Successful intelligence in the classroom

Robert J. Sternberg

Many students could learn more effectively than they do now if they were taught in a way that better matched their patterns of abilities. Teaching for successful intelligence provides a way to create such a match. It involves helping all students capitalize on their strengths and compensate for or correct their weaknesses. It does so by teaching in a way that balances learning for memory, analytical, creative, and practical thinking. This article describes how such teaching is done and provides data supporting the efficacy of the approach.

****

MANY CHILDREN FAIL TO LEARN at a level that matches their ability to learn. There can be a number of reasons for this failure. One reason is that the way 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 in order to understand these children (Sternberg, 1997a, 1999), and a set of methods of teaching for successful intelligence to help these students reach their full potential (Sternberg & Grigorenko, 2000).

The Theory of Successful Intelligence: A Capsule Description

According to the proposed theory, successful intelligence is 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. Thus, there is no one definition of intelligence. People are successfully intelligent by virtue of recognizing their strengths and making the most of them at the same time they recognize their weaknesses and find ways to correct or compensate for them. Both are important. On one hand, students need to learn to correct aspects of their performance in which they are underperforming. On the other hand, they have to recognize that they probably will never be superb at all kinds of performance. It helps to find ways around weaknesses, such as seeking help from others and giving it in return. In other words, people find their own unique path to being intelligent. Successfully intelligent people adapt to, shape, and select environments. In adaptation, they change themselves to fit the environment. For example, a teacher may adapt to the expectations of her principal by teaching in a way she believes the principal will endorse. In shaping, people change the environment to fit them. The teacher may try to persuade the principal to support a new way of teaching different from what the principal has been accustomed to in the past. And in selection, they find a new environment. For example, the teacher may decide to seek a placement in another school if she is unable to convince the principal that her way of teaching is valid and will result in benefits

for the students. They accomplish these ends by finding a balance in their use of analytical, creative, and practical abilities (Sternberg, 1997a, 1999).

This definition of successful intelligence contains within it several implications for teaching.

Classroom Applications

Teaching for successful intelligence attempts to help teachers reach a larger cross-section of students than more traditional teaching methods that emphasize memory and analytical instruction. In teaching for successful intelligence, a teacher follows a number of fundamental ideas.

There is no one right way of teaching and learning. Moreover, there is no one right way of assessing students' achievement. Teaching and assessment should balance use of analytical, creative, and practical thinking. Fundamentally, teachers need to help students capitalize on individual patterns of strengths and, at the same time, help them correct or compensate for weaknesses. Students, like teachers, need to develop flexibility, giving students multiple and diverse options in assessment.

Because students have different life goals, student success needs to be defined in terms that are meaningful to them as well as to the institution. Students are more likely to see meaning if teachers provide numerous examples of concepts that cover a wide range of applications. Grade student work in a way that preserves the integrity of the course as well as the integrity of the students' varied life goals.

Sometimes teachers are reluctant to teach for successful intelligence because they believe that these techniques may apply to other teachers' students, but not to their own. We would say in response that our research, some of which is described below, has not turned up any groups of students who cannot profit from this form of instruction. The students whose performance improves the most tend to be those who do not profit optimally from conventional instruction. For example, children from out-of-the way areas, such as rural Alaska, have tremendous stores of practical knowledge that can help them learn if only teachers give them the chance to use their knowledge to succeed (Sternberg, Lipka, Newman, Wildfeuer, & Grigorenko, 2003).

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)?

Each of the methods of teaching is described below. For many more examples of each method at grade levels ranging from primary to college, see Sternberg and Grigorenko (2000).

Teaching analytically

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 teaching 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 they were similar and ways 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 in order to defeat her opponent. (Physical Education)

Teaching creatively

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 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 walk the walk. The following examples of instructional or assessment activities 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)

Teaching practically

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 other individuals (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 make 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)

It might seem as though teaching for successful intelligence would require much more classroom time per topic than would teaching in more conventional ways. This is not the case, however. The idea is not to teach each topic three times in three ways. Rather, it is to alternate teaching styles so that some of the time one teaches in a way more geared toward analytical thinking, other times in a way more geared to creative thinking, and still other times in a way more geared to practical thinking. The total time spent in teaching given material is the same as in any other way of teaching the material.

Because teaching for successful intelligence reaches more students' patterns of abilities, the students are more likely to be intrinsically motivated to succeed in their work. Some teachers may be reluctant to do this kind of balanced teaching, because they see their own strengths as being primarily in one of the ways of thinking, such as analytical. But teaching only to one's own strengths deprives students with different patterns of abilities valuable opportunities to learn.

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. How do these methods work in practice?

Some Supporting Research

We have sought to test the theory of successful intelligence in the classroom. Our studies extend down to grade 4, and although we believe the methods would apply with younger children, we have not systematically tested their efficacy for them. 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, Grigorenko, Ferrari, & Clinkenbeard, 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 areas as well. One school we visited in Russia in 2000 placed a heavy emphasis on 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 another school--catering to the children of Russian businessman--that strongly emphasized practical abilities. The children who were not practically oriented were told that, eventually, they would be working for their classmates who were.

We used the Sternberg Triarchic Abilities Test, measuring analytical, creative, and practical abilities, in some of our instructional work. The test was administered to 326 children around the United States and in 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). The students were gifted, but in a broader sense than the term is traditionally used. They were not necessarily in the top few percent, and their gifts were not necessarily analytical in nature. Students who came to Yale were divided into four instructional groups. All four instructional groups used the same introductory psychology textbook and listened to the same psychology lectures. What differed was the type of afternoon discussion section to which they were assigned. They were randomly 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 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. This suggests 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, 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. Perhaps as a reflection of the difficulty of de-emphasizing 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 importantly, there was an aptitude-treatment interaction where students placed in instructional conditions that better matched their pattern of abilities outperformed students who were mismatched. In other words, when students are taught in a way that fits how they think, they do better in school. Children with 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 low-income neighborhood in Raleigh, North Carolina. The 142 eighth graders were students who were largely middle- to upper middle-class in Baltimore, Maryland, and Fresno, California. In this study, students were assigned to one of three instructional conditions. 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' performance was 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. One could argue that this result merely reflected the way they were taught. Nevertheless, the result 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, if the 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 to 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 (analytically, creatively, practically) or through the regular curriculum. 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).

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

Why Teaching for Successful Intelligence Works

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

Conclusion

Teachers may wish to consider the option of teaching for successful intelligence. In doing so, they will improve their teaching, improve student learning, and most importantly, modify in a constructive way the entire teaching-learning process. Data collected with thousands of students shows that teaching for successful intelligence works for many students, in many subject-matter areas, at many grade levels. Of course, this form of teaching is not a panacea for the problems of schools, and it most likely will not work for everyone--whether student or teacher. But in our research we have found that the majority of students and teachers benefit from the methods described in this article.

Teaching for successful intelligence obviously relates to other kinds of teaching that emphasize thinking. One example is Bloom's taxonomy, which specifies a set of skills that are arrayed from those at the lowest level of cognition to the highest level of cognition. There are probably three key differences between the present theory and the taxonomy. The first is that the theory of successful intelligence does not array thinking skills hierarchically, but rather, interactively. The second is that there is a more nearly equal balance among analytical, creative, and practical skills than in Bloom's taxonomy. And the third is that the methods of teaching described here are based on a psychological theory rather than a descriptive list of thinking skills.

A second example is Gardner's (1983) theory of multiple intelligences. This theory specifies a number of distinct intelligences, such as linguistic and musical, that can serve as bases for teaching thinking. The present theory is complementary to Gardner's in the sense that any of Gardner's domains, such as the linguistic, can employ analytical, creative, or practical processes (e.g., analyzing a story, writing a story, writing a persuasive essay). But there are differences. One is that the theory of successful intelligence has been subject to many controlled studies seeking empirically to validate it, while Gardner's theory has not. A second difference is that the theory of successful intelligence is more process-oriented: Gardner's theory is more content-oriented. And a third difference is that not all of Gardner's theories fall under the purview of the theory of successful intelligence, such as the candidate "existential intelligence."

A third example is Vygotksy's (1978). Vygotsky suggested that basic to intelligence is internalization, which is the internal reconstruction of an external operation. The basic notion is that we observe those in the social environment around us acting in certain ways and we internalize their actions so that they become a part of ourselves.

Vygotsky also proposed the important notion of a zone of proximal development, which refers to functions that have not yet matured but are in the process of maturation. The basic idea is to look not only at developed abilities, but also at abilities that are developing. This zone is often measured as the difference between performance before and after instruction. Thus, instruction is given at the time of testing to measure the individual's ability to learn in the testing environment. The research suggests that tests of the zone of proximal development tap abilities not measured by conventional tests. Our conception is wholly consistent with this notion.

The similarities among the various proposed methods of teaching are more salient than the differences, however. All of the methods are designed to help students develop thinking skills that they will be able to use to enhance their academic performance and their lives.

Table 1

Assignments for Applying Triarchic Intelligence

Analytical	Creative	Practical
Analyze	Create	Apply
Critique	Invent	Use
Judge	Discover	Put into practice
Compare/contrast	Imagine if ...	Implement
Evaluate	Suppose that ...	Employ
Assess	Predict	Render practical

Note

Preparation of this article was supported by Grant REC-9979843 from the National Science Foundation and by a government grant under the Javits Act Program (Grant R206R00001) as administered by the Institute of Educational Sciences, U.S. Department of Education. 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.

References

Gardner, H. (1983). Frames of mind: The theory of multiple intelligences. New York: Basic.

Grigorenko, E.L., Jarvin, L., & Sternberg, R.J. (2002). School-based tests of the triarchic theory of intelligence: Three settings, three samples, three syllabi. Contemporary Educational Psychology, 27, 167-208.

Sternberg, R.J (1997). Successful intelligence. New York: Plume.

Sternberg, R.J. (1999). The theory of successful intelligence. Review of General Psychology. 3, 292-316.

Sternberg, R.J., & Clinkenbeard, P.R. (1995). The triarchic model applied to identifying, teaching, and assessing gifted children. Roeper Review, 17(4), 255-260.

Sternberg, R.J., Ferrari, M., Clinkenbeard, P.R., & Grigorenko, E.L. (1996). Identification, instruction, and assessment of gifted children: A construct validation of a triarchic model. Gifted Child Quarterly, 40, 129-137.

Sternberg, R.J., Forsythe, G.B., Hedlund, J., Horvath, J., Snook, S., Williams, W.M., et al. (2000). Practical intelligence in everyday life. New York: Cambridge University Press.

Sternberg, R.J., & Grigorenko, E.L. (2000). Teaching for successful intelligence. Arlington Heights, IL: Skylight.

Sternberg, R.J., Grigorenko, E.L., Ferrari, M., & Clinkenbeard, P. (1999). A triarchic analysis of an aptitude-treatment interaction. European Journal of Psychological Assessment, 15(1), 1-11.

Sternberg, R.J., Lipka, J., Newman, T., Wildfeuer, S., & Grigorenko, E.L. (2003). Triarchically-based instruction and assessment of sixth-grade mathematics in a Yup'ik cultural setting in Alaska. Manuscript submitted for publication.

Sternberg, R.J., & Lubart, T.I. (1995). Defying the crowd: Cultivating creativity in a culture of conformity. New York: Free Press.

Sternberg, R.J., Torff, B., & Grigorenko, E.L. (1998a). Teaching for successful intelligence raises school achievement. Phi Delta Kappan, 79(9), 667-669.

Sternberg, R.J., Torff, B., & Grigorenko, E.L. (1998b). Teaching triarchically improves school achievement. Journal of Educational Psychology, 90, 1-11.

Sternberg, R.J., & Williams, W.M. (1996). How to develop student creativity. Alexandria, VA: Association for Supervision and Curriculum Development.

Vygotsky, L.S. (1978). Mind in society: The development of higher psychological processes. Cambridge, MA: Harvard University Press.

Robert J. Sternberg is the IBM Professor of Psychology and Education at Yale University, Elena L. Grigorenko is an associate professor at Yale University and Moscow State University.
