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Cultural Explorations of Human Intelligence Around the World

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Cultural Explorations of Human Intelligence Around the World

Abstract

The goal of this article is to review cultural explorations of human intelligence around the globe. The article opens in the first part with a consideration of cultural studies that suggest that there is more to intelligence than IQ. It continues with the suggestion for what that "more" might be, namely, "successful intelligence." The second part of the article thus describes the theory of successful intelligence, as well as data from various cultures that support the theory. The third part of the article considers cultural conceptions, of implicit theories of intelligence. It is concluded that cultural studies suggest that conventional notions of intelligence are narrow and limited.

INTRODUCTION

Cultural explorations of human intelligence around the world suggest that there is more to intelligence than just IQ, or the general factor (*g*) of intelligence that some psychologists believe is at the core of IQ. Consider some studies that are suggestive of this notion.

There is More to Intelligence than IQ

For example, Carraher, Carraher, and Schliemann (1985) studied a group of children that is especially relevant for assessing intelligence as adaptation to the environment. The group was of Brazilian street children. Brazilian street children are under great contextual pressure to form a successful street business. If they do not, they risk death at the hands of so-called "death squads," which may murder children who, unable to earn money, resort to robbing stores (or who are suspected of resorting to robbing stores). The researchers found that the same children who are able to do the mathematics needed to run their street business are often little able or unable to do school mathematics. In fact, the more abstract and removed from real-world contexts the problems are in their form of presentation, the worse the children do on the problems. These results suggest that differences in context can have a powerful effect on performance.

Such differences are not limited to Brazilian street children. Lave (1988) showed that Berkeley housewives who successfully could do the mathematics needed for comparison shopping in the supermarket were unable to do the same mathematics when they were placed in a classroom and given isomorphic problems presented in an abstract form. In other words, their problem was not at the level of mental processes but at the level of applying the processes in specific environmental contexts.

In our own research, we have found results consistent with those described above. These results have emanated from studies both in the U.S. and in other countries. We describe here our international studies because we believe they especially call into question the straightforward interpretation of results from conventional tests of intelligence that suggest the existence of a general factor.

In a study in Usenge, Kenya, near the town of Kisumu, we were interested in school-age children's ability to adapt to their indigenous environment. We devised a test of practical intelligence for adaptation to the environment (Sternberg, Nokes, Geissler, Prince, Okatcha, Bundy, & Grigorenko, 2001). The test measured children's informal tacit knowledge for natural herbal medicines that the villagers believe can be used to fight various types of infections. At least some of these medicines appear to be effective (Dr. Frederick Okatcha, personal communication), and most villagers certainly believe in their efficacy, as shown by the fact that children in the villages use their knowledge of these medicines an average of once a week in medicating themselves and others. Thus, tests of how to use these medicines constitute effective measures of one aspect of practical intelligence as defined by the villagers as well as their life circumstances in their environmental contexts. Middle-class Westerners might find it quite a challenge to thrive or even survive in these contexts, or, for that matter, in the contexts of urban ghettos often not distant from their comfortable homes.

We measured the Kenyan children's ability to identify the medicines, where they come from, what they are used for, and how they are dosed. Based on work we had done elsewhere, we expected that scores on this test would not correlate with scores on conventional tests of intelligence. In order to test this hypothesis, we also administered to the 85 children the Raven Coloured Progressive Matrices Test, which is a measure of fluid or abstract-reasoning-based abilities, as well as the Mill Hill Vocabulary Scale, which is a measure of crystallized or formal-knowledge-based abilities. In addition, we gave the children a comparable test of vocabulary in their own Dholuo language. The Dholuo language is spoken in the home, English in the schools.

We did indeed find no correlation between the test of indigenous tacit knowledge and scores on the fluid-ability tests. But to our surprise, we found statistically significant correlations of the tacit-knowledge tests with the tests of crystallized abilities. The correlations, however, were negative. In other words, the higher the children scored on the test of tacit knowledge, the lower they scored, on average, on the tests of crystallized abilities. This surprising result can be interpreted in various ways, but based on the ethnographic observations of the cultural anthropologists on our team, Geissler and Prince, we concluded that a plausible scenario takes into account the expectations of families for their children.

Children generally drop out of school before graduation, and most families in the village do not particularly value formal Western schooling. There is no reason they should, as their children will for the most part spend their lives farming or engaged in other occupations that make little or no use of Western schooling. These families emphasize teaching their children the indigenous informal knowledge that will lead to successful adaptation in the environments in which they will really live. Children who spend their time learning the indigenous practical knowledge of the community generally do not invest themselves heavily in doing well in school, whereas children who do well in school generally do not invest themselves as heavily in learning the indigenous knowledge-hence the negative correlations.

The Kenya study suggests that the identification of a general factor of human intelligence may tell us more about how abilities interact with patterns of schooling and especially Western patterns of schooling than it does about the structure of human abilities. In Western schooling, children typically study a variety of subject matters from an early age and thus develop skills in a variety of skill areas. This kind of schooling prepares the children to take a test of intelligence, which typically measures skills in a variety of areas. Often intelligence tests measure skills that children were expected to acquire a few years before taking the intelligence test. But as Rogoff (1990) and others have noted, this pattern of schooling is not universal and has not even been common for much of the history of humankind. Throughout history and in many places still, schooling, especially for boys, takes the form of apprenticeships in which children learn a craft from an early age. They learn what they will need to know in order to succeed in a trade, but not a lot more. They are not simultaneously engaged in tasks that require the development of the particular blend of skills measured by conventional intelligence tests. Hence it is less likely that one would observe a general factor in their scores, much as we discovered in Kenya.

The test of practical intelligence we developed for use in Kenya, as well as some of the other practically-based tests described in this essay, may seem more like tests of achievement or of developing expertise (Ericsson, 1996) than of intelligence. But I have argued that intelligence is itself a form of developing expertise-that there is no clearcut distinction between the two constructs (Sternberg, 1999a). Indeed, all measures of intelligence, one might argue, measure a form of developing expertise. Crystallized-ability tests, such as tests of vocabulary and general information, certainly measure developing and developed knowledge base. And available data suggest that fluid-ability tests, such as tests of abstract reasoning, measure developing and developed expertise even more strongly than do crystallized-ability tests. Probably the best evidence for this claim is that fluid-ability tests have shown much greater increases in scores over the last several generations than have crystallized-ability tests (Neisser, 1998). The relatively brief period of time during which these increases have occurred (about 9 points of IQ per generation) suggests an environmental rather than a genetic cause of the increases. And the substantially greater increase for fluid than for crystallized tests suggests that fluid tests, like all other tests, actually measure an expertise acquired through interactions with the environment. This is not to say that genes do not influence intelligence: Almost certainly they do. Rather, the point is that the environment always mediates their influence and tests of intelligence measure gene-environment interaction effects. The measurement of intelligence is by assessment of various forms of developing expertise.

The forms of developing expertise that are viewed as practically or otherwise intelligent may differ from one society to another or from one sector of a given society to another. For example, procedural knowledge about natural herbal medicines, on the one hand, or Western medicines, on the other, may be critical to survival in one society, and irrelevant to survival in another (e.g., where one or the other type of medicine is not available). Whereas what constitutes components of intelligence is universal, the content that constitutes the application of these components to adaptation to, shaping, and selection of environments is culturally and even subculturally variable.

The developing world provides a particularly interesting laboratory for testing theories of intelligence because many of the assumptions that are held as dear in the developed world simply do not apply. A study we have done in Tanzania (Sternberg, Grigorenko, Ngrosho, Tantufuye, Mbise, Nokes, Jukes, & Bundy, 2002) points out the risks of giving tests, scoring them, and interpreting the results as measures of some latent intellectual ability or abilities. We administered to 358 young school children near Bagamoyo, Tanzania, tests including a form-board classification test, a linear syllogisms test, and a Twenty Questions Test, which measure the kinds of skills required on conventional tests of intelligence. Of course, we obtained scores that we could analyze and evaluate, ranking the children in terms of their supposed general or other abilities. However, we administered the tests dynamically rather than statically. Dynamic testing is like conventional static testing in that individuals are tested and inferences about their abilities made. But dynamic tests differ in that children are given some kind of feedback in order to help them improve their scores. Vygotsky (1978) suggested that the children's ability to profit from the guided instruction the children received during the testing session could serve as a measure of children's zone of proximal development (ZPD), or the difference between their developed abilities and their latent capacities. In other words, testing and instruction are treated as being of one piece rather than as being distinct processes. This integration makes sense in terms of traditional definitions of intelligence as the ability to learn. What a dynamic test does is directly measure processes of learning in the context of testing rather than measuring these processes indirectly as the product of past learning. Such measurement is especially important when not all children have had equal opportunities to learn in the past.

In our assessments, children were first given the ability tests. Then they were given a brief period of instruction in which they were able to learn skills that would potentially enable them to improve their scores. Then they were tested again. Because the instruction for each test lasted only about 5-10 minutes, one would not expect dramatic gains. Yet, on average, the gains were statistically significant and they were significantly greater than those for a control group of 100 individuals who received the pretest and posttest without the intervention in-between them. More importantly, scores on the pretest showed only weak although significant correlations with scores on the post-test. These correlations, at about the .3 level, suggested that when tests are administered statically to children in developing countries, they may be rather unstable and easily subject to influences of training. (In contrast, the correlation for the uninstructed control group was at the .8 level.) The reason could be that the children are not accustomed to taking Western-style tests, and so profit quickly even from small amounts of instruction as to what is expected from them. Of course, the more important question is not whether the scores changed or even correlated with each other, but rather how they correlated with other cognitive measures. In other words, which test was a better predictor of transfer to other cognitive performance, the pretest score or the post-test score? We found the post-test score to be the better predictor.

Dynamic testing can perform successfully in the United States as well as abroad. In one of our studies, we devised a test of foreign-language learning ability that dynamically measured participants' ability to learn an artificial language at the time of test. The language was quite complex and required learning of many different facets, presented both orally and visually (Grigorenko, Sternberg, & Ehrman, 2000). We found that scores on our test correlated more highly with a test of foreign-language learning ability (the Modern Language Aptitude Test-MLAT) than with a test of general ability. Scores also significantly predicted success in foreign-language classrooms at the U.S. Foreign Services Institute (FSI), an institute for teaching languages to foreign-service officers and military personnel.

What, then, is intelligence?

A Theory of Successful Intelligence

Perhaps intelligence is best understood more broadly than it usually is. I have proposed a theory of successful intelligence for this purpose. The theory of successful intelligence has 4 key elements (see also Sternberg, 1997).

1. Intelligence is defined in terms of the ability to achieve success in life in terms of one's personal standards, within one's sociocultural context.
2. One's ability to achieve success depends on one's capitalizing on one's strengths and correcting or compensating for one's weaknesses.
3. Success is attained through a balance of analytical, creative, and practical abilities.
4. Balancing of abilities is achieved in order to adapt to, shape, and select environments.

More details regarding the theory can be found in Sternberg (1985a, 1997, 1999b).

An important foundation of the theory of successful intelligence is the importance of analytical, creative, and practical abilities to intellectual functioning. A number of the studies described below show both the internal validity and the external validity of these constructs.

Three separate factor-analytic studies support the internal validity of the theory of successful intelligence. This means that the studies suggest that the division into analytical, creative, and practical abilities is sound.

In one study (Sternberg, Grigorenko, Ferrari, & Clinkenbeard, 1999) done in the United States, we used the so-called Sternberg Triarchic Abilities Test (STAT-Sternberg, 1993) to investigate the internal validity of the theory. Three hundred twenty-six high school students, primarily from diverse parts of the United States, took the test, which comprised 12 subtests in all. There were four subtests each measuring analytical, creative, and practical abilities. For each type of ability, there were three multiple-choice tests and one essay test. The multiple-choice tests, in turn, involved, respectively, verbal, quantitative, and figural content. Consider the content of each test:

1. Analytical-Verbal: Figuring out meanings of neologisms (artificial words) from natural contexts. Students see a novel word embedded in a paragraph, and have to infer its meaning from the context.
2. Analytical-Quantitative: Number series. Students have to say what number should come next in a series of numbers.
3. Analytical-Figural: Matrices. Students see a figural matrix with the lower right entry missing. They have to say which of the options fits into the missing space.
4. Practical-Verbal: Everyday reasoning. Students are presented with a set of everyday problems in the life of an adolescent and have to select the option that best solves each problem.

5. Practical-Quantitative: Everyday math. Students are presented with scenarios requiring the use of math in everyday life (e.g., buying tickets for a ballgame), and have to solve math problems based on the scenarios.
6. Practical-Figural: Route planning. Students are presented with a map of an area (e.g., an entertainment park) and have to answer questions about navigating effectively through the area depicted by the map.
7. Creative-Verbal: Novel analogies. Students are presented with verbal analogies preceded by counterfactual premises (e.g., money falls off trees). They have to solve the analogies as though the counterfactual premises were true.
8. Creative-Quantitative: Novel number operations. Students are presented with rules for novel number operations, for example, "flix," which involves numerical manipulations that differ as a function of whether the first of two operands is greater than, equal to, or less than the second. Participants have to use the novel number operations to solve presented math problems.
9. Creative-Figural: In each item, participants are first presented with a figural series that involves one or more transformations; they then have to apply the rule of the series to a new figure with a different appearance, and complete the new series.

The analytical essay required students to comment on the use of security guards in schools; the creative essay required students to design an ideal school; and the practical essay required students to state a problem they are facing in their life and to describe three practical solutions to it.

We found that a confirmatory factor analysis (which looks for latent structure underlying a set of data) on the data was supportive of the triarchic theory of human intelligence, yielding separate and uncorrelated analytical, creative, and practical factors. The lack of correlation was due to the inclusion of essay as well as multiple-choice subtests. Although multiple-choice tests tended to correlate substantially with multiple-choice tests, their correlations with essay tests were much weaker. We found the multiple-choice analytical subtest to load most highly on the analytical factor, but the essay creative and practical subtests to load most highly on their respective factors. Thus, measurement of creative and practical abilities probably ideally should be accomplished with other kinds of testing instruments that complement multiple-choice instruments.

In another study using this test, conducted with 3252 students in the U.S. Finland, and Spain, Sternberg and his colleagues used the multiple-choice section of that STAT to compare five alternative models of intelligence, again via confirmatory factor analysis. A model featuring a general factor of intelligence fit the data relatively poorly. The triarchic model, allowing for intercorrelation among the analytic, creative, and practical factors, provided the best fit to the data (Sternberg, Castej¢n, Prieto, Hautakämi, & Grigorenko, 2001).

In a yet another study, Grigorenko and Sternberg (2001) tested 511 Russian school children (ranging in age from 8 to 17 years) as well as 490 mothers and 328 fathers of these children. We used entirely distinct measures of analytical, creative, and practical intelligence. Consider, for example, the tests used for adults. Similar tests were used for children.

Fluid analytical intelligence was measured by two subtests of a test of nonverbal intelligence. The *Test of g: Culture Fair, Level II* (Cattell & Cattell, 1973) is a test of fluid intelligence designed to reduce, as much as possible, the influence of verbal comprehension, culture, and educational level, although no test eliminates such influences. In the first subtest, *Series*, individuals were presented with an incomplete, progressive series of figures. The participants' task was to select, from among the choices provided, the answer that best continued the series. In the *Matrices* subtest, the task was to complete the matrix presented at the left of each row.

The test of crystallized intelligence was adapted from existing traditional tests of analogies and synonyms/antonyms used in Russia. Grigorenko and Sternberg used adaptations of Russian rather than American tests because the vocabulary used in Russia differs from that used in the USA. The first part of the test included 20 verbal analogies (KR20 = 0.83). An example is *circle-ball = square – ?* (a) *quadrangular*, (b) *figure*, (c) *rectangular*, (d) *solid*, (e) *cube*. The second part included 30 pairs of words, and the participants' task was to specify whether the words in the pair were synonyms or antonyms (KR20 = 0.74). Examples are l*atent – hidden, and systematic – chaotic*.

The measure of creative intelligence also comprised two parts. The first part asked the participants to describe the world through the eyes of insects. The second part asked participants to describe who might live and what might happen on a planet called "Priumliava." No additional information on the nature of the planet was specified. Each part of the test was scored in three different ways to yield three different scores. The first score was for originality (novelty); the second was for the amount of development in the plot (quality); and the third was for creative use of prior knowledge in these relatively novel kinds of tasks (sophistication). The mean inter-story reliabilities were .69, .75, and .75 for the three respective scores, all of which were statistically significant at the $p < .001$ level.

The measure of practical intelligence was self-report and also comprised two parts. The first part was designed as a 20-item, self-report instrument, assessing practical skills in the social domain (e.g., effective and successful communication with other people), in the family domain (e.g., how to fix household items, how to run the family budget), and in the domain of effective resolution of sudden problems (e.g., organizing something that has become chaotic). The second part had 4 vignettes, based on themes that appeared in popular Russian magazines in the context of discussion of adaptive skills in the current society. The four themes were, respectively, how to maintain the value of one's savings, what to do when one makes a purchase and discovers that the item one has purchased is broken, how to locate medical assistance in a time of need, and how to manage a salary bonus one has received for outstanding work. Each vignette was accompanied by five choices and participants had to select the best one. Obviously, there is no one "right" answer in this type of situation. Hence Grigorenko and Sternberg used the most frequently chosen response as the keyed answer. To the extent that this response was suboptimal, this suboptimality would work against the researchers in subsequent analyses relating scores on this test to other predictor and criterion measures.

In this study, exploratory principal-component analysis (which looks for latent structure underlying data) for both children and adults yielded very similar factor structures. We obtained clearcut analytical, creative, and practical factors for the tests. Thus, with a sample of a different nationality (Russian), a different set of tests, and a different method of analysis (exploratory rather than confirmatory analysis) again supported the theory of successful intelligence.

Thus the results of three sets of studies suggest that the theory of successful intelligence is valid as a whole. Moreover, the results suggest that the theory can make a difference not only in laboratory tests, but in school classrooms and even the everyday life of adults as well. Consider further the elements of the theory independently.

Cultural Conceptions of Intelligence

One might expect performance on such tests to be hopelessly culture-specific. In other words, it might be expected that what is adaptive in the workplace of one culture may have little to do with what is adaptive in the workplace of another culture. This appears not to be the case, however. In one study, we gave a tacit-knowledge test for entry-level employees to workers in a wide variety of jobs in the United States and in Spain. We then correlated preferred responses in the two countries. The correlation was. 91, comparable to the reliability of the test (c)!

What is especially interesting is that lay conceptions of intelligence are quite a bit broader than ones of psychologists who believe in g (Berry 1974; Sternberg & Kaufman, 1998). For example, in a study of people's conceptions of intelligence (Sternberg, Conway, Ketron, & Bernstein, 1981; see also Sternberg, 1985b), we found that lay persons had a three-factor view of intelligence as comprising practical problem solving, verbal, and social-competence abilities. Only the first of these abilities is measured by conventional tests. In a study of Taiwanese Chinese conceptions of intelligence (Yang & Sternberg, 1997a, 1997b), we found that although Taiwanese conceptions of intelligence included a cognitive factor, they also included factors of interpersonal competence, intrapersonal competence, intellectual self-assertion, and intellectual self-effacement. In a study of Kenya conceptions of intelligence (Grigorenko, Geissler, Prince, Okatacha, Nokes, Kenny, Bundy, & Sternberg, 2001), we found that four distinct terms constitute rural Kenyan conceptions of intelligence-*rieko* (knowledge and skills), *luoro* (respect), *winjo* (comprehension of how to handle real-life problems), *paro* (initiative)-with only the first directly referring to knowledge-based skills (including but not limited to the academic). Even more importantly, perhaps, we discovered in a study among different ethnic groups in San Jose, California, that although the 359 parents in different ethnic groups have different conceptions of intelligence, the more closely their conception matches that of their children's teachers, the best the children do in school (Okagaki & Sternberg, 1993). In other words, teachers value students who do well on the kinds of attributes that the teachers associate with intelligence. The attributes they associate with intelligence are too limited.

In conclusion, there is more to intelligence than IQ, or the g factor believed by some to underlie it. Studies around the world by our group and others suggest a much more variegated view of intelligence than the view of intelligence as comprising just a single thing. Moreover, our research suggests that, in measuring intelligence, one must be careful to evaluate whether the tests we use in one location are appropriate in another. Our results also suggest that we look at children's health: Ill children do not do as well on tests as healthy children. For example, in Jamaica, we found that children with parasitic illnesses underperformed well children, controlling for socioeconomic status (Sternberg, Powell, McGrane, and Grantham-McGregor, 1997). We will never understand intelligence until we seek to study it deeply, and to study it all around the world, questioning our own deeply-held assumptions in the same way that we might readily question the assumptions of others.

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Questions for Discussion

1. How did the research of Nunes and Lave suggest that there is more to intelligence than IQ?
2. Why might scores on tests of academic and practical intelligence correlate negatively with each other?
3. What is a "general factor" of intelligence?
4. What implication does the described study in Tanzania have for ideas regarding the possible modification of intelligence?
5. How does the concept of successful intelligence differ from ordinary conceptions of intelligence?
6. The study that is described, which was done in Russia, suggests that a test of practical intelligence can have certain advantages over a test of academic intelligence? What is one example of such an advantage suggested by the study?
7. By what mechanism might moderate to severe parasitic illnesses adversely affect tested intelligence?
8. What factors of intelligence were found in the study that was done in Taiwan?