Practical Assessment, Research, and Evaluation

Volume 4 *Volume 4, 1994-1995* Article 4

1994

Current Issues in Research on Intelligence

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Practical Assessment, Research & Evaluation

A peer-reviewed electronic journal.

Volume 4, Number 4, November, 1994 ISSN=1531-7714

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"...Most educators and many psychologists think intelligence tests measure - or ought to measure - something like the innate capacity or potential of the learner. This has always been a popular belief among both professionals and laymen. It is a personal theory that is staunchly held and, like other personal theories, is not easily altered by disconfirming evidence." (Lohman, 1993, p. 14)

The use of intelligence tests in the American education system is widespread despite the well documented shortcomings of these instruments. For instance, the fact that minority groups are overrepresented in special education and underrepresented in gifted and talented programs is but one example of how intelligence test scores, coupled with the results from other diagnostic instruments, are used daily to make decisions about eligibility for special programs.

What is our current understanding of the concept of intelligence and what is the state-of-the-art with respect to its assessment? This article answers these two general questions in the following way. First, I discuss briefly several current conceptions of what intelligence is. Second, because most current conceptions of intelligence hold that it develops, I turn to a discussion of the role of learning and its effects on intellectual ability. Finally, I briefly discuss what effect these current conceptions have had on our assessment of the ability we call intelligence.

CURRENT CONCEPTIONS OF INTELLIGENCE

Intelligence has been defined and studied under a number of different rubrics, among them individual differences, cognitive abilities, and aptitudes. Probably the most influential developments in our recent understanding of these concepts have come from educational and psychological researchers associated with cognitive psychology. Three of those individuals, Robert Sternberg, Howard Gardner, and John Horn serve as a representative sample of researchers who have made significant gains in our current conceptions of intelligence. In the following paragraphs I briefly summarize each one's conceptualization of intellectual abilities.

Robert Sternberg. Sternberg's (1985) theory of intelligence contains three subtheories, one about context, one about experience, and one about the cognitive components of information processing. The contextual subtheory attempts to specify what would be considered "intelligent" in a given culture or context. According to Sternberg, culturally intelligent behavior involves either adapting to one's present environment, selecting a more optimal environment, or reshaping one's current environment. The experiential subtheory claims that the expression of any intelligent behavior will be a function of the amount of experience one has with the particular class of tasks being tested. According to Sternberg, intelligence is best demonstrated when the task is relatively novel or unfamiliar. The componential subtheory describes the cognitive structures and processes that together produce intelligent behavior. Sternberg proposes three general types of processes: metacomponents (which control and monitor processing), performance components (processes that execute plans), and knowledge acquisition components (which encode and assemble new knowledge). As a whole, the triarchic theory claims different aspects or kinds of intelligence (e.g., academic, practical).

Howard Gardner. One of the most popular recent views of intelligence, at least among practitioners, has come from Gardner (e.g., Gardner & Hatch, 1989). He proposes a theory of multiple intelligences in which he claims there are seven relatively independent intelligences. Those intelligences are logical-mathematical, linguistic, musical, spatial, bodily-kinesthetic, interpersonal, and intrapersonal. Additionally, Gardner recognizes that one's experiences will influence the degree to which each of the intelligences can be expressed. Thus, rather than characterizing an individual's intelligence by a single test score, Gardner argues for determining the profile of one's intelligences, taking into account culturally valued activities that can be expressed in a familiar context. Accordingly, this view suggests the need for new forms of assessment. Gardner and his colleagues have been working on versions of new, more authentic assessment tools for the past 8 years. The results have been mixed. For a critique, the interested reader should see Sternberg (1991).

John Horn. Along with his advisor, Raymond B. Cattell, John Horn has developed a theory of intelligence that specifies two broad factors, fluid abilities and crystallized abilities, along with numerous specific factors that support the general ones. Fluid intelligence represents one's ability to reason and solve problems in novel or unfamiliar situations.

Crystallized intelligence, on the other hand, indicates the extent to which an individual has attained the knowledge of a culture. According to Horn (1989), the Gf - Gc theory can also be thought of as a theory of multiple intelligences because of the relative independence of fluid and crystallized abilities (characterized by distinctly separate patterns of covariation). Horn also argues that the expressions of these abilities "... are outcroppings of distinct influences operating through development, brain function, genetic determination, and the adjustments, adaptations, and achievements of school and work." (Horn, 1989, p. 76)

LEARNING AND INTELLECTUAL ABILITIES

An important development in our understanding of intelligence, is the near universal agreement among researchers that at least some aspects of our intellectual abilities depend heavily on our experiential histories. This acknowledgement should be clear in the three theories summarized above. Each one recognizes the inseparability of experience from intellectual ability. This position stands in stark contrast to the one that holds that intelligence tests measure - or ought to measure - one's innate capacity. Admitting that experience influences one's performance on an intelligence test severely undermines the innate capacity notion, unless one adopts the weaker position that intelligence is a measure of one's innate capacity to learn. In either case, the logical position to assume is that any theory that attempts to explain individual differences in intellectual abilities must include a learning subtheory as part of it.

A recent volume edited by Ackerman, Sternberg, and Glaser (1989) presents several current approaches that integrate information processing theories of learning with theories of individual differences in abilities. Two widely acknowledged views have come from Ackerman (e.g., 1993) and Lohman (1989; 1993). The next two paragraphs briefly summarize these researchers' views.

Phillip Ackerman. Ackerman (1993) has adapted aspects of John R. Anderson's theory of cognitive skill acquisition (e.g., Anderson, 1983) and coupled it with a theory of intellectual abilities proposed by Marshalek, Lohman, and Snow (1983). The integration has produced a hybrid theory which claims that as learning occurs, intellectual differences are reduced for tasks that have a consistent problem-solving structure. In contrast, intellectual differences become magnified for tasks that have variable (novel?) problem-solving structures. In other words, with practice peoples' intellectual abilities will be either similar or different, depending on the nature of the mental processes required to solve different types of problems.

David Lohman. Lohman (1989; 1993) has coupled information processing theories of learning (e.g., Anderson, 1983) with the Gf - Gc theory (e.g., Horn, 1989) in order to characterize the relation between learning and intelligence. It has been known for some time that crystallized intelligence was the product of the acquisition of knowledge (i.e., experience). However, recently Lohman (1993) has argued persuasively that fluid intelligence (i.e., the ability to reason in novel situations) may also be amenable to learning. In fact, he espouses that schools would benefit from direct instruction and testing of fluid abilities.

CURRENT ISSUES IN THE ASSESSMENT OF INTELLIGENCE(S)

The state of affairs with respect to testing intelligence is interesting. Basically, current practice doesn't match the recommendations being offered by educational and psychological researchers. One question to be answered is, "Given our understanding of the nature of intellectual abilities, why do current intelligence tests remain so popular and the standard form of interpretation so pervasive?" In a provocative reply, Sternberg (1992) argues that market forces (i.e., the demands of test consumers) have retarded the development of new, more appropriate measures of intellectual abilities. He points out that signs of change are appearing, but until they gain more momentum, current instruments, no matter how inadequate, will continue to be the standard.

A second question to be answered is, "How can current research inform the development of new instruments to assess intellectual abilities?" There are two parts to this answer, each with its own potential contribution. First, while intelligence tests were originally devised to classify individuals according to their academic potential, our education system is now faced with an admittedly diverse set of students who possess a wide range of expressible abilities. One answer that is emerging from the cognitive analysis of intellectual abilities is that tests are likely better used for diagnostic purposes (i.e., as assessments of current functioning so as to inform instructional needs) rather than for classification. Thus, several researchers (e.g., Gardner & Hacht, 1989) propose the development of new assessment tools designed for a new purpose.

A second and related answer that is surfacing is that fine-grained cognitive analyses can be used beneficially to uncover individual differences in the information processing profiles of students (e.g., Carpenter, Just, & Shell, 1990). A clear and important implication of this work is that such analyses will eventually lead to dramatic improvement in our ability to assess an individual's current level of intellectual functioning and to prescribe instructional interventions that will maximize each individual's potential.

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Descriptors: Educational Assessment; *Educational Research; Experience; *Intelligence; Intelligence Tests; Learning; *Metacognition; *Multiple Intelligences; Psychological Studies; *Research Needs; *Theories

Citation: Yekovich, Frank R. (1994). Current issues in research on intelligence. *Practical Assessment, Research & Evaluation*, 4(4). Available online: http://PAREonline.net/getvn.asp?v=4&n=4.