (Keating & Stanley, 1972; Stanley, Keating, & Fox, 1974), we settled on the mathematical part of the College Board Scholastic Aptitude Test (SAT-M). Soon we defined our target group as those boys and girls who scored at least 500 on the SAT-M before age 13. We wanted to learn as much as possible about such scorers. We knew they were quite precocious, as will be explained, but had only rather vague notions about what this precocity would predict. Would most of these high scorers eagerly become top-flight mathematicians, or at least physicists, computer scientists, or electrical engineers?

How remarkable is it to score 500 or more on the SAT-M before age 13? Fewer than 1 in 100 boys and 1 in 200 girls 12 years old and in the seventh grade would score that well (CTY, 1989). The average college-bound male high school senior scores 498 after many years of studying mathematics; the average for females is 455. How in the world could a seventh grader, who probably had no course work in algebra or geometry, do better than those college-bound seniors? Leta Hollingworth would have known right away, but initially we had to fight some tough battles with incredulous parents, teachers, and prospective entrants into the talent search.

A mother telephoned me and said, frankly, that she thought I was crazy to imagine that any 12-year-old could properly take a difficult aptitude test designed for able high school seniors. Her other son, a 12th grader, was dreading it. I went out on a limb and suggested that her younger son might score nearly as well as the older one. Indeed, this kid in the first year of junior high school surpassed his older brother and earned a higher score than most of the other seniors. That convinced this mother and her friends, but for a while the going was rough.

Many high school math teachers were almost outraged by what they mistakenly presumed to be our attempt to prove that their courses weren't needed. We gathered data, however, that showed a wide range of knowledge of first-year algebra among the high scorers, from little to much. Many knew rather little mathematics itself but were admirably equipped intellectually to learn it fast and well. On the other hand, about half of the young students who scored at least 500 on the SAT-M before age 13 already knew more algebra, as judged by our administration of the Cooperative Mathematics Test, Algebra I, than did half of the eighth-or ninth-graders who already had studied algebra for a full school year. Clearly, they did not need 180 45-or 50-minute periods of instruction, so SMPY devised ways to speed them along into second-year algebra (Stanley, 1986).

The rest is history (e.g., see Stanley & Benbow, 1986). Nowadays, each January more than 100,000 seventh- and eighth-graders across the land take the entire SAT, including its two verbal parts, in the regular national administration. Most of them are registered in the annual talent searches conducted by four private universities: Duke, Johns Hopkins, Northwestern, and the University of Denver. These grew out of SMPY, but independently of it, beginning in 1980 or later. As Leta Hollingworth would have predicted, the search model proved to be powerful and robust.

An illustration may clarify this. In 1989, the Center for the Advancement of Academically Talented Youth (CTY) at Johns Hopkins had nearly 33,000 registrants in 19 states and a few foreign countries who took the SAT (CTY, 1989). Of these, 3,367 scored 500 to 790 on the SAT-M. On the SAT-Verbal, 5,965 scored equivalently—that is, 430 to 800, in the upper 49% of college-bound 12th graders. The 1.8-to-1 verbal-to-math ratio perhaps indicates that participants in the talent search were brighter than they were well prepared in fundamental aspects of mathematics needed to score high on the SAT-M.

Another bit of evidence that this difficult a test is needed for measuring mathematical precocity accurately is the fact that 80 boys and 10 girls scored 700 or more on the SAT-M. Only 6% of college-bound male high school seniors do. This observation in earlier talent searches (Johns Hopkins has conducted 16 thus far) led to SMPY's creating its "700-800 on SAT-M Before Age 13 Group" in 1980 and providing thereafter very special educational stimulation for these 1 in 10,000 young students[1]. Achievements of the 750 members in the U.S. and the 191 in China are phenomenal (e.g., Gross, 1986; Stanley, 1987a, 1987b, 1989; Stanley, Feng, & Zhu, 1989).

Even more remarkable was the 7-year-old in California who scored 670 on the SAT-M the first time he took the test and the 8-year-old in Australia (Gross, 1986) who scored 760. How inadequate a ceiling nearly all the tests they take in school must have!

Of course, SMPY uses many other difficult tests to estimate the intellectual level of its young people. A favorite is the 36-item adult form of Raven's Progressive Matrices. At age 9 the same Australian boy scored 32 and was able to correct his four errors immediately. The average British university student scores 21. No wonder this lad went on to earn a bronze medal in the high-school-level International Mathematical Olympiad at age 10, a silver medal at age 11, and a gold medal the day before his 13th birthday!

Terman's Concept Mastery Test (CMT), designed for 40-year-old adults whose childhood Stanford-Binet IQs averaged about 150, can be used to study individual differences in verbal ability among intellectually exceedingly able young people. The range of CMT scores among members of SMPY's 700-800M group is great.

We also use extremely difficult special tests of spatial relationships ability, mechanical comprehension, and analytical reasoning. (For an illustrative study, see Benbow, Stanley, Kirk, & Zonderman, 1983). It seems that at the top of the ability distribution, no one has a flat profile. Difficult enough tests can differentiate well even among persons who all scored at the 99th percentile at grade level.

Competitions as Above-Level Testing

I already have referred to that superb test of mathematical ability before one has even nearly mastered mathematics, the International Mathematical Olympiad (IMO). Of the approximately 400,000 high school students who take the American High School Mathematics Examination in a given year, about 3,000 score well enough to take the American Invitational Mathematics Examination. Of those, fewer than 100 move on to the U.S.A. Mathematical Olympiad. The top 8 of those get special honors and, along with 16 other extremely high scorers, compete for a place on the 6-person U.S. team in the IMO.

In the IMO itself, there is keen competition among the approximately 50 participating countries. To make a perfect score in the IMO is the pinnacle of mathematical success as a high school student (10 out of the nearly 300 participants, including one American, did so in 1989). To win a gold medal, which does not usually require a perfect score, is a great achievement. A silver medal is a fine accomplishment, and even a bronze medal is not to be sneered at, because half of the contestants win no medal (see Dauber, 1987, 1988).

In college there is the more mathematically demanding Putnam Competition; it involves primarily Americans. At the high school level are the International Chemistry Olympiad and the International Physics Olympiad. In junior high or middle school one has MathCounts. There are Mathematical Olympiads for elementary schools, and so on. This is above-level testing with many associated benefits such as socialization with one's true intellectual peers, travel, meeting new youths as able as oneself or abler, and cooperating with other members of a team on behalf of one's school.

In science, the project-oriented annual (since 1942) Westinghouse Science Talent Search provides plenty of challenge for about 1,400 U.S. high school seniors each year. Three hundred of them get valuable honors. Forty win $1,000 and a one-week stay in Washington, DC, to exhibit their projects and try for $140,000 in college scholarships.

Conclusion

"Ah, but one's reach should exceed one's grasp, or what's a heaven for?" (slight revision of a line written by the poet Robert Browning). Above-level testing enables us to find cognitively advanced boys and girls. It also enables them, their parents, and their teachers to devise ways for them to use the revealed talent(s) to move toward professional or vocational success and a fulfilled life.

[1] To join, send a photocopy of the SAT score report to SMPY, 430 Gilman Hall, Johns Hopkins University, Baltimore, MD 21218. Persons beyond their 13th birthday may qualify by earning 10 additional points per month or fraction of a month. For example, someone 13 years 3 months 2 days old on the day he or she took the SAT would have to score at least 740. Anyone 13 years 10 months 0 days old would need the maximum attainable SAT-M score, 800. For statistical details about SMPY's 700-800 group, see Stanley (1988) and Lupkowski and Stanley (1988).

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Social and Emotional Education of the Gifted: The Discoveries of Leta Hollingworth

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Leta Stetter Hollingworth was concerned with the unique adjustment problems that gifted children experience. In her writings we find insights into the nature of these problems, their impact at different levels of giftedness, and solutions that could be implemented today. Although in any one article she limited her discussion to five or six of these "perplexities," as she called them, I found a total of 11 different issues among her writings on this topic. This article synthesizes Leta's thoughts on the psychosocial development of gifted children and presents her program for "emotional education" of the gifted.

What does it feel like to be a gifted child? What types of adjustment problems are unique to the gifted? Are there "special perplexities in the life of the gifted child, and at what point in the range of intellect (do) these perplexities begin?" (1942, p. 255)[1]. What do these children need for optimal adjustment to occur? These are among the questions Leta Stetter Hollingworth raised and attempted to answer in her lifetime.

Why were questions such as these important to her? She was not particularly interested in predicting the next generation of eminent adults or in searching for a set of universal principles of development. Instead, she was fascinated with the minds of gifted children and sought to understand each child's personal experience. She prized the *individual* (Pritchard, 1951); she considered individual lives irreducible to statistical averages. Pritchard (1951) suggested that her lack of faith in highly statistical research was due in part to her training as a clinical psychologist and in part to her temperament. Consistently ahead of her

[1] All citations with the date but not the author's name are by Leta Hollingworth.

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