

Computer simulations take children to dynamic visualizations and create multiple experiences.

Success in school depends partially on children feeling that at least one staff person at their school likes them. Children often reflect, "One teacher got me through." Through careful listening, teachers can provide a safe place where these children believe that what they think and feel is valued. Among the rewards from children who believe this is trust. And if they trust they may reveal some of their extraordinary visions and sensitivities. This age of information assures that bright children can be nourished with the appreciation and learning they crave. Gifted children can have manifold opportunities to advance society and their own lives, even though they continue to wrestle with the essential problems Leta Hollingworth described over 60 years ago.

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Research

Leta Stetter Hollingworth: A Pilgrim in Research in Her Time and Ours

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Leta Hollingworth's research program spanned three decades (1912-1939) and three areas: psychology of women, mental retardation, and intellectual talent. The last area captured her greatest attention; she completed more than twice as many publications on this topic than in the other two areas combined. This article presents an analysis and characterization of her research, especially her research dealing with gifted children. Leta Hollingworth's research contributions must be viewed as a model to be aspired to even today. She addressed her research questions with scientific rigor, and the best journals published her articles. Yet Hollingworth was committed to both research and service. She tried to enhance the potential of gifted students by providing them with appropriate educational programming. Her research through service to gifted students serves as a cornerstone for the gifted child movement in the 1980s.

In a period when women were excluded from intellectual activities, Leta Stetter Hollingworth was to leave a mark. She managed to rise above a time when "the restriction of women to the mediocre grades of ability and achievement should be reckoned with by our educational systems. The education of women for such professions as administration, statesmanship, philosophy, or scientific research...is far less needed than education for such professions...where the average is the essential" (Thorndike, 1906, p. 213). Leta Hollingworth lived during a time when women were believed to be capable of only average performance. Yet Hollingworth was far above average. She worked hard to fully develop her own talents, as well as those found in others (Benjamin, 1975; H. Hollingworth, 1943; Shields, 1975). Leta Hollingworth

varied from the expected role of motherhood of that time. She eventually achieved the position of full professor at Teacher's College in New York, a truly discrepant and exceptional achievement for a woman of that time. "Varied" and "exceptional" not only describes Leta Hollingworth and her research contributions, but these two words also capture the focus of her research.

Hollingworth's studies were concentrated in three areas: psychology of women, mental retardation, and intellectual talent. In the domain of psychology of women, her earliest area of concentration, Leta Hollingworth was

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presented with the challenge of studying variability.

Psychology of Women

In the early 1900s the prevailing view that women tended toward mediocrity in ability was justified on the basis of greater variational tendency of males. "Psychologically the greater variational tendency of men, as likewise the greater conservative tendencies of women, radiates to every distinctive aspect of their contrasted natures and expressions" (Jastrow, 1915, p. 568). "The greater frequency of amentia among males has come to be rather commonly credited and is sometimes cited as proof of the greater variability of males (Hollingworth, 1913, p. 756). Even her mentor, Thorndike, cited the variability hypothesis as proof that women should not aspire to excellence or eminence. While still a graduate student Hollingworth boldly challenged this viewpoint, which was supported primarily by armchair dogma (Benjamin, 1975; Shields, 1975).

Mental Retardation

In her first research investigation on the topic, she studied 1,000 consecutive cases from the Clearing House for Mental Defectives. She tabulated the frequency of mental retardation by age and by gender. More males than females were committed to the Clearing House. Yet the age of institutionalization differed greatly. Up to age 16 more males than females were committed. "At the age of 16 the curve for females crosses that for the males, and from that point on the frequency for females is much greater than for males" (Hollingworth, 1913, p. 755). Moreover, her data revealed that a female with a mental age of 6 years survived in society about as well as a male with a mental age of 11 years.

These findings led Hollingworth to conclude that no more males than females are mentally retarded; rather, mentally retarded females compared to mentally retarded males are better able

to survive in society without being noticed. Hollingworth proposed that this discrepancy resulted from the different roles assigned to men and women in our society. To survive, females do not need to compete. They can perform housework and menial tasks, and sell sex. Males, however, are expected to enter society and compete for their wage.

The role of women in our society has changed drastically over the past 75 years. Nevertheless, Hollingworth's findings appear to be still relevant today. Reschly and Jipson (1976) studied the incidence of mild mental retardation by ethnicity, geographic locale, age, gender, and urban-rural residence. Contrary to the still existing view, they too found that no more boys than girls in school are mentally retarded; rather, females are not as frequently identified for special programs as are males. Richardson, Katz, and Koller (1986) arrived at the same conclusion in their study on mild mental retardation. They further hypothesized that the behavior of females in the classroom is more conducive to the classroom environment. This results in the very same condition being noticed in males but not in females. Thereby, more males than females are identified as mentally retarded and receive special programming. In this case, as well as in many others, Hollingworth's findings have held up to the test of time.

Further Studies on Variability

Not satisfied by establishing her case with just one study, Hollingworth continued her work in the area of variability. She took 10 measurements of 1,000 consecutive male newborns and 1,000 consecutive female newborns (Montague & Hollingworth, 1914). None of her data revealed a greater male than female variability.

Hollingworth (1914) also studied variation in ability among females as a function of the menstrual cycle. She tested several females and two control males, over a 3-month period, on a set of perceptual-motor

tasks, as well as in tapping, color naming, and naming opposites. She also studied in depth three females as they learned to type. No evidence of performance decrements as a function of the menstrual cycle was found. Although Sommer (1973) reported similar findings, just recently some dissident results have been published. Hampson and Kimura (1988) did reveal fluctuations in ability according to the menstrual cycle. They showed, in women with normal menstrual cycles, that performance levels on a perceptual-spatial task are lower in the midluteal phase of the cycle (when levels of estrogen and progesterone are high) compared to the menstrual phase, when hormone levels are low. The opposite pattern was found on speeded manual and articulatory tasks.

Thus, Hollingworth's findings on variations of ability with the menstrual cycle have not ultimately been proven to be correct. Most noteworthy, however, is that Hollingworth pursued with scientific rigor research questions being posed 75 years later (e.g. Benbow, 1988; Hampson & Kimura, 1988; Ruble, 1983). She was prescient.

Children with Exceptional Abilities

Although Hollingworth's contributions to the psychology of women were at the very least timely, her greatest contributions were in the area of exceptional children. Perhaps her work in variability had sparked her interest in studying children much discrepant from the average. Possibly her own personal history of contending with a society that expected average performance of women led her to a career studying and helping those who, like she, varied from the average. First, Hollingworth investigated mentally retarded children, presumably because of her work at the Clearing House. When gifted children captured her attention in the 1920s, however, they came to occupy her time exclusively. She produced four times as many scholarly works on the gifted than either in the area of

mental retardation or in psychology of women. Hollingworth was among the first to study giftedness scientifically rather than just describe it.

Although perhaps best remembered for her book, *Children with Above 180 IQ*, my analysis of Leta Hollingworth as a researcher will be confined to her published articles. Because of her untimely death in 1939 at age 53, Hollingworth was never able to write this book, for which she had collected extensive data. Using her notes, her husband wrote *Children with Above 180 IQ*.

Most of Hollingworth's research on the gifted was conducted as part of experimental classes at Public School 165, and later at Public School 500, the Speyer School. Both were located in New York City. Students at those schools had IQs greater than 130 (at that time, in the top centile, 1%). Her research in the area of the gifted can be described as dealing with identifying, characterizing, and developing the potential of gifted youth. The questions she asked were varied, as were her subjects.

Identification of the Gifted

Leta Hollingworth was a strong proponent of testing: "It might be supposed that teachers have always recognized gifted children, at sight. But, in fact, teachers' judgments of intellectual caliber in children are extremely unreliable. Experiment has shown that teachers in the primary or secondary schools 'can select twenty to forty percent of the bright pupils in their grades'" (Hollingworth, 1937, p. 265). And "Binet rendered possible, for the first time in human history, the accurate appraisal of the mental caliber of human beings while they are still immature...The new power over nature thus attained has unlimited possibilities for human dealing" (Hollingworth, 1937, p. 273). Hollingworth's favorite mental test was the Stanford-Binet: "For distribution of intelligence of children, Stanford-Binet is, and long has been, probably the very best of all instruments

available (Hollingworth & Kaunitz, 1934, p. 112). In the 1980s the validity of identifying gifted children on the basis of one overall indicator of intelligence has been questioned (e.g., Feldhusen, 1989; Stanley, 1984b). Nonetheless, emphasizing valid instruments for identifying gifted children was perhaps one of her most important contributions.

Hollingworth also conducted several studies that addressed specific identification issues, the most important of which were two reports on the stability of giftedness (Hollingworth & Kaunitz, 1934; Lorge & Hollingworth, 1936). In the first of these two studies, she retested individuals who as children had been identified as being in the top 1% in ability (greater than 130 IQ) on the Stanford-Binet. In an attempt to control for regression toward the mean, she included in her sample only children with IQs greater than 133. Using the Army Alpha, she tested 114 students 10 years after identification:

Of 116 children testing in the top centile of the distribution of school children by Stanford-Binet, eighty-two per cent were found when near maturity, ten years later, to rate in the top centile of the military draft by Army Alpha. The remainder rated in high centiles. No individual regressed to or nearly to average. Fallacies of selection were avoided in the follow-up sample by complete observation of a representative sample (n=56) of the total number of subjects (n=148) originally identified in childhood. Girls regressed from the top centile somewhat more frequently than boys....This result affords a validation, by means of elapsed time, of the predictive power of available mental tests on the one hand; and on the other, a proof of the constancy of the intellectual development of gifted children in terms of centile status (Hollingworth & Kaunitz, 1934, p. 118).

Using a somewhat different sample and a different battery of mental tests, Lorge & Hollingworth

(1936) reaffirmed the earlier findings: Highly gifted students maintain their top status in mental ability until adulthood. In this second article, Hollingworth also discussed the concept of genius. Lewis Terman had labeled children with 140+ IQ as being geniuses. Hollingworth questioned the wisdom of this judgment because such an ability level is "found to define the 75th percentile of college graduates" (Lorge & Hollingworth, 1936). Rather, "it is only when we have an IQ (S-B) of at least 160 in a child that we may begin to expect mildly noteworthy accomplishments" (Lorge & Hollingworth, 1936, p. 224). Hollingworth suggested that at 180 IQ the term "genius" is appropriate.

A third notable, but perhaps not as influential, study on identification compared testing results from the Stanford-Binet with those from the Herring-Binet. The Herring-Binet test was developed on statistical assumptions rather than through field-testing of children, as had been done for the Stanford-Binet. The Herring-Binet underpredicted Stanford-Binet IQ by 17 points and underpredicted achievement by a similar amount. Hollingworth concluded that tests based entirely on statistical assumptions were not valid (Carroll & Hollingworth, 1930). Perhaps this report is part of the reason why this form of test development did not flourish. The Herring-Binet has not left a mark on history.

Finally, Hollingworth was even interested in the intelligence of siblings of children testing higher than 135 IQ. Cobb and Hollingworth (1925) tested siblings of children with a mean IQ of 155. Every sibling save one was tested. The mean IQ of siblings was 129. Thus, she demonstrated the statistical concept of "regression towards the mean."

Characterizing Gifted Children

Hollingworth also devoted considerable effort to characterizing gifted students. She seemed especially intent on dispelling the various myths associated with the gifted.

For example, a common myth is that gifted children are unattractive. This led to one of the more fascinating studies Hollingworth conducted: "the comparative beauty of the faces of highly intelligent adolescents." Hollingworth (1935) took great care in obtaining pictures of a group of adolescents with IQs greater than 135 and another group of average-ability students, who served as controls. Not only did she systematically rule out bias in the groups selected to be photographed, but she also used scientific precision to ensure that all photographs were comparable. These photographs then were judged for physical attractiveness by 20 individuals naive as to the purpose of the study. A sorting technique and a Likert-type scale were used to assess the physical beauty of each photographed adolescent. The experimental design was elegant and can hardly be criticized even by today's standards. Hollingworth's study revealed that gifted adolescents are viewed as physically more attractive than adolescents of "ordinary" ability.

In another set of experiments, Hollingworth tested the musical sensitivity of gifted children (Hollingworth, 1926), their tapping rate (Hollingworth & Monahan, 1926), neuro-muscular capacity (Monahan & Hollingworth, 1927), and stature (Hollingworth, 1930a). Giftedness was found not be associated with musical sensitivity but, rather, with scholastic achievement (Cobb & Taylor, 1924; Gray & Hollingworth, 1931), tapping speed, size, and strength.

"There is a great discrepancy, however, between amount of deviation in intellect and in scholastic achievement, on the one hand, and in size and motor capacity, on the other" (Hollingworth & Monahan, 1926, p. 517).

Hollingworth was also critically concerned about the social adjustment of intellectually gifted children and wrote much about this topic. The most notable experimental study may have been her testing of

gifted children using the Bernreuter Inventory of Personality (Hollingworth & Rust, 1937). She found that gifted adolescents were much less neurotic, much more self-sufficient, and much less submissive than adolescents who were not gifted. Her anecdotal impressions tested children also were conveyed and found to be consistent with the test results.

Despite the superior standing of gifted children on measures of psychosocial adjustment, which were in direct contrast to prevailing beliefs, Hollingworth (1930b, 1931a) noted problems in peer relations, especially among the most highly gifted. She described the situation as arising from a combination of immaturity and superior intelligence. The exceptionally gifted child does not fit well with age peers or mental peers; he or she has a limited number of possible friendships.

Peer relations placed limitations for acceleration, in Hollingworth's mind: "If the child is greatly accelerated in grade status, so that he is able to function intellectually with real interests, he will be misplaced in other important respects. A child of eight years graded with twelve-year-olds is out of his depth socially and physically, though able to do intellectual work as well as they can" (Hollingworth, 1931a, p. 152).

Development of Potential

Hollingworth believed that the above findings on immaturity and intellectual superiority had "direct implications for pedagogy....At 10 years of age, most of them can be advanced one year, and many of them two years, beyond age-grade norms, without showing a 'deficit' either in size or in motor capacity. This degree of advancement will not, however, take care of their intellectual needs, since they are, on the average, five years beyond the age-grade norms in capacity to assimilate ideas. The alternatives of rational policy are, therefore, either to compromise between intellect and sensory-motor mechanisms in grading, or to segregate such children (where the population is dense) in

special classes, so that special provisions can be made for the exercise of all capacities, without the necessity of compromise" (Hollingworth & Monahan, 1926, pp. 517-518).

Hollingworth was critically interested in providing appropriate educational programming to the gifted students she identified. In this manner, she went beyond her contemporary, Lewis Terman, and his Genetic Studies of Genius. Terman's intentions were to observe intellectual giftedness unfold; he primarily characterized his participants. Although Terman also took an interest in the educational development of his students, his interest was not systematic. In contrast, Hollingworth not only was interested in finding and studying the gifted, but was also committed to providing educational programming for them.

Hollingworth did not believe that bright students took care of themselves:

At present the waste that comes from forcing upon small containers what can never be received, and from leaving large containers unfilled, in our schools, is unrealized.... What a gifted child needs is an education that will challenge his interest, will utilize to the full his power of learning, and will constitute a genuine opportunity for mental development (Hollingworth, 1937, p. 272).

With such a philosophy it is understandable why Leta Hollingworth, a strong researcher, worked with two schools to provide appropriate programming for the gifted. Several of her papers were devoted to describing various educational options for the gifted (e.g., Hollingworth, 1923; 1924a; 1924b, 1931b). Although she provided a rationale for acceleration, Hollingworth clearly favored enrichment within segregated classes. She experimented extensively with this option and then evaluated the results through a longitudinal study.

In one such study Hollingworth compared the achievement of gifted children enrolled and not enrolled in special classes (Gray & Holling-

worth, 1931). In an experimental group, gifted children were given the opportunity to advance at their own pace in prescribed subject matter of the elementary school. They spent about half of each day on work of the typical classroom and the remainder of the day on supplemental, enrichment activities. Children in the special classes covered not only prescribed subject matter but also conversational French, biography, the history of civilization, and much supplemental work in science, mathematics, English composition, and music. After 3 years of experimentation, the students in the special classes were compared with children of the same age and ability who had spent all their school hours in the regular classroom. Both groups were tested with the Stanford Achievement Test, which assessed mastery of prescribed subject = matter. Results indicated that achievement scores in the prescribed curriculum areas were no lower for students in the experimental classes than for gifted students devoting all their school time to the prescribed subjects.

Hollingworth concluded that "gifted children may cover a large amount of intellectual work in addition to that of the ordinarily prescribed school subjects, without detriment to their achievement in the latter" (Gray & Hollingworth, 1931, p. 261). Hollingworth provided an evaluation of the effects of special program participation. Few studies even today provide such evaluations.

Whereas the previous study represents an overall program evaluation, Hollingworth also studied the impact of individual aspects in the program. For example, one educational program developed for students in the experimental classes was the study of biography. As conducted, biography took on the flavor of a seminar, with much discussion and questioning. This new educational option was first developed and tried out on a group of children with 150+ IQ. The activity worked extremely well. Thus, next year Hollingworth tried to replicate

her findings with a class of 135+ IQ children. For this group, the study of biography was not successful. The students seemed too immature to handle the discussion format of the class. Thus, Hollingworth (1924c) concluded that the study of biography was well suited for children having a mental age of 14.

In sum, Leta Hollingworth is most noteworthy for her experimentation with a variety of educational options, but especially with segregated classes, to enhance the development of gifted children. She preferred segregated classes because of their benefits in both the educational and the affective domains. She assessed the immediate impacts, and determined the long-term consequences of her educational interventions. More than 50 years later the concern that programmatic efforts on behalf of the gifted are rarely evaluated is frequently expressed (e.g., Horowitz & O'Brien, 1986). This state of affairs in the 1980s makes Leta Hollingworth's research contributions to program development and evaluation even more remarkable.

Concluding Remarks

Leta Hollingworth's research contributions must be viewed as a model to be aspired to even today. Although there are clear exceptions, the general research contributions in the field of gifted rarely have approached the standards she set. Her research questions, which were varied, were addressed with scientific rigor. She even used control groups to evaluate her findings, a procedure rarely adopted today, even though it is highly recommended (Sternberg & Davidson, 1985). Moreover, many of her papers were published in the best journals. In the 1980s Leta Hollingworth would be considered a powerful researcher. That she conducted her work in the 1920s and 1930s, without ever receiving a grant, makes her contributions even more remarkable!

Lewis Terman was Hollingworth's contemporary. Although Terman's research contributions

have had greater impact on the fields of psychology and of the gifted, Hollingworth's research program was perhaps more comprehensive and went beyond Terman's. Terman observed and detailed the process of talent unfolding into achievement. He did not systematically attempt to enhance the potential of the children he identified. Hollingworth did. In addition, to her, social and emotional issues were as important as educational development.

Hollingworth communicated her findings to researchers as well as teachers and parents of gifted children. Some of her papers were research reports intended for scholarly audiences; others were aimed at illustrating how her findings were relevant for practice and parenting. This is further indication of Hollingworth's commitment to both research and service.

The influence of Hollingworth's research on the field of gifted can be felt even today. Because I am intimately familiar with the Study of Mathematically Precocious Youth (SMPY), I can detail her influence there. SMPY is actually modeled after Hollingworth's pioneering efforts. Although Lewis Terman's work was clearly the model for SMPY's talent search concept, Hollingworth was the inspiration that led to experimentation in educational programming.

Moreover, she was primarily concerned with the exceptionally talented, as SMPY is today. In the 1980s SMPY at Johns Hopkins University has focused on children who score at least 700 on SAT-M before age 13 (Stanley, 1984a). Such a score represents a frequency of less than 1 in 10,000—equivalent to Hollingworth's subjects of at least 180 IQ.

A third parallel can be made. SMPY at Iowa State University (ISU) is longitudinally studying the development of intellectually talented students (e.g., Benbow & Arjmand, in press), as both Terman and Hollingworth did. SMPY at ISU also is evaluating longitudinal impacts of SMPY's various educational interventions (e.g., Richardson & Benbow, in press), in

the Hollingworth tradition.

Setting Hollingworth and SMPY apart, however, is their different choice of educational programming. SMPY's emphasis is on acceleration (Benbow, 1986; Stanley, 1977), which closely resembles Terman's philosophy. Although Hollingworth appeared to have had no objection to acceleration, she clearly believed that the concept of segregated classes for the gifted was the option of choice. SMPY, in offering fast-paced classes in mathematics and science to academically talented students during the summer (e.g., through CY-TAG at ISU), appreciates their benefits for both educational and social development.

In conclusion, Leta Hollingworth was an exceptional woman and scientist. Exceptional and prescient also describe her research program, which serves as a foundation for the gifted child movement in the 1980s. Her work changed the way we think about giftedness. Leta Hollingworth was a paradigm shifter.

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