



Interamerican Journal of Psychology

ISSN: 0034-9690

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Sociedad Interamericana de Psicología
Organismo Internacional

Sternberg, Robert J.

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Interamerican Journal of Psychology, vol. 39, núm. 2, 2005, pp. 189-202

Sociedad Interamericana de Psicología

Austin, Organismo Internacional

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The Theory of Successful Intelligence

Robert J. Sternberg

Tufts University, Medford, MA

Abstract

This article presents a theory of successful intelligence. The theory is substantially broader than conventional intelligence. It defines intelligence in terms of the ability to achieve one's goals in life, within one's sociocultural context. The article is divided into four major parts. The article opens with a consideration of the nature of intelligence. The next part discusses the measurement of intelligence. Next it discusses how people can be intelligent but foolish. Finally it draws conclusions. *Keywords:* Successful intelligence; analytical intelligence; creative intelligence; practical intelligence.

La Teoría de Inteligencia Exitosa

Compendio

Este artículo presenta una teoría de Inteligencia exitosa. La teoría es substancialmente más ancha que la teorías convencionales de inteligencia. Define inteligencia por lo que se refiere a la habilidad de lograr las metas de uno en la vida, dentro del contexto sociocultural de uno. El artículo es dividido en cuatro partes. El artículo abre con una consideración de la naturaleza de inteligencia. Entonces discute una medida de inteligencia. Luego discute cómo las personas pueden ser inteligentes pero ingenuas. Finalmente, dibuja las conclusiones. *Palabras-clave:* Inteligencia exitosa; inteligencia analítica; inteligencia creativa; inteligencia práctica.

Conventional views of intelligence favor individuals who are strong in memory and analytical abilities (e.g., Carroll, 1993; Cattell, 1971; Jensen, 1998). They disfavor most other individuals. The result is that individuals who may have the talents to succeed in life may be labeled as *unintelligent*, whereas some of those labeled as *intelligent* may be less endowed with such talents. This article presents a broader theory of intelligence that is more encompassing, but that is nevertheless rigorously validated. The theory is the theory of successful intelligence (Sternberg, 1997).

The history of the theory presented here has been documented, to some extent, in two earlier theoretical articles (Sternberg, 1980b, 1984). In the first article (Sternberg, 1980b) a theory of components of intelligence was presented. The article made the argument arguing that intelligence could be understood in terms of a set of elementary information-processing components that contributed to people's intelligence and individual differences in it. In the second article (Sternberg, 1984) the theory was expanded to include not just the analytical aspect of intelligence, which had been the emphasis of the earlier article, but the creative and practical

here is somewhat more elaborate (Sternberg, 1997, 1998a, 1999c) intelligence. According to this definition, intelligence is: 1) the ability to achieve one's goals in life, within one's sociocultural context; 2) by capitalizing on one's strengths and correcting or compensating for weaknesses; 3) to identify, to shape, and select environments; and, 4) to use a mix of analytical, creative, and practical abilities.

Consider first Item 1. Intelligence is the ability to identify a meaningful and coherent set of goals, and to have the dispositions to reach those goals. One may be a statesperson, another, a scientist, and another, an athlete. Others may decide on careers in athletics, science, or whatever. The question typically is not what goals individuals have chosen, but rather how they have done so that they can realize those goals. Thus, this item actually includes: a) identifying meaningful goals; b) coordinating those goals in a meaningful way so that they form a coherent path toward seeking in life; and, c) moving a substantial part of the path toward reaching those goals.

everything or bad at everything. People who are the positive intellectual leaders of society have identified their strengths and weaknesses, and have found ways to work effectively within that pattern of abilities.

There is no single way to succeed in a job that works for everyone. For example, some lawyers are successful by virtue of their very strong analytical skills. They may never argue in a courtroom, but they can put together an airtight legal argument. Another lawyer may have a commanding presence in the courtroom, but be less powerful analytically. The legal profession in the United Kingdom recognizes this distinction by having separate roles for the solicitor and the barrister. In the United States, successful lawyers find different specializations that allow them to make the best use of their talents. Unsuccessful lawyers may actually attempt to capitalize on weaknesses, for example, litigating cases when their legal talent lies elsewhere.

This same general principle applies in any profession. Consider, for example, teaching. Educators often try to distinguish characteristics of expert teachers (see Sternberg & Williams, 2001), and indeed, they have distinguished some such characteristics. But the truth is that teachers can excel in many different ways. Some teachers are better in giving large lectures; others in small seminars; others in one-on-one mentoring. There is no one formula that works for every teacher. Good teachers figure out their strengths and try to arrange their teaching so that they can capitalize on their strengths and at the same time either compensate for or correct their weaknesses. Team teaching is one way of doing so, in that one teacher can compensate for what the other does not do well.

Item 3 recognizes that intelligence broadly defined refers to more than just “adapting to the environment,” which is the mainstay of conventional definitions of intelligence. The theory of successful intelligence distinguishes among adapting, shaping, and selecting.

In adaptation to the environment, one modifies oneself to fit an environment. The ability to adapt to the environment is important in life, and is especially important to individuals entering a new program. Most of them will be entering a new environment that is quite different from the one in which they

tanks). Clearly, adaptability is a key skill for intellectual intelligence. An intellectual leader ought to have the ability to adapt to a variety of environments.

In life, adaptation is not enough, however. It must be balanced with shaping. In shaping, one shapes the environment to fit what one seeks. In adapting, one modifies oneself to fit the environment. The environments in any field are not just adaptors; they are shapers. They recognize that they cannot change the environment if they want to have an impact on the world. They must change some things. Part of success is recognizing what to change, and then how to change it.

When an individual enters an institution, the individual will not only adapt to the environment but also shape it in a way that makes it a better place for the individual. Selection committees will wish to look for evidence of a candidate’s engagement in a variety of activities and of the individual’s having made a difference in those activities. Shaping the environment is a kind of impact (see Sternberg, 2003a).

Sometimes, one attempts unsuccessfully to adapt to the environment and then also fails in shaping the environment. No matter what one does to try to make the environment work out, nothing in fact seems to work. In such cases, the action may be to select another environment.

Many of the greatest people in any field are those who started off in another field and found their way. It was not really the one in which they had their strengths. Rather than spend their lives doing something that does not match their pattern of strengths and weaknesses, they had the sense to find something else to do in which they had a contribution to make.

Item 4 points out that successful intelligence involves a broader range of abilities than is typically measured by intellectual and academic skills. Most of the skills are primarily or exclusively memory and analytical skills. In regard to memory, they assess the ability to recognize information. With regard to analytical skills, they measure the skills involved when one analyzes information, contrasts, evaluates, critiques, and judges. They measure skills during the school years and in later life.

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translate strategies to solve these problems exists in any culture.

Metacomponents, or executive processes, plan what to do, monitor things as they are being done, and evaluate things after they are done. Examples of metacomponents are recognizing the existence of a problem, defining the nature of the problem, deciding on a strategy for solving the problem, monitoring the solution of the problem, and evaluating the solution after the problem is solved.

Performance components execute the instructions of the metacomponents. For example, inference is used to decide how two stimuli are related and application is used to apply what one has inferred (Sternberg, 1977). Other examples of performance components are comparison of stimuli, justification of a given response as adequate although not ideal, and actually making the response.

Knowledge-acquisition components are used to learn how to solve problems or simply to acquire declarative knowledge in the first place (Sternberg, 1985). Selective encoding is used to decide what information is relevant in the context of one's learning. Selective comparison is used to bring old information to bear on new problems. And selective combination is used to put together the selectively encoded and compared information into a single and sometimes insightful solution to a problem.

Although the same processes are used for all three aspects of intelligence universally, these processes are applied to different kinds of tasks and situations depending on whether a given problem requires analytical thinking, creative thinking, practical thinking, or a combination of these kinds of thinking. In particular, analytical thinking is invoked when components are applied to fairly familiar kinds of problems abstracted from everyday life. Creative thinking is invoked when the components are applied to relatively novel kinds of tasks or situations. Practical thinking is invoked when the components are applied to experience to adapt to, shape, and select environments. One needs creative skills and dispositions to generate ideas, analytical skills and dispositions to decide if they are good ideas, and practical skills and dispositions to implement one's ideas and to convince others of their worth (Sternberg, 1999b).

More details regarding the theory can be found in Sternberg

is not smart. Rather, one should merely consider it as one indicator among many of a person's intelligence.

The Assessment of Intelligence

Our assessments of intelligence are based on three components: analytical, creative, and practical. We discuss those assessments here.

Analytical Intelligence

Analytical intelligence is involved in the logical processing components of intelligence. It is used to evaluate, judge, or compare and contrast information when components are applied to relatively familiar problems where the judgments to be made are of a logical nature.

In some early work, it was shown that people solve problems, such as analogies or syllogisms, exponentially (Guyote & Sternberg, 1980b, 1983; Sternberg & Gardner, 1984; Sternberg, 1981), with response times or error rates increasing exponentially. One of the goals of this research was to understand the origins of individual differences in (theoretical) human intelligence. With componential theory, we specify sources of individual differences in intelligence score such as that for "inductive reasoning." For example, response times on analogies (Sternberg, 1980a) and syllogisms (Sternberg, 1980a) were decomposed into elementary performance components. The goals of such research is to: a) specify an information-processing model of task performance; b) propose a parameter model, so that each information-processing component is assigned a mathematical parameter corresponding to its error rate (and another corresponding to its response time) for cognitive tasks administered in such a way that they can be modeled through mathematical modeling to isolate the mathematical model. In this way, it is possible to study the solving of various kinds of problems in terms of important individual or developmental differences. For example, performance components are used? 2) How long does it take to execute each component? 3) How

reasoning) (*A to C*); 4) *application*, the amount of time needed to apply the relation as inferred (and sometimes as mapped) to a new set of stimuli (*A to B to C to ?*); 5) *comparison*, the amount of time needed to compare the validity of the response options (*D1, D2, D3, D4*); 6) *justification*, the amount of time needed to justify one answer as the best of the bunch (e.g., *D1*); and 7) *preparation-response*, the amount of time needed to prepare for problems solution and to respond.

Studies of reasoning need not use artificial formats. In a more recent study, a colleague and I looked at predictions for everyday kinds of situations, such as when milk will spoil (Sternberg & Kalmar, 1997). In this study, the investigators looked at both predictions and postdictions (hypotheses about the past where information about the past is unknown) and found that postdictions took longer to make than did predictions.

Research on the components of human intelligence yielded some interesting results. Consider some examples. First, execution of early components (e.g., inference and mapping) tends exhaustively to consider the attributes of the stimuli, whereas execution of later components (e.g., application) tends to consider the attributes of the stimuli in self-terminating fashion, with only those attributes processed that are essential for reaching a solution (Sternberg, 1977). Second, in a study of the development of figural analogical reasoning, it was found that although children generally became quicker in information processing with age, not all components were executed more rapidly with age (Sternberg & Rifkin, 1979). The encoding component first showed a decrease in component time with age and then an increase. Apparently, older children realized that their best strategy was to spend more time in encoding the terms of a problem so that they later would be able to spend less time in operating on these encodings. A related, third finding was that better reasoners tend to spend relatively more time than do poorer reasoners in global, up-front metacomponential planning, when they solve difficult reasoning problems. Poorer reasoners, on the other hand, tend to spend relatively more time in local planning (Sternberg, 1981). Presumably, the better reasoners recognize that it is better to invest more time up front so as to be able to process a problem more efficiently later on. Fourth, it also was found in a study of the development of verbal analogical reasoning

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multiple sources of individual and developmental differences. The three main sources were in knowledge, in the components, use of context clues, and in the variables. For example, in the sentence, “*east and sets in the west*,” the knowledge component of selective comparison is the knowledge about a known concept, the stimulus word (neologism) in the sentence, “*blen*.” The variables that appear in the sentence, such as the fact that it sets, and the information about whether the mediating variable is that the information on the presentation of the unknown word.

We did research such as that described above. We believed that conventional psychometric tests incorrectly attributed individual and developmental differences. For example, a verbal analogies test that is on the surface to measure verbal reasoning might be primarily vocabulary and general information (Sternberg, 1977). In fact, in some populations, reasoning is a source of individual or developmental differences. If researchers then look at the sources of individual differences in vocabulary, they would need to control for the differences in knowledge did not control for. Some children had much more frequent opportunities to learn word meanings than others.

In the componential-analysis work, correlations were computed between component times for individuals and scores on tests of conventional psychometric abilities. First, in the study of verbal reasoning (Sternberg, 1977; Sternberg & Rifkin, 1983), it was found that although in the application, comparison, and justification components, with such tests, the highest correlation typically was for the preparation-response component. This result was first, because this component was estimated to be constant in the predictive regression equation, and up giving birth to the concept of the meta-components or order processes used to plan, monitor, and control performance. It was also found, second, that the same was obtained for all the components shown in discriminant validation: They tended to

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ar-syllogistic reasoning not only in terms of the fit of response-time or error data to the predictions of the alternative models, but also in terms of the correlations of component scores with psychometric tests of verbal and spatial abilities (Sternberg, 1980a). Fifth and finally, it was found that there were individual differences in strategies in solving linear syllogisms, whereby some people used a largely linguistic model, others a largely spatial model, and most the proposed linguistic-spatial mixed model. Thus, sometimes, less than perfect fit of a proposed model to group data may reflect individual differences in strategies among participants.

Creative Intelligence

Intelligence tests contain a range of problems, some of them more novel than others. In some of the componential work we have shown that when one goes beyond the range of unconventionality of the conventional tests of intelligence, one starts to tap sources of individual differences measured little or not at all by the tests. According to the theory of successful intelligence, (creative) intelligence is particularly well measured by problems assessing how well an individual can cope with relative novelty. Thus it is important to include in a battery of tests problems that are relatively novel in nature.

We presented 80 individuals with novel kinds of reasoning problems that had a single best answer. For example, they might be told that some objects are green and others blue; but still other objects might be *grue*, meaning green until the year 2000 and blue thereafter, or *bleen*, meaning blue until the year 2000 and green thereafter. Or they might be told of four kinds of people on the planet Kyron, *blens*, who are born young and die young; *kwefs*, who are born old and die old; *balts*, who are born young and die old; and *prosses*, who are born old and die young (Sternberg, 1982; Tetewsky & Sternberg, 1986). Their task was to predict future states from past states, given incomplete information. In another set of studies, 60 people were given more conventional kinds of inductive reasoning problems, such as analogies, series completions, and classifications, but were told to solve them. But the problems had premises preceding them that were either conventional (dancers wear shoes) or novel (dancers eat shoes). The participants had to solve the problems as though the counterfactuals were true (Sternberg

bleen task mentioned above, the inductive reasoning component requiring people to switch from *green-blue* thinking to *grue-bleen* thinking. The switch from *green-blue* thinking again was a particular test of the ability to cope with novelty.

Practical Intelligence

Practical intelligence involves individual differences in abilities to the kinds of problems that are encountered in life, such as on the job or in the home. Practical intelligence involves applying the components of intelligence, so as to: a) adapt to, b) shape, and, c) select an environment. Adaptation is involved when one changes the environment. Shaping is involved when one changes the environment to suit oneself. And selection is involved when one decides to seek out another environment. Practical intelligence is a match to one's needs, abilities, and desires. It is a balance of adaptation, shaping, and selection. It is the competence with which they balance and coordinate their courses of action.

Much of our work on practical intelligence has been on the concept of tacit knowledge. Tacit knowledge is a construct as what one needs to know to do something effectively in an environment that one does not know and that often is not even verbalized (Sternberg & Wagner, 1993; Sternberg & Wagner, 1987; Sternberg, Wagner, Williams, & Williams, 1986). Tacit knowledge is the form of production knowledge that is in the form of production rules or "if-then" statements that describe performance in various kinds of everyday situations.

We typically have measured tacit knowledge with related problems that present problems that are encountered on the job. We have measured tacit knowledge in children and adults, and among adults, for people in various occupations, such as management, sales, and school administration, secretarial work. A typical tacit-knowledge problem, people are given a story about a problem someone faces and a set of statements in a set of statements, how a statement represents. For example, people are given a measure of tacit knowledge for sales

with experience, but it is profiting from experience, rather than experience per se, that results in increases in scores. Some people can have been in a job for years and still have acquired relatively little tacit knowledge. Second, we also have found that subscores on tests of tacit knowledge — such as for managing oneself, managing others, and managing tasks — correlate significantly with each other. Third, scores on various tests of tacit knowledge, such as for academics and managers, are also correlated fairly substantially (at about the .5 level) with each other. Thus, fourth, tests of tacit knowledge may yield a general factor across these tests. However, fifth, scores on tacit-knowledge tests do not correlate with scores on conventional tests of intelligence, whether the measures used are single-score measures of multiple-ability batteries. Thus, any general factor from the tacit-knowledge tests is not the same as any general factor from tests of academic abilities (suggesting that neither kind of *g* factor is truly general, but rather, general only across a limited range of measuring instruments). Sixth, despite the lack of correlation of practical-intellectual with conventional measures, the scores on tacit-knowledge tests predict performance on the job as well as or better than do conventional psychometric intelligence tests. In one study done at the Center for Creative Leadership, we further found, seventh, that scores on our tests of tacit knowledge for management were the best single predictor of performance on a managerial simulation. In a hierarchical regression, scores on conventional tests of intelligence, personality, styles, and interpersonal orientation were entered first and scores on the test of tacit knowledge were entered last. Scores on the test of tacit knowledge were the single best predictor of managerial simulation score. Moreover, these scores also contributed significantly to the prediction even after everything else was entered first into the equation. In recent work on military leadership (Hedlund et al., 2003; Sternberg et al., 2000; Sternberg & Hedlund, 2002), it was found, eighth, that scores of 562 participants on tests of tacit knowledge for military leadership predicted ratings of leadership effectiveness, whereas scores on a conventional test of intelligence and on a tacit-knowledge test for managers did not significantly predict the ratings of effectiveness.

We also have done studies of social intelligence, which is viewed in the theory of successful intelligence as a part of

Even stronger results have been obtained in a study in Usenge, Kenya, near the town of Kisumu, where we were interested in school-age children's abilities in their indigenous environment. We devised a test of practical intelligence for adaptation to the environment (Sternberg & Grigorenko, 1997; Sternberg, Noker, Okatcha, Bundy, et al., 2001). The test of practical intelligence measured children's informal tacit knowledge of the effectiveness of medicines that the villagers believe can be used to treat various types of infections. At least some of these medicines are thought to be effective and most villagers certainly believe in their efficacy, as shown by the fact that children use them in their knowledge of these medicines an average of 10 times in medicating themselves and others. Thus, these medicines constitute effective measures of practical intelligence as defined by their effectiveness in their life circumstances in their environment. Middle-class Westerners might find it quite surprising that children or even survive in these contexts, or, for that matter, in contexts of urban ghettos often not considered as comfortable homes.

We measured the Kenyan children's ability to identify the medicines, where they come from, what they are used for, how they are dosed. Based on work we had done elsewhere, we expected that scores on this test would be a better predictor of scores on conventional tests of intelligence. To test this hypothesis, we also administered to the children the Raven Coloured Progressive Matrices Test of fluid or abstract-reasoning-based abilities, the Mill Hill Vocabulary Scale, which is a measure of formal-knowledge-based abilities. In addition, we administered to the children a comparable test of vocabulary in their native language. The Dholuo language is spoken in the area where the schools are.

We did indeed find no correlation between scores on the test of indigenous tacit knowledge and scores on the test of fluid intelligence. But to our surprise, we found statistically significant correlations of the tacit-knowledge tests with the tests of fluid intelligence. The correlations, however, were negative. In other words, the higher the children scored on the test of tacit knowledge, the lower they scored, on a test of fluid intelligence.

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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 the investigators discovered in Kenya. Some years back, Vernon (1971) pointed out that the axes of a factor analysis do not necessarily reveal a latent structure of the mind but rather represent a convenient way of characterizing the organization of mental abilities. Vernon believed that there was no one “right” orientation of axes, and indeed, mathematically, an infinite number of orientations of axes can be fit to any solution in an exploratory factor analysis. Vernon’s point seems perhaps to have been forgotten or at least ignored by later theorists.

We have considered each of the aspects of intelligence separately. How do they fare when they are assessed together?

All Three Aspects of Intelligence Together

figural content. Consider the content of
Verbal: Figuring out meanings of neologisms from natural contexts. Students see a neologism in a paragraph, and have to infer its meaning.
Analytical-Quantitative: Number series. Students see what number should come next in a series.
Analytical-Figural: Matrices. Students see a matrix with the lower right entry missing. They have to choose which option fits into the missing space.
Everyday reasoning. Students are presented with everyday problems in the life of an adolescent. They choose the option that best solves each problem.
Quantitative: Everyday math. Students are presented with scenarios requiring the use of math in everyday life (e.g., tickets for a ballgame), and have to solve the problems on the scenarios.
6) Practical-Figural: Reasoning. Students are presented with a map of an area (e.g., a field) and have to answer questions about the area (e.g., how much through the area depicted by the map).
7) Analogical reasoning. Students are presented with verbal analogies. Students are presented with verbal analogies by counterfactual premises (e.g., money and time). They have to solve the analogies as though the counterfactual premises were true.
8) Creative-Quantitative: Operations. Students are presented with mathematical operations, for example, *f* *l* *i* *x*, which involves manipulations that differ as a function of the number of two operands is greater than, equal to, or less than.
Participants have to use the novel number to solve the presented math problems.
9) Creative-Quantitative: Series. Participants are first presented with a figure in a series of one or more transformations; they then have to choose which of the series to a new figure with a different number to complete the new series.
10) Analytical-Verbal: Schools. Requires students to analyze the use of intelligence tests in schools: What are the advantages and disadvantages? How can these be weighed to make a recommendation?
Essay: Give three practical solutions to a problem you are currently having in your life.
12) Creative-Verbal: Ideal school. Consider the content of the triarchic theory of human intelligence.

Confirmatory factor analysis on the triarchic theory of human intelligence.

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, Castejón, Prieto, Hautakami, & Grigorenko, 2001).

In a further study, we (Grigorenko & 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. They 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. We 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 *latent-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

respectively, how to maintain the value of money, how to do when one makes a purchase and discovers that the one one has purchased is broken, how to locate a person in a time of need, and how to manage a situation. Each vignette received for outstanding work. Each vignette was scored by five choices and participants had to choose one. Obviously, there is no one "right" answer in these vignettes. Hence Grigorenko and Sternberg used the most frequently chosen response as the keyed answer. To the extent that a response was suboptimal, this suboptimality was used by the researchers in subsequent analyses relative to other predictor and criterion measures.

In this study, exploratory principal-components analysis of both children and adults yielded very similar results. Both varimax and oblimin rotations yielded similar loadings on creative, and practical factors for the tests. To test the effect of a different nationality (Russian), a different method of analysis (exploratory factor analysis) and confirmatory analysis) again supported the results for fluid intelligence.

The analytical, creative, and practical tests described here were employed were used to predict mental health and physical health among the Russian adults. Mental health was measured by widely used paper-and-pencil tests of depression and physical health was measured by self-reports. The best predictor of mental and physical health was the creative intelligence measure. Analytical intelligence was a predictor, however. Thus, the researchers' theory of intelligence encompassing analytical, creative, and practical intelligence provides better prediction of success in life than a theory comprising just the analytical element.

In a recent study supported by the College Board and the Rainbow Project Team, (2002), we used a battery of tests on 1015 students at 15 different colleges and 2 high schools). Our goal was to predict SAT, but to devise tests that would supplement SAT, measuring skills that this test does not measure. The multiple-choice STAT tests described here were additional measures of creative skills and practical intelligence.

Creative skills. The three additional tests were: 1. *Cartoons:* Participants were

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done to measure creativity (Sternberg & Lubart, 1995), which is described further below.

3. *Oral Stories*: Participants were presented with five sheets of paper, each containing a set of pictures linked by a common theme. For example, participants might receive a sheet of paper with images of a musical theme, a money theme, or a travel theme. The participant then chose one of the pages and was given 15 minutes to formulate a short story and dictate it into a cassette recorder. The dictation period was not to be more than five minutes long. The process was then repeated with another sheet of images so that each participant dictated a total of two oral stories. Six judges were trained to rate the stories for originality, complexity, emotional evocativeness, and descriptiveness.

Practical skills. The three additional tests were as follows:

1. *Everyday Situational Judgment Inventory (Movies)*. This video-based inventory presents participants with seven brief vignettes that capture problems encountered in general, everyday life, such as determining what to do when one is asked to write a letter of recommendation for someone one does not know particularly well.

2. *Common Sense Questionnaire*. This written inventory presents participants with 15 vignettes that capture problems encountered in general business-related situations, such as managing tedious tasks or handling a competitive work situation.

3. *College Life Questionnaire*. This written inventory presents participants with 15 vignettes that capture problems encountered in general college-related situations, such as handling trips to the bursar's office or dealing with a difficult roommate.

We found that our tests significantly and substantially improved upon the validity of the SAT for predicting first-year college grades (Sternberg & the Rainbow Project Collaborators, 2005; Sternberg, The Rainbow Project Collaborators, & University of Michigan Business School Project Collaborators, 2004). The test also improved equity: Using the test to admit a class would result in greater ethnic diversity than would using just the SAT or just the SAT and grade-point average. This test is now going into Phase-2 piloting, where it will be tried out on a larger sample of individuals.

formal instruction. In one condition, participants received no any instructional treatment. They were given a pre-test and then take a post-test. In a second condition, participants received instruction as an instructional condition, but without any formal instruction, per se. In a third condition, participants received knowledge-acquisition component plus formal instruction. Participants used to decontextualize word meaning and context cues. In the fourth condition, they were taught to use context cues. In the fifth condition, they were taught to use mediating variables. In the sixth condition, participants of the theory-based formal-instruction condition outperformed participants in the two control conditions. Their performance did not differ. In other words, formal instruction was better than no instruction without formal instruction.

Creative-thinking skills also can be taught. A program has been devised for teaching them (Davidson & Sternberg, 1996; see also Sternberg & Grigorenko, 2003). In doing relevant work, the investigators divided participants into fourth-grade children into experimental and control groups. All children took pretests on insightfulness. In the experimental group, the children received their regular school instruction. In the control group, others received instruction on insightfulness. In the experimental group, instruction of whichever kind, all children showed an increase in insight skills. We found that children taught to solve insight problems using knowledge-acquisition component gained more from pretest to posttest than children who were not so taught (Davidson & Sternberg, 1996).

Practical-intelligence skills also can be taught. A program developed a program for teaching practical intelligence aimed at middle-school students, the program was designed to teach students "practical intelligence for school" such as doing homework, taking tests, reading, and so on (Sternberg, Krechevsky, Sternberg, & Okagaki, 1999; Sternberg & Williams et al., 2002). We have evaluated the program in a variety of settings (Gardner et al., 1999; Sternberg & Jackson, 1990) and found that students taught to use practical intelligence outperform students in control groups who did not receive instruction.

Individuals' use of practical intelligence can lead to their own gain in addition to or instead of the gain of others. They can be practically intelligent for themselves and for others. It is for this reason that wisdom is a practical intelligence.

conventional framework of analytical tests based on standard psychometric models do not seem likely greatly to expand our predictive capabilities (Schmidt & Hunter, 1998).

We view intelligence as a form of developing expertise (Sternberg, 1998a, 1999a, 2003a). Indeed, some of our tests may seem more like tests of achievement or of developing expertise (see Ericsson, 1996; Howe, Davidson, & Sloboda, 1998) than of intelligence. But it can be argued that intelligence is itself a form of developing expertise — that there is no clearcut distinction between the two constructs (Sternberg, 1998a, 1999a). Indeed, all measures of intelligence, one might argue, measure a form of developing expertise.

An example of how tests of intelligence measure developing expertise emanates from work we have done in Tanzania. A study done in Tanzania (see Sternberg & Grigorenko, 1997; Sternberg, Grigorenko, et al., 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 school children between the ages of 11 and 13 years 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 they 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 (Brown & Ferrara, 1985; Budoff, 1968; Day, Engelhardt, Maxwell, & Bolig, 1997; Feuerstein, 1979; Grigorenko & Sternberg, 1998; Guthke, 1993; Haywood & Tzuriel, 1992; Lidz, 1987, 1991; Sternberg & Grigorenko, 2002a; Tzuriel, 1995; Vygotsky, 1978). 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.

they were tested again. Because the instruction lasted only about 5-10 minutes, one would expect small gains. Yet, on average, the gains were statistically significant for the experimental group, and statistically significant for the control group. In the control group, pretest scores correlated at the .8 level. In the experimental group, pretest scores on the pretest showed only weak correlations with scores on the post-test. The correlation, at about the .3 level, suggested that when tested statically to children in developing countries, the test is unstable and easily subject to influences of instruction. It could be that the children are not accustomed to static style tests, and so profit quickly even from minimal instruction as to what is expected from them. The more important question is not whether the pretest scores even correlated with each other, but rather whether they correlated with other cognitive measures. In other words, is the pretest a better predictor of transfer to other cognitive measures than the post-test score or the post-test score? The post-test score to be the better predictor.

Academic skills. In a first set of studies, we explored the question of whether conventional school tests systematically discriminates against children with creative and practical strengths (Sternberg, 1995; Sternberg, Ferrari, Clinkenbeard, & Grigorenko, 1995; Sternberg, Grigorenko, Ferrari, & Clinkenbeard, 1995). Motivating this work was the belief that children in developing countries strongly tend to favor children with practical memory and analytical abilities. However, the system is unbalanced in other directions as well. Sternberg and Grigorenko visited in Russia in 2002 with an emphasis upon the development of creative and practical abilities more so than on the development of analytical abilities. While on this trip, they were told that the Russian system — catering to the children of Russian businessmen — strongly emphasized practical abilities, and that children who were not practically oriented were told that they would be working for their classmates' parents. They were practically oriented.

The investigators used the Sternberg Test, as described above, in some of our studies. The test was administered to 326 children

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analytical, creative, or practical instruction. For example, in the memory condition, they might be asked to describe the main tenets of a major theory of depression. In the analytical condition, they might be asked to compare and contrast two theories of depression. In the creative condition, they might be asked to formulate their own theory of depression. In the practical condition, they might be asked how they could use what they had learned about depression to help a friend who was depressed.

Students in all four instructional conditions were evaluated in terms of their performance on homework, a midterm exam, a final exam, and an independent project. Each type of work was evaluated for memory, analytical, creative, and practical quality. Thus, all students were evaluated in exactly the same way.

Our results suggested the utility of the theory of successful intelligence. This utility showed itself in several ways.

First, we observed when the students arrived at Yale that the students in the high creative and high practical groups were much more diverse in terms of racial, ethnic, socioeconomic, and educational backgrounds than were the students in the high-analytical group, suggesting that correlations of measured intelligence with status variables such as these may be reduced by using a broader conception of intelligence. Thus, the kinds of students identified as strong differed in terms of populations from which they were drawn in comparison with students identified as strong solely by analytical measures. More importantly, just by expanding the range of abilities measured, the investigators discovered intellectual strengths that might not have been apparent through a conventional test.

Second, we found that all three ability tests — analytical, creative, and practical — significantly predicted course performance. When multiple-regression analysis was used, at least two of these ability measures contributed significantly to the prediction of each of the measures of achievement. Perhaps as a reflection of the difficulty of deemphasizing the analytical way of teaching, one of the significant predictors was always the analytical score. (However, in a replication of our study with low-income African-American students from New York, Deborah Coates of the City University of New York found a different pattern of results. Her data indicated that the practical

A follow-up study (Sternberg, Torff, & Torff, 1998b) examined learning of social studies by third-graders and eighth-graders. The study compared the performance of students in a very low-income neighborhood in North Carolina. The 142 eighth-graders were from largely middle to upper-middle class neighborhoods in Maryland, and Fresno, California. In the first condition, they were assigned to one of three instructional conditions. In the first condition, they were taught the course the way they have learned had there been no intervention. In the second condition, the course was on memory. In a second condition, the course was taught in a way that emphasized creative thinking. In the third condition, they were taught in a way that emphasized analytical, creative, and practical learning. Students' performance was assessed through multiple-choice assessments (through multiple-choice assessments) of memory, analytical, creative, and practical learning (through multiple-choice assessments).

As expected, students in the second condition (analytical, creative, practical) condition outperformed other students in terms of the performance on the multiple-choice tests. One could argue that this result merely reflected the way the course was taught. Nevertheless, the result suggests that these kinds of thinking succeeded. More importantly, it was the result that children in the second condition outperformed the other conditions on the multiple-choice memory tests. In other words, the goal is just to maximize the amount of information, teaching for successful intelligence. It enables children to capitalize on their strengths or to correct or to compensate for their weaknesses. It enables children to encode material in a variety of ways.

We have now extended these results to the middle-school and the high-school levels. In a study of 432 middle-school students and 432 high school students, reading was taught either triarchically or through a standard way. At the middle-school level, reading was taught triarchically. At the high school level, reading was taught triarchically. In mathematics, physical sciences, social studies, history, foreign languages, and the arts, students who were taught triarchically substantially outperformed those who were taught in standard ways.

The first is *unrealistic optimism* with respect to the long-term consequences of what they do. They may believe themselves to be so smart that they believe that, whatever they do, it will work out all right. They may overly trust their own intuitions, believing that their brilliance means that they can do no wrong.

The second is *egocentrism*. Many smart people have been so highly rewarded in their lives that they lose sight of the interests of others. They start to act as though the whole world revolves around them. In doing so, they often set themselves up for downfalls, as happened to both Presidents Nixon and Clinton, the former in the case of Watergate, the latter in the case of *Monicagate*.

The third characteristic is a sense of *omniscience*. Smart people typically know a lot. They get in trouble, however, when they start to think they “know it all.” They may have expertise in one area, but then, start to fancy themselves experts in practically everything. At that point, they become susceptible to remarkable downfalls, because they act as experts in areas where they are not, and can make disastrous mistakes in doing so.

The fourth characteristic is a sense of *omnipotence*. Many smart people find themselves in positions of substantial power. Sometimes they lose sight of the limitations of their power, and start to act as though they are omnipotent. Several U.S. presidents as well as presidents of other countries have had this problem, leading their countries to disasters on the basis of personal whims. Many corporate chieftains have also started to think of themselves as omnipotent, unfortunately, cooking the books of their corporations at will.

The fifth characteristic is a sense of *invulnerability*. Not only do the individuals think they can do anything; they also believe they can get away with it. They believe that either they are too smart to be found out or, even if found out, they will escape any punishment for misdeeds. The result is the kind of disasters the United States has seen in the recent Enron, Worldcom, and Arthur Andersen debacles.

Conclusions

Some psychologists will believe that the theory of successful intelligence departs too much from the conventional

will be those who wish to preserve their theories, and those who will continue to replicate hundreds and thousands of times. If general intelligence does indeed matter for success in life, I agree. At the same time, I suspect that, and also, that those who keep replicating errors of the past are unlikely to serve as the leaders of the future. But only time will tell. There is typically some value to replication after the point where a point is established to continue to produce papers than to produce breakthroughs.

The educational systems in many of our countries place a great emphasis on instruction and assessment of two important skills: memory and, to a lesser extent, logic. Students who are adept at these two skills are rewarded in the educational system, because the ability and achievement tests we use all largely measure processes emanating from these two kinds of skills. The problem, however, namely, that children who excel in other kinds of skills may be shortchanged. These children might learn and test well in areas where they given an opportunity to play to their strengths and weaknesses.

Our societies can create closed systems that reward certain types of children and that disadvantage others. Children who excel in memory and analytical skills will end up doing well on ability tests and achieve, and hence find the doors of opportunity open. Children who excel in other abilities may end up doing poorly on tests, and find the doors shut. By treating children as alternative patterns of abilities as losers, we are creating harmful self-fulfilling prophecies that do nothing for society needs. What societies need is a new conception of intelligence. The theory of successful intelligence provides one such conception.

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Successful intelligence is defined as one's ability to set and accomplish personally meaningful goals in one's life, given one's cultural context. A successfully intelligent person accomplishes these goals by figuring out his or her strengths and weaknesses, and then by capitalizing on the strengths and correcting or compensating for the weaknesses. My colleagues and I have tested the theory of successful intelligence, in its various phases, using a variety of converging operations, including reaction-time analysis, cultural analysis, factor analysis, correlational analysis, predictive analysis, and instructional analysis, among other methods. The results have been, for the most part, highly supportive of the theory. Key References. Sternberg, R. J. (1977). According to the proposed theory, successful intelligence is (1) the use of an integrated set of abilities needed to attain success in life, however an individual defines it, within his or her sociocultural context. People are successfully intelligent by virtue of (2) recognizing their strengths and making the most of them at the same time that they recognize their weaknesses and find ways to correct or compensate for them. A number of implications follow from the theory of successful intelligence with regard to teaching and assessment. It should be noted, however, that these implications do not follow uniquely from the theory. This article presents a theory of successful intelligence. The theory is substantially broader than conventional theories of intelligence. It defines intelligence in terms of the ability to achieve one's goals in life, within one's sociocultural context. The article is divided into four major parts. The article opens with a consideration of the nature of intelligence. Then it discusses measurement of intelligence. Next it discusses how people can be intelligent but foolish. Finally it draws conclusions. Keywords: Successful intelligence; analytical intelligence; creative intelligence; practical intelligence. Discover the world's research. 20+ million members. Successful intelligence is viewed as a form of developing expertise (Sternberg, 1998a, 1999b). In other words, it is not a fixed entity, but a flexible and dynamic one. All intelligence tests measure only an aspect—typically a limited aspect—of developing expertise. To identify gifted students in terms of the theory of successful intelligence, we prefer to use a variety of measures: * standardized tests of memory and analytical abilities. (tests of IQ, SAT, ACT, SSAT, etc.);1.