Teaching for Successful Intelligence: Principles, Procedures, and Practices

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In this article, we discuss the theory of successful intelligence as a basis for identifying gifted children, teaching such children, and assessing their achievement. First, we briefly review the theory of successful intelligence. Then, we describe how to teach and assess for successful intelligence. Next, we discuss and answer potential objections to teaching for successful intelligence. Then, we present some data based on teaching for successful intelligence. Finally, we draw some conclusions.

Introduction

More and more, educators are recognizing that many children, including gifted children, fail to live up to their potential. There can be a number of reasons for this failure, one of which is that the way in which the students are taught and, often, assessed in school does not enable them to learn and perform in an optimal way. We have developed the theory of successful intelligence to understand these children (Sternberg, 1997a, 1999), and we have developed a set of methods of teaching for successful intelligence to help these students reach their full potential (Sternberg & Grigorenko, 2000).

In this article, we review the theory of successful intelligence. Then, we describe how to teach and assess for successful intelligence. We also answer potential objections to teaching for successful intelligence and present data. Finally we draw some conclusions.

As a "metatheoretical" point, it should be said up front that the theory of successful intelligence conceptualizes giftedness in a way that is different from that of some conventional conceptions of giftedness, for example, those who view intelligence as unidimensional (e.g., Jensen, 1998). We view intelligence as multidimensional: Hence, there are multiple ways to be gifted. Teaching for successful intelligence is designed to help ensure that all children can capitalize on their gifts, as well as correct or compensate for skill sets in

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Journal for the Education of the Gifted. Vol. 27, No. 2/3, 2003, pp. 207–228.

which they have not developed gifts. Indeed, developing giftedness is seen, in large part, as helping children develop these patterns of capitalization, correction, and compensation.

The Theory of Successful Intelligence: A Capsule Description

The theory of successful intelligence suggests that students' failures to achieve at a level that matches their potential often results from teaching and assessment that are narrow in conceptualization and rigid in implementation. Thus, none of the above explanations is adequate. Rather, the ways of the academy simply fail to meet the needs of students. The traditional ways, in essence, typically shine a spotlight on a small number of students with a certain pattern of abilities and almost never shine the spotlight on a large number of students who have the ability to succeed, but whose patterns of abilities do not correspond to the patterns valued by the schools. The solution is to value other ability patterns and then change teaching and assessment so that these other ability patterns can lead to success in school.

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. Successfully intelligent people (3) adapt to, shape, and select environments through (4) finding a balance in their use of analytical, creative, and practical abilities (Sternberg, 1997a, 1999). Consider each element of the theory in turn.

The first element makes clear that there is no one definition of success that works for everyone. For some people, success is brilliance as a lawyer; for others, it is originality as a novelist; for others, it is caring for one's children; for others, it is devoting one's life to God. For many people, it is some combination of things. Because people have different life goals, education needs to move away from single targeted measures of success, such as grade point average.

In considering the nature of giftedness, we need to consider the full range of definitions of success by which children can be gifted. For example, in research we have done in rural Kenya (Sternberg et

al., 2001), we have found that children who may score quite high on tests of an aspect of practical intelligence (e.g., knowledge of how to use natural herbal medicines to treat parasitic and other illnesses) may score quite poorly on tests of IQ and academic achievement. Indeed, we found an inverse relationship between the two skill sets, with correlations reaching the -.3 level. For these children, time spent in school takes away from time in which they learn the practical skills that they and their families view as needed for success in life. In the Western world, the same might be said for many children who want to enter careers in athletics, theater, dance, art, music, carpentry, plumbing, entrepreneurship, and so forth. They may see time spent developing academic skills as taking away from the time they need to develop practical skills relevant to meeting their goals in life.

The second element asserts that there are different paths to success, no matter what goal one chooses. Some people achieve success in large part through personal charm; others through brilliance of academic intellect; others through stunning originality; others through working extremely hard. For most of us, there are at least a few things we do well, and our successful intelligence is dependent in large part upon making these things "work for us." At the same time, we need to acknowledge our weaknesses and find ways to either improve upon them or compensate for them. For example, we might work hard to improve our skills in an area of weakness or work as part of a team so that other people compensate for the kinds of things we do not do particularly well.

The third element asserts that success in life is achieved through some balance of adapting to existing environments, shaping those environments, and selecting it. Often, when we go into an environment—as do students and teachers in school—we try to modify ourselves to fit those environments. In other words, we adapt. But sometimes it is not enough to adapt: We are not content merely to change ourselves to fit the environment; rather, we also want to change the environment to fit us. In this case, we shape the environment to make it a better one for us and possibly for others, as well. But there may come times when our attempts to adapt and shape lead us nowhere—when we simply cannot find a way to make the environment work for us. In these cases, we leave that old environment and select a new one. Sometimes, the smart thing is to know when to get out.

Finally, we balance three kinds of abilities to achieve these ends: analytical abilities, creative abilities, and practical abilities. We need creative abilities to generate ideas, analytical abilities to

determine whether they are good ideas, and practical abilities to implement the ideas and convince others of their value. Most people who are successfully intelligent are not equal in these three abilities, but they find ways of making them work harmoniously together.

We have used five kinds of converging operations to test the theory of successful intelligence: cultural studies, factor-analytic studies, information-processing analyses, correlational analyses, and instructional studies (some of which are described below). This work is summarized elsewhere (e.g., Sternberg, 1985, 1997a, 2003a, 2003b; Sternberg et al., 2000). Examples of kinds of evidence in this work supporting the theory are the factorial separability of analytical, creative, and practical abilities; the substantial incremental validity of measures of practical intelligence over the validity of measures of academic (general) intelligence in predicting school and job performance; the usefulness of instruction based on the theory of successful intelligence in comparison with other forms of instruction; and differences in the nature of what constitutes practical intelligence across cultures. This definition of successful intelligence contains within it several implications for teaching (Sternberg & Grigorenko, 2000; Sternberg & Spear-Swerling, 1996).

Teaching and Assessing for Successful Intelligence

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. At some level, the practices of good teaching will be the same without regard to the theory that generates these practices, and, hence, there will be overlap in such practices across theoretical frameworks. Moreover, many good teachers already follow the suggestions we make. The fourth implication below, with regard to teaching for analytical, creative, and practical thinking, is what most distinguishes the theory of successful intelligence from other related constructivist theories (e.g., Collins, Brown, & Newman, 1989; Palincsar & Brown, 1984; Rogoff, 1990), in general, or other broad theories of intelligence, in particular (e.g., Gardner, 1983, 1999).

1. Because students have different life goals and, hence, different outcomes that, for them, are successful, student success needs to be defined in terms that are meaningful to the students, as well as to the institution.

Students take courses for many reasons. How can teachers translate such a wide range of needs into effective teaching and assessment strategies?

(1) *Provide numerous examples of concepts that cover a wide range of applications.* In almost any course, examples can be narrowly or broadly conceived. Broadly conceived examples—and lots of them—help more students relate to the material. For example, historical events have implications for understanding literature, current news events, notions of science and scientific progress, spotting sources of future political unrest, and so forth. By giving multiple and diverse concrete examples, teachers meet the needs of more students.

(2) *Give students multiple and diverse options in assessment.* Options can take various forms. For example, students can have a term project or paper assignment (which itself may be optional) that enables them to write about any topic of interest to them so long as it falls within the purview of the course. In this way, students are invited to find a way to relate a given course to their own current or potential future personal or professional interests. Usually, it is a good idea to have students submit a proposal or précis for comments before they start on the full-fledged project or paper. As an example, a test may have options built into it. Students might have, for instance, a common multiple-choice section followed by a selection of essays that involve application of concepts in diverse ways to different fields. A test on a novel, for example, might have a choice of essays on (a) an analysis of the plot of the novel, (b) a comparison of two characters, (c) the application of the themes of the novel to everyday life, and so forth.

(3) *Grade student work in a way that preserves the integrity of the course, as well as the integrity of the students' varied life goals.* Diverse forms of assessment will succeed only if the teachers are able to understand and, to some extent, identify with student goals in preparation of projects or essays. If students learn that certain types of projects or essays or even points of view consistently receive higher grades than do others, the students will learn quickly that the teacher is letting a thousand flowers bloom in theory, but not in practice (much as happened when Mao Tse-tung encouraged dissent and then punished the dissenters).

2. Help students to capitalize on strengths and, at the same time, help them correct or compensate for weaknesses.

Think back to your three or four best teachers. Were they identical in their methods of instruction and assessment? Did they all achieve their success in the same way? Almost certainly they did not. People succeed (and fail) for different reasons. One teacher might stand out for the lectures she gave, another for her facilitation of group discussions, a third for his serving as a role model. Just as professionals (in all fields) succeed (and fail) in different ways, so do students. To maximize students' opportunities for success, it is important to enable them to capitalize on their strengths and to correct or compensate for weaknesses. Teaching in this way maximizes students' achievement (Sternberg, Grigorenko, Ferrari, & Clinkenbeard, 1999). These facts have several implications.

(1) *There is no one right way of teaching and learning.* Different students learn and think in different ways (Sternberg, 1997a, 1997b). Some students may learn better from lectures, others from class discussions. Some may learn better via oral presentation, others by reading. Some may prefer verbal presentation of material, others, pictorial representation. Some may love to delve into details, others may prefer to concentrate on the big picture. By varying teaching techniques, one is likely to reach more students more successfully.

(2) *There is no one right way of assessing students' achievement.* Experience suggests that some students excel in multiple-choice tests, others in essays. Some students do well so long as the questions are limited to factual recall, whereas others do better if they are allowed to show their deeper understanding, perhaps, of fewer facts. Unidimensional assessments (e.g., tests that are all multiple choice, all short answer, or all essay) often fail to enable students to capitalize on strengths. The same students may repeatedly excel while others repeatedly do poorly, not for lack of ability or even achievement, but for lack of variety in the way the students' knowledge and skills are assessed.

(3) *Teach and assess to weaknesses, as well as to strengths.* Some teachers might misunderstand the message here as a plea for extreme individualization—an individualized program for each student. Such a program is usually impractical, especially at the introductory level, and often is counterproductive. Students need to learn to correct or compensate for weaknesses, as well as to capitalize on strengths. Thus, it is important that students be

intellectually uncomfortable some of the time, just as it is important for them to be intellectually comfortable and secure some of the time. Students need to learn to deal with more challenging methods of instruction and assessment, as well as with ones that challenge them less. By varying methods of instruction and assessment for all students, you automatically provide an environment in which, at a given time, some students will be more and others less comfortable. Fortunately, different students will be at different comfort levels at different times.

3. *Students need to learn to balance adaptation to, shaping of, and selection of environments.*

The balance of these three responses to the environment has certain implications for teaching:

(1) *Students, like teachers, need to develop flexibility.* A rigid classroom or institutional environment is likely to foster rigidity in the thinking of the students in it. Given the amazingly rapid rate of development today—the initiation and rapidly changing environment of the Internet, the changing nature of jobs and the requirements of those jobs, the rapidly changing social structures that render behavior that is socially acceptable one year and socially unacceptable the next—schools are obliged to develop flexibility in their students. The rapid accumulation of knowledge may render much of the knowledge students acquire in school obsolete, but it will never render obsolete the facility they acquire in coping with novel environments. As a result, teachers need not only encourage students by challenging them, but also to encourage students to challenge themselves. For example, the school environment should be structured in a way that encourages students to take difficult courses or courses that challenge the boundaries they may previously have set for themselves.

The environment should also encourage students to understand and be able to represent points of view other than their own. At the same time, students need to learn to critique in a thoughtful and systematic manner beliefs they may have held dear throughout their lives, whatever these beliefs may be.

(2) *Students need to be allowed and even encouraged to take risks and to make mistakes.* People often learn more from

their mistakes and failures than from their successes. An environment that does not allow students to make mistakes or to fail in their endeavors deprives them of important learning opportunities. Environmental selection means choosing a new environment over an old one. It can apply to changing one's term-paper topic after discovering that one's first choice did not work out or to changing one's course schedule after deciding that the selection of a particular course was a mistake. Students often view the decisions to make such changes as implying that they have wasted time in their former choices (e.g., of paper topics or courses). Quite the contrary, the students have learned a lesson they will need in life: to have a sense of when and how to cut losses and to recognize that sometimes there is a need to change one's direction or even one's goals. Put succinctly, they need to learn that nothing ventured, nothing gained.

(3) *Students need to learn how to overcome obstacles.* When the environment of the classroom, the institution, or even the society is less than ideal, it often requires guts to try to change (shape) it. Outmoded and often counterproductive practices continue in all institutions and even classroom settings simply because no one, including the faculty, wants to challenge authority and cut through the red tape needed to improve the learning or working environment. Often, when students or faculty try to make changes, they encounter opposition and even outright defiance. Yet, the world would be a much worse place to live if no one had had the courage to stand up to opposition and fight for change—to shape the environment.

At the same time, students need to learn to balance adaptation with shaping. Someone who initiates and then fights one battle after another is likely to lose considerable time, as well as credibility, in the resulting skirmishes. Students and faculty alike need to learn to pick their battles carefully and then stand up for the causes that truly are meaningful to them. As teachers, we might find numerous aspects of our institutions in need of change. We cannot change them all. We, just like our students, therefore, need to develop a taste for which battles are worth fighting and which are not. But, when we choose, we must then be willing to stand up for our

beliefs and show persuasively why others should adopt them.

4. *Teaching and assessment should balance the use of analytical, creative, and practical thinking.*

All teaching and assessment should be balanced in terms of the thinking skills they require. At the same time, as teachers, we need to put behind us the false dichotomy between "teaching for thinking" and "teaching for the facts," or between emphases on thinking and emphases on memory.

Thinking always requires memory and the knowledge base that is accessed through the use of our memories. One cannot analyze what one knows if one knows nothing. One cannot creatively go beyond the existing boundaries of knowledge if one does not know what those boundaries are. And one cannot apply what one knows in a practical manner if one does not know anything to apply.

At the same time, memory for facts without the ability to use those facts is useless. A story recently appeared in the news about a man who entered a truck upon which an electrical wire had fallen during a continuing storm. A second man, observing the first man's imminent entrance into the truck, shouted at him to stop, but too late. The first man was electrocuted. The first man had master's degrees in physics and engineering; the second man had no such degrees. Without doubt, the first man's educational achievements gave him the declarative (factual) knowledge that he could have used to save his life. But he was unable to apply this knowledge (turn it into procedures) in a way that would have ensured his survival.

It is for this reason that we encourage teachers to teach and assess achievement in ways that enable students to analyze, create with, and apply their knowledge. When students think to learn, they also learn to think. And there is an added benefit: Students who are taught analytically, creatively, and practically perform better on assessments, apparently without regard to the form the assessments take. That is, they outperform students instructed in conventional ways, even if the assessments are for straight factual memory (Sternberg, Torff, & Grigorenko, 1998a, 1998b). Moreover, our research shows that these techniques succeed, regardless of subject-matter area. But what, exactly, are the techniques used to teach analytically, creatively, and practically (see Table 1 for a summary)?

(1) *Teaching analytically means encouraging students to (a) analyze, (b) critique, (c) judge, (d) compare and contrast, (e) evaluate, and (f) assess.* When teachers refer to "teach-

Table 1

Summary of Selected Prompts for Analytical, Creative, and Practical Instruction and Assessment

Analytical	Creative	Practical
(a) analyze	(a) create	(a) apply
(b) critique	(b) invent	(b) use
(c) judge	(c) discover	(c) put into practice
(d) compare and contrast	(d) imagine if . . .	(d) implement
(e) evaluate	(e) suppose that . . .	(e) employ
(f) assess	(f) predict	(f) render practical

ing for critical thinking," they typically mean teaching for analytical thinking. How does such teaching translate into instructional and assessment activities? Consider various examples across the school curriculum:

(a) *Analyze* the development of the character of Heathcliff in *Wuthering Heights*. [literature]
(b) *Critique* the design of the experiment (just gone over in class or in a reading) showing that certain plants grew better in dim light than in bright sunlight. [biology]
(c) *Judge* the artistic merits of Roy Lichtenstein's "comic-book art," discussing its strengths, as well as its weaknesses, as fine art. [art]
(d) *Compare and contrast* the respective natures of the American Revolution and the French Revolution, pointing out ways in which they were similar and those in which they were different. [history]
(e) *Evaluate* the validity of the following solution to a mathematical problem and discuss weaknesses in the solution, if there are any. [mathematics]
(f) *Assess* the strategy used by the winning player in the tennis match you just observed, stating what techniques she used to defeat her opponent. [physical education]

(2) *Teaching creatively means encouraging students to (a) create, (b) invent, (c) discover, (d) imagine if…, (e) suppose that…, and (f) predict.* Teaching for creativity requires teachers not only to support and encourage creativity, but also to role model it and to reward it when it is displayed (Sternberg & Lubart, 1995; Sternberg &

Williams, 1996). In other words, teachers need not only to talk the talk, but also to walk the walk. Consider some examples of instructional or assessment activities that encourage students to think creatively.

(a) *Create* an alternative ending to the short story you just read that represents a different way things might have gone for the main characters in the story. [literature]
(b) *Invent* a dialogue between an American tourist in Paris and a French man he encounters on the street from whom he is asking directions on how to get to the Rue Pigalle. [French]
(c) *Discover* the fundamental physical principle that underlies all of the following problems, each of which differs from the others in the "surface structure" of the problem, but not in its "deep structure." [physics]
(d) *Imagine if* the government of China keeps evolving over the course of the next 20 years in much the same way it has been evolving. What do you believe the government of China will be like in 20 years? [government, political science]
(e) *Suppose that* you were to design one additional instrument to be played in a symphony orchestra for future compositions. What might that instrument be like, and why? [music]
(f) *Predict* changes that are likely to occur in the vocabulary or grammar of spoken Spanish in the border areas of the Rio Grande over the next 100 years as a result of continuous interactions between Spanish and English speakers. [linguistics]

(3) *Teaching practically means encouraging students to (a) apply, (b) use, (c) put into practice, (d) implement, (e) employ, and (f) render practical* what they know. Such teaching must relate to the real practical needs of the students, not just to what would be practical for individuals other than the students (Sternberg et al., 2000). Consider some examples:

(a) *Apply* the formula for computing compound interest to a problem people are likely to face when planning for retirement. [economics, math]
(b) *Use* your knowledge of German to greet a new acquaintance in Berlin. [German]

(c) *Put into practice* what you have learned from teamwork in football to making a classroom team project succeed. [athletics]
(d) *Implement* a business plan you have written in a simulated business environment. [business]
(e) *Employ* the formula for distance, rate, and time to compute a distance. [math]
(f) *Render practical* a proposed design for a new building that will not work in the aesthetic context of the surrounding buildings, all of which are at least 100 years old. [architecture]

Clearly it is possible to implement teaching for successful intelligence in a wide variety of academic contexts. But there are potential problems with any new methodology. What are the potential problems for this one?

Potential Objections to Teaching for Successful Intelligence With Replies

Here are 12 common objections and replies with respect to the implementation of the techniques described in this article:

1. *Teaching for successful intelligence requires individualization to many patterns of abilities, which is impractical because one cannot know all students' patterns of abilities. In a large class, one even may not know any students' patterns of abilities.*

This objection is based on a misunderstanding. As noted above, teaching for successful intelligence actually is largely uniform across students because all students need to learn both how to capitalize on strengths and how to correct or compensate for weaknesses. At a given time, instruction may be favoring some students and not others. But, over time, it should roughly favor all students equally.

Teaching for successful intelligence stresses maximizing, not equalizing, all students' outcomes. This type of teaching neither assumes equal achievement of students nor aims at eliminating individual differences. Teaching for successful intelligence is a tool devised to ensure content presentation in a number of ways, all of which engage students' diverse patterns of abilities.

2. *Teaching for successful intelligence means teaching everything in three ways and that is impractical.* It *is* impractical to teach everything in three ways; and few, if any, concepts should be taught all three ways. Rather, teachers should vary their use of analytical, cre-

ative, and practical techniques over concepts and over time. On average, a roughly equal amount of time should be devoted to each kind of teaching. But it is not necessary or desirable to teach every concept in three ways. Thus, teaching for successful intelligence does not mean that the school year must somehow be extended magically. The amount of teaching is not different, but the quality is. The teacher needs to gauge students' needs and understanding and then teach in the ways that are appropriate.

3. *Teaching for successful intelligence is too novel for most teachers and requires too much effort to implement.* When we give workshops on teaching for successful intelligence, one of the first things we emphasize is that *all* teachers will have used the large majority of the techniques at least some of the time. There is relatively little, and, for some teachers, nothing new in teaching for successful intelligence. Good teachers do these things spontaneously or learn how to do them in short order. Rather, good teachers are often out of balance: They emphasize certain kinds of teaching and assessment techniques at the expense of others. Thus, the main thing many teachers have to work on is balance, rather than learning how to teach in totally novel ways.

4. *Exams tend to stress memory for material, so it really does not make sense to teach in a way that encourages thinking that will prove to be at best irrelevant and at worst detrimental to exam performance.* As noted above, this objection is simply wrong. Teaching for successful intelligence seems to raise student achievement on average, regardless of subject matter or means of assessment (Grigorenko, Jarvin, & Sternberg, 2002; Sternberg et al., 1998a, 1998b).

5. *Teaching for successful intelligence is for gifted students (or students with learning disabilities), and I don't teach for gifted students (or students with learning disabilities).* This objection is misguided. Teaching for successful intelligence improves learning for all students, not just for gifted students (or students with learning disabilities). Indeed, the students who have been identified as gifted or talented (or as having learning difficulties) are typically those who are already profiting from or receiving special accommodations within conventional instruction. It is not just the students who have been identified as academically gifted or talented (or as having learning disabilities) who gain from teaching for successful intelligence. All students gain, especially those who may be creatively minded or practically minded and whose talents do not show up with conventional teaching. For example, students from at-risk or, at least, challenging environments often *must* develop

their practical and creative thinking skills to thrive or even to stay alive in their early environments. Teaching for successful intelligence enables students to capitalize on these skills, whereas conventional teaching typically does not.

6. *Teaching for successful intelligence seems applicable to higher level, but not lower level courses.* This misconception is common. Students should learn to think analytically, creatively, and practically at all levels. The techniques can be and have been applied at all levels, including the introductory level (e.g., Sternberg, 1995). Even the most basic material can be taught in any of the three ways.

An additional reason to teach for successful intelligence is precisely that the kinds of thinking required more closely resemble those required for the real-world work for which school is preparatory. In a conventional course, a student who is a poor memorizer using conventional memory learning may conclude that he or she lacks the skills needed to be a successful historian, biologist, psychologist, geographer, language interpreter, or whatever when, in fact, the skills in which he or she is weak may apply largely only to achieving success in introductory-level courses. Students may thus drop out of subject-matter areas in which they actually have the skills needed to succeed on the job, but not to succeed especially well in the first-level courses that prepare for the job. Thus, teaching for successful intelligence may enable students to pursue their dreams, students who otherwise might give up in despair, falsely believing themselves to be incompetent.

7. *Teaching for successful intelligence is applicable to small courses, but not to large ones.* In fact, teaching for successful intelligence may be done, at least at some level, in courses of any size. In extreme cases, it may be feasible only to give multiple-choice or short-answer exams if the number of students is extremely large and the resources for grading the students' work extremely small. But having students analyze ideas, come up with their own ideas, and learn how to apply ideas can be done in any course. Teachers can encourage students to think in these ways and can model these kinds of thinking for the students.

Large classes may mean that a teacher can only use certain aspects of teaching for successful intelligence. But approximating full teaching for successful intelligence is better than giving up on it altogether. Even if one is limited to multiple-choice exams, it still is possible to design questions that require at least some amount of analytical, creative, and practical thinking, in addition to questions that require only pure, factual recall.

8. *Teaching for successful intelligence is applicable only to certain subject areas.* As the above examples show, teaching for successful intelligence is applicable to all subject-matter areas.

9. *It really makes more sense for a teacher to teach in a way with which he or she is comfortable; and few teachers can claim to excel in all three or even two of analytical, creative, and practical skills. Other teachers can always complement with their strengths what I lack on my own.* This interpretation of the role of the teacher is designed to make teaching easier, rather than more effective. The problem is that students often take only a few introductory courses, perhaps just one. Therefore, some students may never even get to view the thinking of the other teachers. If they find that they do not excel in learning the way the introductory-course teacher prefers to teach, chances are the students (as well as the teachers) will not attribute their failure to a mismatch between teaching and learning preferences. Rather, they will attribute their failure to sheer incompetence and never even get the chance to find out that they could have succeeded with another teacher and another method of teaching. Teachers, as a result, have a responsibility to make sure that they maximize the conditions of learning for *all* students, not just for those whose strengths happen to match the teacher's own.

10. *I already do all these things anyway, so I can do what I have been doing without applying a fancy name to it.* If you are already doing all these things, that's wonderful! But our research has shown that there frequently is a discrepancy between what teachers think they are doing and what they are actually doing, as revealed by classroom observations (Spear & Sternberg, 1987). Thus, the teacher needs to make sure he or she truly is doing these things, rather than merely thinking he or she is doing them.

11. *Students won't like learning analytically, creatively, or practically, or they will find it too hard.* There are always some students who do not like any particular method of teaching. But, on average, you will reach more students teaching for successful intelligence.

Outside the classroom, students learn in these ways. Now they can learn in these ways inside the classroom, as well. There may be an adjustment at first on the part of students. But, our data show that, once they are familiar with the proposed methods of teaching and assessment, students like them more, not less, than traditional methods (Sternberg et al., 1998).

12. *This is all theory. It won't work.* Our research shows it *does* work (see Sternberg & Grigorenko, 2000, for a brief review).

Actually, we have found that the best predictor of success is motivation: The techniques succeed if teachers want them to and fail if teachers set things up to fail so they then can say, "I told you so." Let's see some examples of how it works.

Some Instructional Data

We have sought to test the theory of successful intelligence in the classroom. In a first set of studies, we explored the question of whether conventional education in school systematically discriminates against children with creative and practical strengths (Sternberg & Clinkenbeard, 1995; Sternberg, Ferrari, Clinkenbeard, & Grigorenko, 1996; Sternberg et al., 1999). Motivating this work was the belief that the systems in most schools strongly tend to favor children with strengths in memory and analytical abilities. However, schools can be unbalanced in other directions, as well. One school we visited in Russia in 2000 placed a heavy emphasis upon the development of creative abilities—much more so than on the development of analytical and practical abilities. While on this trip, we were told of yet another school—catering to the children of Russian businessmen —that strongly emphasized practical abilities and in which children who were not practically oriented were told that, eventually, they would be working for their classmates who were practically oriented.

To validate the relevance of the theory of successful intelligence in the classroom, we have carried out a number of instructional studies. In one study, we used the Sternberg Triarchic Abilities Test (Sternberg, 1993). The test was administered to 326 children around the United States and in some other countries who were identified by their schools as gifted by any standard whatsoever. Children were selected for a summer program in (college-level) psychology if they fell into one of five ability groupings: high analytical, high creative, high practical, high balanced (high in all three abilities), or low balanced (low in all three abilities). Students who came to Yale were then assigned at random to four instructional groups, with the constraint that roughly equal numbers with each ability pattern be assigned to each group. Students in all four instructional groups used the same introductory psychology textbook (a preliminary version of Sternberg, 1995) and listened to the same psychology lectures. What differed among them was the type of afternoon discussion section to which they were assigned. They were assigned to an instructional condition that emphasized either memory, 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 such status variables as these may be reduced by using a broader conception of intelligence. Accordingly, 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 important, just by expanding the range of abilities measured, we 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. In particular, for homework assignments, significant beta weights were obtained for analytical (.25) and creative (.16) ability measures; for the independent project, significant weights were obtained for the analytical (.14), creative (.22), and practical (.14) measures; for the exams, significant weights were obtained for the analytical (.24) and creative (.19) measures (Sternberg et al., 1999). 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 tests were better predictors of course performance

than were the analytical measures, suggesting that what ability test predicts what criterion depends on population, as well as mode of teaching.)

Third and most important, there was an aptitude-treatment interaction whereby students who were placed in instructional conditions that better matched their pattern of abilities outperformed students who were mismatched. In particular, repeated-measures analysis revealed statistically significant effects of match for analytical and creative tasks as a whole. Three of five practical tasks also showed an effect. In other words, when students are taught in a way that fits how they think, they do better in school (see Cronbach & Snow, 1977, for a discussion of the difficulties in eliciting aptitude-treatment interactions). Children with high levels of creative and practical abilities, who are almost never taught or assessed in a way that matches their pattern of abilities, may be at a disadvantage in course after course, year after year.

A follow-up study (Sternberg, Torff, & Grigorenko, 1998a, 1998b) examined learning of social studies and science by third graders and eighth graders. The 225 third graders were students in a very low-income neighborhood in Raleigh, North Carolina. The 142 eighth graders were students who were largely middle to upper-middle class studying in Baltimore, Maryland, and Fresno, California. These latter children were part of a summer program for gifted students sponsored by Johns Hopkins University. In this study, students were assigned to one of three instructional conditions. Randomization was by classroom. In the first condition, they were taught the course that basically they would have learned had there been no intervention. The emphasis in the course was on memory. In a second condition, students were taught in a way that emphasized critical (analytical) thinking. In the third condition, they were taught in a way that emphasized analytical, creative, and practical thinking. All students' performances were assessed for memory learning (through multiple-choice assessments), as well as for analytical, creative, and practical learning (through performance assessments).

As expected, students in the successful intelligence (analytical, creative, practical) condition outperformed the other students in terms of the performance assessments. For the third graders, respective means for the triarchic (successful intelligence), critical-thinking, and memory conditions were 6.31, 5.90, and 4.89 for analytical performance measures; 6.71, 5.94, and 4.58 for creative performance measures; 5.96, 6.39, and 5.31 for practical performance measures; and 11.28, 10.54, and 10.73 for the multiple-choice memory measures. For the eighth graders, the respective triarchic (suc-

cessful intelligence), critical thinking, and memory condition means were 6.23, 6.42, and 6.11 for analytical performance assessments; 7.32, 5.60, and 6.01 for creative performance measures; 7.14, 6.12, and 6.30 for practical performance measures; and 32.57, 30.06, and 28.03 for the multiple-choice memory measures. One could argue that this pattern of results merely reflected the way students were taught. Nevertheless, the results suggested that teaching for these kinds of thinking succeeded. More important, however, was the result that children in the successful intelligence condition outperformed the other children even on the multiple-choice memory tests. In other words, to the extent that one's goal is just to maximize children's memory for information, teaching for successful intelligence is still superior. It enables children to capitalize on their strengths and to correct or compensate for their weaknesses, and it allows children to encode material in a variety of interesting ways.

We have now extended these results to reading curricula at the middle school and the high school level. In a study of 871 middle school students and 432 high school students, we taught reading either triarchically or through the regular curriculum. Classrooms were assigned randomly to treatments. At the middle school level, reading was taught explicitly. At the high school level, reading was infused into instruction in mathematics, physical sciences, social sciences, English, history, foreign languages, and the arts. In all settings, students who were taught triarchically substantially outperformed students who were taught in standard ways (Grigorenko, Jarvin, & Sternberg, 2002). Effects were statistically significant at the .001 level for memory-analytical, creative, and practical comparisons.

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 also in school classrooms and even the everyday life of adults.

Conclusion

Why should teaching for successful intelligence improve performance relative to standard (or critical thinking) instruction, even when performance is assessed for straightforward memory-based recall? There are at least four reasons. First, teaching for successful intelligence encourages deeper and more elaborated encoding of

material than does traditional teaching so that students learn the material in a way that enhances probability of retrieval on tests. Second, teaching for successful intelligence encourages more diverse forms of encoding material so that there are more retrieval paths to the material, and, hence, there is a greater likelihood of recall at test time. Third, teaching for successful intelligence enables students to capitalize on strengths and correct or compensate for weaknesses. Fourth, teaching for successful intelligence is more motivating to both teachers and students so that teachers are likely to teach more effectively and students are more likely to learn more. Ideally, of course, exams should *not* assess only static memory learning.

The theory of successful intelligence can potentially modify the ways in which we think about identifying, teaching, and assessing the gifted and talented. It provides a unified model for all three operations. Analytical, creative, and practical ability tests can be used in identification, as we have done. Teaching can then be done in ways that stress analytical, creative, and practical thinking. Then achievement can be assessed via these three ways of thinking, in addition to assessments for memory. Through such procedures, a wider range of gifts is revealed, and students are better able to capitalize on the gifts they have.

We do not claim that our method is uniquely useful for gifted and talented students. Rather, it adds to the armamentarium of techniques available for teaching gifted and talented students. Eventually, methods may be combined in ways that make them more effective than individual approaches considered alone.

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Authors' Note

Preparation of this article was supported by Grant REC-9979843 from the National Science Foundation and by government grants under the Javits Act Program (Grant No. R206R950001, R206R00001) as administered by the Institute of Educational Sciences (formerly the Office of Educational Research and Improvement), U.S. Department of Education, and was prepared under subcontract to the Temple University Laboratory for Student Success (LSS) as part of a grant from the U.S. Department of Education (Award #31-1992-701), Institute for Educational Sciences. Grantees undertaking such projects are encouraged to express freely their professional judgment. This article, therefore, does not necessarily represent the positions or the policies of the U.S. government, and no official endorsement should be inferred.