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Inside

NRC/GT Researchers: Brandwein Always Looked Forward

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As educators and researchers, we have a natural inclination to look back at educational theories and practices to see what has been learned and to look around to determine how we can improve current instructional strategies and curricular approaches. Then we use formal and informal data to make decisions about what comes next. These data-based decisions have a considerable impact on the young people we work with every day.

At The National Research Center on the Gifted and Talented (NRC/GT), many of our publications focus on identifying the gifts and talents of young people whose potential abilities may go unnoticed. Obviously, it is easier to recognize demonstrated abilities of students such as the following:

- read and interpret text that is 3 or 4 years above age/grade level;
- construct and solve complex mathematical problems, illustrating an advanced level of conceptual understanding; or
- design and implement a new approach to a science experiment, resulting from rejections of earlier hypotheses.

Some 3-year-old children already recognize letters, speak in complete sentences, write their names, draw basic geometric shapes, and ask questions about how things work. Their inquisitiveness is remarkable, which encourages adults, siblings, and older children to create more opportunities to promote their curiosity and zest for learning. It is more difficult to recognize potential gifts and talents among children who may not have had exposure to numerous early educational opportunities in the home or at school.

Looking back at the works by Dr. Paul F- Brandwein is an incredible educational experience. His contributions to identifying and nurturing the obvious and latent talents and gifts of young people would fill more than the 16 pages of this newsletter. A literature search of publications illustrates the breadth and depth of his work that provides the blueprint for making decisions about why we must constantly question and rethink how we create educational opportunities.

In 1955, Brandwein produced a book entitled *The Gifted Student as Future Scientist: The High School Student and His Commitment to Science*. This book was later updated and published in 1981. There are several sections of the book that I review periodically. As a scholar and researcher, Brandwein asked himself: What Makes a Scientist? He then pursued the following strategies as a way of responding to the question:

- noted characteristics of scientists through observations;
- checked the growing body of knowledge through discussions with colleagues, teachers, and supervisors;
- prepared a booklet describing the high school program in which he worked; and
- asked for a critique of his findings and conclusions from 100 experts in the field of science teaching.

Brandwein looked back, looked around, and made decisions about what came next. He stated:

> . . . [F]rom the observations of working scientists as well as from common sense observations, it seems clear that Genetic and Predisposing Factors were not all that operated in the making of a scientist. Opportunities to get further training and the inspiration of the individual teacher were

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> clearly factors to be considered in reaching a working hypothesis on the nature of high level ability in science.

Brandwein's study of research scientists supported Genetic Factors, such as high oral and written verbal ability and high mathematical ability. He believed that Genetic Factors

> appear[ed] to have a relationship to high intelligence and may have a primary basis in heredity. Naturally, Genetic Factors are altered by an environment. It fact, it is clearly understood here that . . . any individual is the product of his [her] heredity and his [her] environment. (p. 9)

Predisposing Factors were characterized by persistence and questing. Persistence requires an extended time commitment to a research question that must be addressed despite failures and frustrations. Questing means "a notable dissatisfaction with present explanations and aspects of reality" (p. 10). These factors, however, may be necessary, but not sufficient to explain the making of a scientist. Continued study revealed the importance of the Activating Factor or "opportunities for advanced training and contact with an inspirational teacher" (p. 11). As a researcher and scientist, Brandwein offered a working hypothesis:

> High level ability in science is based on the interaction of several factors—Genetic, Predisposing, and Activating. All factors are generally necessary to the development of high level ability in science; no one of the factors is sufficient in itself. (p. 12)

Brandwein did not generate hypotheses about teaching and learning from a position outside the classroom. He was the teacher, the researcher, and the scholar who implemented his ideas in schools. He experimented with instructional and curricular approaches and made adjustments as warranted. He created a learning environment for students whose potential in science was "to be determined." A brief overview of the operational approach to identifying, nurturing, and supporting potential does not do justice to Brandwein's ability to determine "what is next?" (see Brandwein, 1981). In the operational approach, high school students participated in general science and the talent search began. He posed questions such as:

- Whose curiosity is insatiable?
- Whose work is exemplary?
- Who goes beyond course requirements?
- Who has science-related hobbies?

Invited and self-nominated students were involved in laboratory work beyond their scheduled classes, such as preparing lab materials, assisting in experiments, maintaining a school museum, or participating in science clubs. Students continued to receive guidance and encouragement to pursue additional science opportunities. These opportunities became increasingly specialized and required a considerable commitment to scholarly work. Students were living and working as junior scientists, lending further research evidence to the working hypothesis related to high level ability in science. As the breadth, depth, and complexity of the science work increased, Dr. Brandwein posed new questions and tested hypotheses about learning and teaching. He continually challenged his thinking.

The National Research Center on the Gifted and Talented continually approaches research by looking back at what has been learned, looking around at current practices, and determining what's next. We are adding to the knowledge base initiated by so many renowned people in our field. An effective way to peruse our research findings to date is to visit our web site at www.gifted.uconn.edu. Abstracts and findings are available for each research monograph produced by the NRC/GT. This collection represents a small portion of our contributions to the literature, however. Our most recent count of publications totals over 500. Obviously, the web site is a more efficient way of looking back at what we have learned. Our 10 year research journey has benefited from the past and current work of so many scholars, researchers, and practitioners. Dr. Paul F-Brandwein is one person we always look to as a role model as we continue our search for answers to questions about learning and teaching.

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The Effectiveness of Triarchic Teaching and Assessment

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According to Sternberg's Triarchic Theory of Intelligence, intelligence results from information processing components being applied to experience for the purposes of adaptation to, shaping of, and selection of environments. According to this theory, intelligence and the intellectual skills that constitute it and form the basis of intellectual achievements are forms of developing expertise—they can be developed just like any other forms of expertise. Abilities are not fixed, but rather, flexible.

Basics of the Triarchic Theory

The triarchic theory is based on the notion that all students need to learn a problem solving cycle. First, they need to identify problems. In other words, they need to know that they must get their homework done, study for a test, write a paper, and get it in on time. Second, they need to allocate resources for solving the problem. For example, they need to think in advance about how much time and effort to allocate to doing homework, studying for a test, or writing a paper. They also need to plan when they will start and finish their work. Third, they need to formulate a strategy for solving the problem. For example, they need to decide how to get their homework done, or study for the test, or get their paper written. What kinds of notes will they use? What kinds of study strategies will work best given what they need to do? What kind of help will they need? Fourth, they need to monitor their problem solving. For example, as they are studying or writing a paper, they need to be aware of whether things are going smoothly, or whether they are encountering problems they need to fix. Fifth, they need to evaluate their problem solving. After they are done with the task on which they are working, they have to decide whether their work is adequate or whether they need to improve on what they have done.

According to the triarchic theory, three kinds of thinking are essential to problem solving, in particular, and to human intelligence, in general.

- **Analytical thinking** occurs when the components are applied to relatively familiar types of problems in their abstracted form. Analytical thinking is involved when people analyze, evaluate, judge, compare and contrast, and critique. For example, a student might be asked to evaluate the assumptions underlying a logical argument or to compare and contrast the themes underlying two short stories.
- **Creative thinking** occurs when the components of information processing are applied to relatively novel types of problems. Creative thinking is involved when people create, invent, discover, explore, suppose, and imagine. For example, a student might be asked to create a poem or to invent a better mouse trap.
- **Practical thinking** occurs when the components of information processing are applied to highly contextualized, everyday problems. Practical thinking is involved when people apply, use, utilize, implement, and contextualize. For example, a student might be asked how the lessons of the Vietnam War are and are not relevant to the situation that has arisen in Serbia, or how to apply algebraic techniques to determining compound interest on an investment.

Validation of Theory

We are interested not just in proposing theories, but also in conducting rigorous tests of these theories in the laboratory,

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classroom, and workplace. Some of the main findings from these studies are the following:

1. The analytical, creative, and practical aspects of intelligence can be measured via both multiple-choice and essay formats. Formal modeling supports the triarchic model of intelligence over competing models, such as a model of an overarching general factor and a model of content factors. Analytical, creative, and practical intelligence are essentially distinct; there is no general factor of intelligence that applies across all kinds of intellectual tasks.
2. Tests of analytical intellectual abilities tend to correlate well with conventional tests of intellectual abilities because these tests measure what the conventional tests measure.
3. Tests of creative intellectual abilities are relatively domain specific and correlate weakly to moderately with conventional tests of intelligence, with the correlations being higher the more novel the content of the conventional tests.
4. Tests of practical intellectual abilities correlate weakly or not at all with conventional tests of intelligence and predict real world occupational success as well as or better than conventional tests of academic intelligence, thus complementing conventional tests. Under special circumstances, tests of practical intelligence may show negative correlations with conventional ability tests.

Our Data

In our earlier research, we showed that it is possible through instructional interventions to improve analytical-thinking skills, creative-thinking skills, and practical-thinking skills. In our more recent research, we have shown that the triarchic theory can be applied to improve students' achievement in school (Sternberg, 1997; Sternberg et al., 2000).

The Triarchic Aptitude Treatment Interaction Study

In this study, we examined whether the triarchic theory would give rise to an aptitude treatment interaction in the context of a college level psychology course taught to high school students who were selected for their triarchic ability pattern, and then taught in a way that either better or more poorly matched their ability pattern, and whose achievement was assessed triarchically as well. Thus, a crucial aspect of this study was that identification of participants, instruction of participants, and assessment of participants' achievement all were based on triarchic theory of intelligence. The motivation for this study was to show that conventional means of teaching and assessment may systematically undervalue creatively and practically oriented students. These students may have the ability to perform quite well, but they may perform at lower levels than those of which they are capable because neither the form of instruction nor the form of assessment well matches their pattern of strength.

Participants consisted of 199 high school students (146 females and 53 males) from among 326 who were tested and who were selected for participation in a summer program on the basis of their patterns of abilities. Program participants were 60% European-American, 11% African-American, 6% Hispanic-American, and 17% American from another ethnic minority (thus a total of 34% U.S. ethnic minority). Another 4% were from South Africa and 2% were from other locations.

Participants were identified as high in analytical ability (20%), high in creative ability (19%), high in practical ability (18%), balanced high (i.e., high in all three abilities—20%), and balanced low (i.e., low in all three abilities—24%). Identification was accomplished via a research form of the Sternberg Triarchic Abilities Test (STAT), which is based on the triarchic theory. There were 9 multiple choice tests, crossing 3 types of abilities (analytical, creative, practical) with 3 types of content (verbal, quantitative, figural), plus 3 essay tests (analytical, creative, practical). For example, the analytical verbal multiple choice test involved inference of meanings of unknown words from paragraph contexts, and the practical figural multiple choice test involved route planning use maps. As another example, the creative essay required participants to design their ideal school.

The 4-week long instruction for the course involved common and unique elements for each instructional group. Two parts were common: the college level psychology text, which contained analytical, creative, and practical content; and the morning lectures, taught by an award winning teacher, which involved analytical, creative, and practical elements. The experimental manipulation occurred in the afternoon when participants were assigned to a discussion section that emphasized either memory, analytical, creative, or practical processing, and that either was a better or a poorer match to the participants' tested pattern of abilities.

As an example, memory oriented instruction might ask students to recall the main elements of the cognitive theory of depression; analytically oriented instruction might ask students to compare and contrast the cognitive to the psychoanalytic theory of depression; creatively oriented instruction might ask students to invent their own theory of depression, drawing on, but going beyond past theories; and practically oriented instruction might ask students to show how they could use existing theories of depression to help a depressed friend.

All participants were tested via homework assignments, a midterm examination, a final examination, and an independent project. All assessments were evaluated for analytical, creative, and practical achievement. The examinations also included multiple choice items that measured memory achievement.

All correlations of ability tests scores (analytical, creative, practical) with all measures of achievement were statistically significant, reflecting perhaps the fact that the instruction and assessment were guided by the same theory as was the identification instrument (i.e., the STAT). More important was the aptitude-treatment interaction, which also was statistically significant for all ability groups. In other words, students who were better matched triarchically in terms of their pattern of abilities outperformed students who were more poorly matched. Perhaps as interesting was the result that the analytical (IQ-like) test tended to identify as gifted, mostly White children, of middle to upper middle socioeconomic class background, who were students in so-called "good" schools. The creative and practical tests, however, identified students from a much wider mixture of ethnic groups, socioeconomic levels, and educational backgrounds as gifted.

The Triarchic Instructional Studies in Social Studies and Science

In a follow-up set of studies, we sought to show that in terms of simple main effects, triarchic instruction is potentially superior to other forms of instruction, regardless of students' ability patterns. The triarchic theory holds that students should be instructed in a way that helps them both capitalize on their strengths and correct and compensate for weaknesses. Thus, ideally, students will be taught in all three ways (analytically, creatively, practically), as well as for memory. These studies were conducted in the students' own schools rather than in a special summer school setting; their teachers were their actual classroom teachers; and the material they studied was the actual material they were studying as part of their regular instruction, suitably modified as necessary for the study.

Participants in a primary school study included 213 third grade students (106 boys and 107 girls) in two elementary schools in Raleigh, NC. Both schools serve a diverse population of almost exclusively lower socioeconomic status students, including large groups of African-American, Hispanic-American, and Asian students. A total of nine classes of 20-25 students each participated in the research.

During the intervention, students received an instructional unit on the topic of communities—a social studies unit required for third grade students in North Carolina. No formal text was used for the unit, rather, materials were developed by teachers. The intervention took place for 10 weeks, 4 days per week, for 45 minutes per day, for a total of 30 hours of instruction.

Participants in a secondary school study consisted of 141 rising eighth graders (68 boys and 73 girls) drawn from around the nation from predominantly White middle-class backgrounds. Students took a summer psychology course either in Baltimore, MD, or Fresno, CA, in connection with the Center for Academic Advancement at John Hopkins University. The 10 section course took place in two intensive 3-week sessions. Classes met 5 days per week with 7 hours of class time per day.

In both studies, students were divided into three instructional groups: traditional (memory oriented), critical thinking (analytically oriented), and triarchic (analytically, creatively, and practically oriented). Instructional time was the same in each condition, and all teachers were appropriately in-serviced.

To illustrate the three different instructional treatments, consider three ways in which a third grade unit on public services (e.g., fire, police) can be taught. The approach taken in the traditional instruction was to have children memorize the names and functions of the various public services. In critical thinking instruction, an additional analytical effort was undertaken whereby students would compare and contrast the different services and evaluate which ones to keep—and why—in case of a budget crisis. In triarchic instruction, students might additionally be asked to invent their own public service, to

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describe its means and ends, and to compare this new public service with conventional ones.

Students in both studies were evaluated for memory-based achievement (via multiple choice tests), as well as for analytical, creative, and practical achievement (via essay tests). For example, a memory oriented assessment might ask which of several officials is an elected official. An analytical assessment might ask students to write a page explaining what a person in a given governmental position (e.g., Mayor of Raleigh) does, why the position is needed, and why the position is one of authority. A creative assessment might ask the student to imagine a place where no one tried to be a good citizen, and to write about a third grader's visit to this place. A practical assessment might ask the student how to handle a situation in which he or she is in charge of teaching 8-year-old students visiting from England different kinds of government services available in Raleigh, NC.

The results from the two studies were roughly comparable. In general, triarchic instruction was superior to the other modes of instruction, even on memory based multiple-choice items. In other words, students showed better academic performance through triarchic instruction even if their achievement was measured in terms of pure memory-based performance. In the elementary school study, students also were administered a self-assessment questionnaire for which the students were asked how much they liked the course, how much they thought they learned in the course, and how well they thought they did in the course. The students in the triarchic group generally gave significantly higher ratings than did the students in the other two groups.

The Triarchic Reading Studies

More recently, we have extended our work on applying the triarchic theory in the classroom to the goal of improving reading performance (Sternberg & Grigorenko, 2000). We chose as a target a group of students with the average reading scores among the lowest in the state of Connecticut (according to the Connecticut Mastery Test scores), namely, students in New Haven public schools. The project had three parts. One part was a middle school community study, a second part a Summerbridge (summer program) study, and a third part a study in a community high school. All of these studies were long-term and were fully infused, building on existing curriculum units rather than introducing new ones. As in the earlier studies, we were trying to help teachers improve what they were already doing (e.g., teaching reading), rather than giving them a new curriculum that they would most likely reject for lack of time.

The first, the middle school study, involved two phases. In phase 1, 2 schools (10 teachers and 146 students) participated as an experimental group and 2 schools (4 teachers and 171 students) participated as a control group. In phase 2, 4 schools (14 teachers and 350 students) participated as an experimental group and 3 schools (9 teachers and 225 students) participated as control groups. The reading material in this study was the actual material the students were studying in school, namely, stories from *Light Up the Sky*, a Harcourt Brace Treasury of Literature basal reader. In this study, all students received a pretest involving 2 vocabulary, 2 comprehension, and 2 homework (a take home section) assessments, and a posttest with the same elements. Only the experimental students received the intervention, with the other students receiving their normal reading instruction. All teachers (experimental and control) were involved in professional development geared to their appropriate role. Thus, experimental group teachers were involved in triarchic teaching, and control group teachers on the use of mnemonics to help improve student memory performance. The program lasted from November through the remainder of the school year.

The second, the Summerbridge study, was smaller in scope, involving 5 teachers and 33 seventh graders as an experimental group and no teachers and 29 seventh graders as a control group. In this study, all students were accepted for a summer program, and then the experimental students who were selected at random from the total group were told that they would get the summer program in the summer of 1998. The control students, also randomly selected, participated in the summer program in the summer of 1999. In the Summerbridge study, the reading material was chosen by regular teachers of the program, and included two novels, *A Raisin in the Sun* and *The Lottery Rose*. All students received a pretest and posttest. The 6-week intervention was given only to experimental group students. In these studies, the goal was to supplement standard reading instruction—which included both phonic and whole language elements—with a specifically triarchic intervention. An example of an analytical activity would be to create a time line that requires students to order a series of major events that

happened in a story. For the story "Teacher for a Day," students are told that first Belva went to school, then Miss Englehardt became dizzy, then Belva taught the class, then _____, then Belva used the lever to move the rock. The students had to fill in the blank with one of four events. An example of a creative activity, performed after reading the story "Many Moons," required students to speculate, on the basis of incomplete information, on why there are rainbows after storms, why rainbows might have so many different colors, and why cows say "Moo" so much of the time. An example of a practical activity, done after the students read "A New Home in Ohio," required students to plan an escape from slavery using an underground railroad. Students were given a map, a set of tools, and a set of survival rules to aid them in planning the escape route.

The third study at the high school involved our working with teachers in different subject matter areas (English, mathematics, science, arts, social science, history, and foreign languages), with a focus on teaching reading for content. The participants in the study were high school students attending grades 10 through 12 in high schools in New Haven and Ansonia, Connecticut. A total of 432 students (130 females, 215 males, and 87 of unreported gender) participated in the study. Of these students, 201 (46.5%) were attending schools enrolled in the triarchic group (2 New Haven schools) and 231 were attending the control school (in Ansonia). Teachers' guides and student assessments were developed based on each teacher's specific curriculum.

We analyzed the data from these studies in a variety of ways. One way was to look at changes in teacher behavior. Before our middle school intervention, teachers in a typical classroom lesson used an average of 18 memory analytical activities (combined), 0 creative activities, and 3 practical activities. After the intervention, experimental group teachers used an average of 18 memory analytical activities, 13 creative activities, and 17 practical activities. The intervention thus had a huge (and significant) effect on teacher behavior in the teaching of reading. Analysis of individual teacher behavior revealed that almost all individual teachers showed changes in behavior as a result of the intervention. Teachers also were asked to rate the program on various facets on a 1 (low) to 7 (high) scale. Sample ratings were 6.4 for interest to the teacher, 6.0 for interest to students, 6.2 for motivating the teacher, and 6.1 for motivating the students. Students were also asked for their feedback. Of the total, 35% liked the activities very much, 51% liked the activities, 10% did not care much one way or the other, 2% disliked the activities, and 2% hated the activities. Most importantly though, were the assessments of objective improvement. In the middle school study, the experimental students showed significantly greater gains than the controls in reading and vocabulary. For the Summerbridge study, the experimental students in the program showed significantly greater gains than the control students in analytical, creative, and practical achievement. Overall gains were significantly greater for experimental than for control group students. In the high school study, a comparison of students' reading/writing skills before and after the intervention suggested that the triarchic teaching improved students' performance significantly more than did conventional teaching. As was the case at the middle school level, both teachers and students rated the program positively.

Conclusion

Triarchic teaching—teaching students not only for memory, but for analytical, creative, and practical processing—works. It improves achievement assessed via either conventional or performance assessments at all grade levels and in all subject matter areas we have examined, across a range of socioeconomic and achievement levels of students.

Triarchic teaching is easy to do. The main principles are simple:

1. Some of the time, teach analytically, helping students learn to analyze, evaluate, compare and contrast, critique, and judge.
2. Some of the time, teach creatively, helping students learn to create, invent, imagine, discover, explore, and suppose.
3. Some of the time, teach practically, helping students learn to apply, use, utilize, contextualize, implement, and put into practice.
4. Some of the time, enable all students to capitalize on their strengths.
5. Most of the time, enable all students to correct or compensate for their weaknesses.
6. Make sure your assessments match your teaching, calling upon analytical, creative, and practical as well as memory skills.
7. Value the diverse patterns of abilities in all students.

Any teacher knows how to teach triarchically. Our goal is simply to give teachers a simple-to-follow "recipe" to make sure the

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teachers do what they already know how to do. You can start teaching triarchically right away, and start seeing significant improvements in your own students' achievements and attitudes.

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Thinking and Writing Skills in High Ability, Ethnic Minority, High School Students

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Acquiring the skills necessary for academic success is a major academic and social problem facing gifted under represented, ethnic minority, high school students. These students often have not had the experiences and opportunities available to students with successful academic careers. A persistent problem is how to help students develop strong discourse and writing skills. Few programs of support exist for high school students within a college setting. Those within high schools or community settings are often not evaluated. Some highly structured college support programs have demonstrated that it is possible to support these students' academic development so that they can take advantage of their high abilities despite lacking contextual opportunities. Harney, Brigham, and Sanders (1986) and Brigham, Moseley, Sneed, and Fisher (1994) describe efforts to support the success of academically at-risk minority college freshman.

Several variables have been identified in these studies that appear to affect minority student success, particularly at large universities. Three important factors are: (a) the development of important academic skills, (b) involvement in the cultural and social life of the academic institution, and (c) self-confidence to compete with their majority peers (Brigham et al., 1994). In addition, these programs find that motivation and persistence are important characteristics of success. We wanted to explore how to give high ability, ethnic minority, high school students a "headstart" on college academic success through a college course.

Three Important Intellectual Skills for Academic Success

Robert Sternberg (1995) proposed a model of intelligence that is useful for developing talent in high ability students and is applicable to teaching all students. The triarchic theory of intelligence can be used for identifying, teaching, and assessing gifted students. This model can help teachers focus on the skills necessary for academic and social success. The triarchic model suggests that three intellectual abilities are important to academic and social success: (a) memory analytic, (b) creative synthetic, and (c) practical contextual thinking skills. Sternberg and his colleagues have described these skills as well as interventions and materials designed to enhance them in high school students. Memory analytic abilities are used in learning, comparing, analyzing, evaluating, and judging material. Most traditional standardized intelligence, aptitude, and achievement tests assess these skills. Creative synthetic abilities are used when one produces something new from a synthesis of material or develops a novel interpretation of an ordinary situation. This could also involve coping in a novel way with various life situations. Practical contextual abilities are those used to confront everyday problems encountered in day-to-day experience. This experience could occur at school, work, or home. Understanding how the world "works" and how to get along in it, whether based on formal or informal knowledge, represents this kind of thinking.

The Sternberg triarchic abilities model provides a basis for individualizing instruction or intervention activities to maximize

ability and performance by matching instruction to performance. Academic performance can also be enriched by activities that enhance positive self-regard and social support. Extending a skills-based college success intervention to include high school students would seem to give these students an opportunity to have a "headstart" on excelling in academic performance in college. Furthermore, using a specific skills-based thinking model to develop the instructional intervention might improve academic performance outcomes. This thinking skills approach can also be useful to teachers in enhancing basic writing skills required by advanced academic training. We are currently using this approach to offer a college based academic and social support project to high ability, ethnic minority, high school students.

Teaching Thinking: A High School Intervention Project

We are working in one urban high school to offer thinking and writing training to high ability ethnic minority high school students. We call our effort the Teaching Thinking Project (TTP). This intervention research effort, begun in 1996, is designed to promote academic skills in highly capable, ethnic minority, high school students. We use Sternberg's model of triarchic intelligence, described above, as an organizing framework.

The TTP offers a unique opportunity to recruit high ability students from a low income high school with students from some of the most under represented ethnic minority populations in the U.S. Participants in this research intervention are a sample of students attending an academic magnet school in a large eastern urban city with a current population of 1,541 students on a college campus. Of the participants, 50% are Latina/os (primarily of Dominican and Puerto Rican descent); 30% identify as being of native-born African descent; 16% report that they are Caribbeans of African descent; and 4% can be classified as Asian (Chinese and Pakistani). Many of these students, if accepted in college, would be the first generation in their families to attend college.

The Intervention

We select students to participate based in part on their Sternberg Triarchic Abilities Test (STAT) scores (Sternberg, 1995). The STAT assesses how well students answer questions that require them to use analytic, practical, or creative thinking skills. The test includes both multiple choice and essay questions. We use the test so we can select students who have a particular strength, but also need to improve some thinking or writing skills. Students attend a one semester, college level, introductory course in psychology. The course is held 3 days a week for three lectures and 1 to 2 hour lab sessions with a college mentor. Class size is about 12 students. Each student is assigned to a highly successful and trained college mentor, who is matched with them based on thinking skills that need improvement.

Lectures are designed to encourage students to develop their thinking and writing skills by applying their thinking abilities to specific situations presented in the course. We use Sternberg's (1995) *In Search or the Human Mind*, as a text. The text is supported by a generous and useful array of CD ROM, test-bank, lecture, and hands-on materials. The text is particularly useful because it is organized to emphasize to students how to think using higher order thinking. Sections of the text, practice materials, and questions for thinking, writing, and examinations are identified as focusing on one of Sternberg's three thinking skills. For example, when students are introduced to material about the brain and sensation and perception, they are presented with activities and questions that ask them to think analytically by comparing and contrasting various theories about how perception occurs. They are also given an opportunity to think creatively by answering questions that challenge them to create or construct such as: "If you were designing the human brain, what would you do differently to render humans more adaptive to their environments?" And, they are given an opportunity to rehearse practical thinking skills by answering questions like: "What tasks would require the use of binocular depth cues? How might a person with only one eye compensate for the lack of binocular depth perception?"

During lab sessions, participants are divided into three small groups (practical, analytic, and creative) according to their lowest score on the STAT. The college mentors facilitate the discussion of class material in the small groups. The students discuss questions from the chapter assigned for that particular session and their responses are recorded by one of the students in each small group. Students also use lab time to meet individually with mentors to plan writing projects and to develop writing skills based on critical feedback of writing samples.

Academic and Social Support

The mentoring relationship is an important part of our intervention. We find that mentors do become role models for

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the high school students. During the mentoring sessions, mentors talk with their mentees about family, school work and environment, interpersonal relationships, as well as the students' emotional state. Mentors explore the students' state of mind by talking about upcoming academic and extracurricular events, the students' overall academic performance, and personal issues. Mentors meet with their mentees once a week for an hour and keep detailed notes of their mentoring sessions. During the semester following students' participation in the project, they often visit the lab and are encouraged to continue to work with mentors to develop academic skills and to begin or complete the search for colleges. Some students develop close relationships with their mentors.

Lessons Learned

Although the results of this study will not be available until the intervention is completed, we have learned the following two important lessons from the experience of working with high ability, ethnic minority, high school students who are under represented in gifted programs:

1. **Assessing initial intellectual abilities.** The STAT has three subtests that assess analytic, creative, and practical thinking skills. Possible scores range from 1 - 12 for each multiple-choice sub-test, with 36 being the maximum score possible for an overall total score. We found that the average STAT multiple-choice subscores for our sample of 54 students to date were moderately high. For the multiple-choice sub-tests, students had a mean score of 6.7 on the analytic sub-test; 7.9 on the creativity sub-test, and 6.6 on the practical sub-test. The mean total score is 21 (*SD* = 3.77). Sternberg (1995) reports a slightly different pattern of results for a sample of 199 high ability high school students who participated in the original summer course on which the TTP is based. Of these students, 60% were of European descent and 40% were described as ethnic minority. Sternberg (1995) reports a mean of 7.9 for the analytic; 8.6 for the creative and 8.1 for the practical subscore for these students. While the Sternberg sample scores consistently higher than the TTP sample, both samples score highest on the creative and lowest on analytic subscales. The TTP sample scores equally low on the practical subsample, but the Sternberg sample scores for the practical and creative subtests are very similar. Since we used STAT scores to select students and to assign them to the particular thinking skills intervention best suited to their thinking profile, we plan to look at whether or not these scores improve after the intervention. We offered students help in the thinking skills area where they seemed weakest and allowed them to learn by working on assignments using their best thinking skills. Preliminary results indicate that STAT scores improve for analytic and creative, but not practical subscores.

2. **Meeting Students' Academic Needs.** The high ability ethnic minority high school students have a number of academic needs. One of their major needs is to develop writing skills that meet college standards. Most of the students who participated in the project had difficulties meeting basic college writing standards, and we had to give them detailed feedback on their essay questions and research papers. Students had difficulty elaborating in written assignments and difficulties with the mechanics of writing (e.g., grammar, punctuation, syntax). Two of the difficulties identified by our mentors, the instructors, and the students were: (a) understanding the question to be addressed and developing a coherent and relevant answer; and (b) organizing ideas, and developing coherent arguments. We have developed a number of writing workshops to help students develop writing skills and one-on-one coaching sessions with mentors also helped students improve their writing skills. Students report experiencing a stronger sense of confidence in their writing skills and studying techniques. We will provide detailed analyses of how students' writing improved and scoring criteria for assessing student writing in the classroom at the conclusion of the project.

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Gifted and Talented Programs in America's High Schools: A Preliminary Survey Report

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Research on gifted and talented programs in elementary and middle school grades abounds. Research addressing gifted and talented programs at the high school level is relatively scarce. There are two primary reasons for the apparent lack of research information pertaining to high school level programming. First, much of the literature and survey work on gifted and talented programming is grouped into two categories—elementary and secondary. This breakdown makes it difficult to identify programs particular to high schools. We can infer, from the quantity of literature available on middle school program models and teaching strategies and the scarcity of similar literature for high school level programs, that much of the information associated with "secondary" programs is generated from middle school data. Second, there exists a common conception that Advanced Placement and Honors courses at the high school level sufficiently address the needs of gifted and talented students. The result is either that educators do not perceive a need for a gifted program in high schools or that Advanced Placement and Honors courses define a program.

The 1998-1999 State of the States Gifted and Talented Education Report (1999) reveals mandatory identification of gifted and talented students for 30 states (12 states do not have a mandate, while 9 states—including the District of Columbia—did not submit information) and mandatory programming for gifted and talented students for 26 states (16 states—including the District of Columbia—do not have a mandate, while 9 states did not submit information). The academic levels to which these mandates pertain are not specified. There is a discrepancy between mandatory identification and mandatory programming or servicing—several states mandate identification, but do not mandate programming.

No comprehensive, national data exist about both the prevalence and nature of gifted programs specifically for grades 9 through 12. We designed a survey to determine how gifted and talented students' needs are being addressed within America's high schools. The sample is the Collaborative School District (CSD) network, associated with The National Research Center on the Gifted and Talented, who report having gifted and talented programs at their high schools (N=227). Rural, suburban, and urban districts are nearly equally represented (urban is slightly under represented). Our hope is that the survey will begin to clarify the types of programs and services available for high school gifted and talented students. It is essential to note that the results addressed below highlight a small number of the questions from the survey because of the preliminary nature of this report. A more thorough report will be published after more surveys have been returned and analyzed.

Preliminary Analysis

Results of preliminary survey analysis (N=90) indicate that 86% of the respondents' high schools do not offer academic opportunities beyond some combination of mentorships/internships, early college programs (sometimes called dual enrollment), independent studies, and academic clubs/competitions. When asked if the gifted and talented program extended beyond mentorships/internships, dual enrollment, independent studies, or Advanced Placement/Honors/International Baccalaureate courses, 34% responded "Yes" while 66% responded "No." Additional offerings clearly fall into one of four groups: special classes (seminars, research courses, or gifted and talented courses), academic competitions, affective/counseling component, and/or special schools (residential, summer, magnet, or Governor's) that are accessible to students. Special classes are offered by 55% of the respondents, special schools offered by 19%, and both affective/counseling components and unique academic competitions representing 13% each of respondents' additional offerings.

Recall that the survey sample was drawn from the CSD network reporting a gifted and talented program at the high school level. Survey results show that 5% of the respondents do not offer a high school gifted and talented program. This discrepancy is most likely the result of changes in programming, funding, or personnel since the last CSD database update (1997).

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While 95% of respondents claim to have a gifted and talented program, less than half (35%) have a consultant or coordinator associated with those programs. Additionally, several of the respondents whose programs do have consultants or coordinators indicated that consultants or coordinators are often either servicing the entire district or simultaneously functioning in another capacity (such as special/regular education teacher or administrator).

A few interesting and unexpected trends are emerging. First, several schools that have gifted and talented programs at the high school level are servicing students who were last identified in middle school or even elementary school. Second, (and perhaps as a result, in part, of the first) several respondents commented that gifted opportunities at the high school level are open to students regardless of whether they are identified.

When respondents were asked for additional comments, responses included expressing awareness of a need to better address gifted and talented programming in our high schools as well as expressing frustration or a lack of clarity with regard to state mandates for gifted and talented identification and servicing. The latter responses are the result of respondents' feeling that the mandates are insufficiently communicated, enforced, or monitored.

Limitations

There are two levels of limitations with regard to this survey. The sample was convenient rather than random. The Collaborative School District network is a mutually beneficial, voluntary partnership between The National Research Center on the Gifted and Talented and 368 districts, representing all 50 states and a few territories. The second limitation is consequent to the first. We must be cautious in interpretation of data. The results of this survey will provide an idea about what programs currently exist, but the fact that the survey is drawn from a convenient sample prohibits generalization of our analyses.

There are also limits to this preliminary report. As mentioned earlier, this analysis addresses only some of the questions and responses. Additionally, as this survey is being field tested with this sample, areas for survey improvement have emerged. The changes in the survey will improve clarity of questioning, thus yielding more specific and reliable data from the respondents. Because it is preliminary in nature, our snapshot view may change as additional surveys are returned. A final report will be available at the conclusion of this survey project.

Future Plans: The Big Picture Versus the Snapshot

This survey will provide initial indications of what high school gifted programs entail; it is a means for updating our knowledge about programming within the Collaborative School District network as well as a field test for an expanded research project. Targeting the Collaborative School District network provides us with a snapshot view of programming options offered by schools with a high school gifted and talented program. To see beyond the snapshot to the bigger picture, a national survey will be sent to school districts or high schools. The current survey will be revised according to respondent difficulties identified during the field test. The revised survey will then be sent out to districts or high schools randomly selected in every state. The results from that survey will provide a more thorough picture of high school gifted and talented program availability and programming options on a national level.

Recommendations

It is important for us as an educational community to continue to strive for learning environments that optimally meet the needs of all our students. To collectively work toward that end, we are challenged to define clearly what we can offer students as well as how those offerings help us work toward school, district, community, and national goals. Please feel free to contact us with information you feel may be helpful to our research. We are particularly interested in school or district publications describing programming options for gifted and talented students at the high school level.

Joseph Renzulli, the Director of The National Research Center on the Gifted and Talented, recently published an article entitled "What is This Thing Called Giftedness and How Do We Develop It? A Twenty-five Year Perspective" in the *Journal of the Education of the Gifted* a quarterly journal of The Association of the Gifted. This article appears along with six critiques in the Fall 1999 (Vol. 23, No. 1) edition of the journal. Dr. Renzulli's article is also available on the Internet at **www.gifted.uconn.edu** and can be found under "New Articles."

Teacher Bias in Identifying Gifted and Talented Students

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Teachers are often asked to nominate students for gifted and talented programs. Whether or not teachers are qualified identifiers of gifted students has been the topic of much debate throughout the years (Gagné, 1994; Hoge & Cudmore, 1986; Pegnato & Birch, 1959; Rohrer, 1995). The purpose of this study was to identify student characteristics that might influence teacher referrals for gifted and talented programs.

Teachers as Raters of Giftedness

Pegnato and Birch (1959) compared the efficiency and effectiveness of seven different methods of identifying gifted students and observed that "teachers do not locate gifted children effectively or efficiently enough to place much reliance on them for screening" (p. 303). The Pegnato and Birch study has been used for almost 40 years to discount the value of classroom teachers as qualified identifiers of gifted students. Their work has been frequently cited to support the opinion that classroom teachers are not reliable at identifying gifted students in their classrooms.

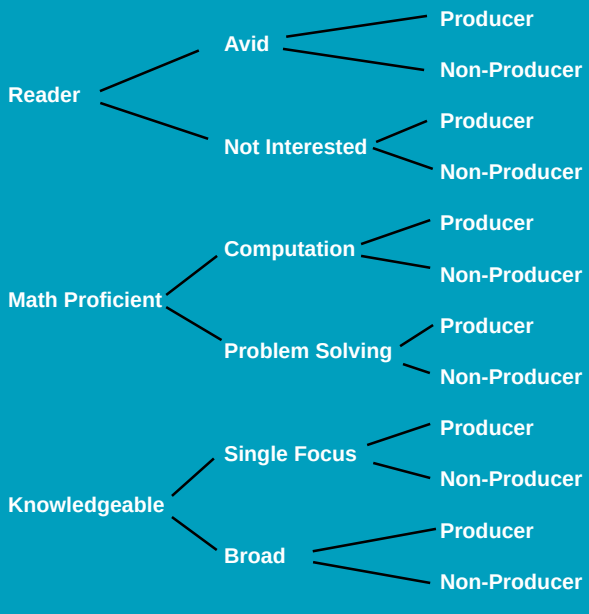

Figure 1. **Student profiles.**

Gagné (1994) criticized the methods employed by Pegnato and Birch. "We should not compare the effectiveness and efficiency levels of a given method (e.g., method X is very effective, but not very efficient) because these two indices will move in opposite directions as we change the cut off scores" (p. 125). Gagné suggested that data from the Pegnato and Birch study be reevaluated by computing a correlation coefficient between each method and the criterion. After reanalyzing the data, Gagné found that "teachers do not come out worse than most other sources of information, including some subgroups of the Otis" (p. 126).

More recent studies have also indicated that teachers are not the poor identifiers of gifted students that Pegnato and Birch (1959) indicated. Hoge and Cudmore (1986) suggested there is very little empirical foundation for the negative evaluation so often associated with teacher judgment measures. Rohrer (1995) found that while teachers' preconceived notions of giftedness could preclude children with certain personality traits from consideration for gifted programs, overall, "teachers were able to recognize intellectual potential in students who were not the stereotypical White, fit, well-adjusted, high-achieving students" (p. 279).

Renzulli and his colleagues (Renzulli et al., 1976) developed the *Scales for Rating the Behavioral Characteristics of Superior Students* for use by classroom teachers to nominate students. The *Scales* are among the most popular instruments of identification used today for nominating students for gifted programs. However, Renzulli cautioned that teachers should be trained before using the rating scales.

One area of concern in identifying students for gifted programs is gender bias. Gagné (1993) reported that

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males were more often thought to be more able in areas requiring physical or technical skill and females were perceived as performing better in the areas of artistic talent and socioaffective domains. Teachers spend more time interacting with male students in verbal and nonverbal ways (Mann, 1994; Oliveres & Rosenthal, 1992; Sadker & Sadker, 1993). Teachers face male students when talking (Sadker & Sadker, 1995) and give more detailed instructions to male students (Oliveres & Rosenthal, 1992). Not only do males received more attention, but the quality of this attention is higher than that received by females. Perhaps this additional attention translates into males receiving special "nomination" attention as well.

Bernard (1979) found that "irrespective of the sex of teacher or student, or course of study, students who are perceived as masculine in role orientation are likely to be evaluated more highly than students who are not" (p. 562). Dusek and Joseph (1983) also found that "teachers were more likely to expect high achieving students, regardless of gender, to be masculine or androgynous, and low achieving students, regardless of gender, to be feminine or undifferentiated" (p. 338).

Methodology

We developed 12 student profiles based on Tannenbaum's (1997) concept of producing and non-producing gifted students (see Figure 1). For example, we created four profiles that featured some aspect of reading. Two of the profiles depicted students who were avid readers, and two of the profiles depicted students who were not interested in reading. Of each of these pairs, one featured a student who was engaged in classwork (producer), and one featured a student who did not complete classwork (non-producer). In total, twelve different profiles were created. We created an identical set of 12 profiles in which only the gender of the student's name was changed. While one profile featured Brenda, an identical one featured Brian. Anglo names were used to avoid adding an additional selection criteria of ethnicity. The 12 profiles were given to a panel of three judges. Each judge correctly identified which of the 12 categories in Figure 1 matched the profiles.

We also created three additional profiles. One featured an introverted, quiet, absentminded student. Another involved a "cocky," dominant student who put down others. The final profile included a language arts oriented, avid reader with a large vocabulary.

The profiles were organized into two sets of 15. Each set contained a mixture of males and females who depicted each of the 12 categories shown in Figure 1 plus the 3 additional personalities. Ninety-two educators, classroom teachers (n=58) and gifted and talented specialists (n=34), who were attending a week-long, regional gifted and talented conference in the Northwest evaluated a set of 15 profiles. The educators were instructed to "Make recommendations of students that should be included in a gifted and talented program." A 4-point Likert scale with 1= "Definitely NOT include," 2 ="NOT include with reservations," 3="Include with reservations," and 4= "Definitely include" was used for each student profile.

Results

Gender differences were found with two profiles. Gifted and talented specialists and classroom teachers were similar in rating producing avid readers higher than non-producing readers. However, non-producing males who were not interested in reading were rated higher than similar females by classroom teachers. Introverted, absent-minded females were nominated with less confidence than males with similar nonproductive characteristics.

Math problem-solving producers were more likely to be nominated than similar non-producers. Gifted and talented specialists were likely to nominate producing and non-producing math problem-solvers than classroom teachers were. Non-producers who exhibited superior mental computation skills earned higher ratings than producers who used standard computation methods. Gifted and talented specialists valued mental computations more than classroom teachers.

The esoteric nature of students' knowledge appeared to influence educators' selections. Non-producers who were interested in airplane design and flying were more likely to be nominated than producing students who were interested in dinosaurs, a topic of interest to most elementary students. The nature of the student interest appeared to influence classroom teachers more than it influenced gifted and talented specialists.

Discussion

It appears that some gender stereotypes still exist when identifying students for gifted programs. Boys were excused for being disorganized and introverted. Non-producing avid readers who were male also received higher ratings than similar females.

The gender stereotype of females "liking reading" and boys "not liking reading" seemed to carry over to identification. It may be that when students fail to match the gender stereotype, their unexpected behavior draws attention to them. In some cases, this may increase the likelihood of their being nominated for gifted and talented programs. Tannenbaum (1986) described gifted traits as being both scarce and valued. Based on this preliminary study, it may be that some students are nominated for a program because they do not "fit the mold", rather than for the gifted behaviors that they exhibit. This finding is supported with the higher rating received by the nonproductive student with an esoteric interest over the producing student with a common interest.

Overall, students who chose not to engage in classroom assignments were rated lower than students of a similar profile who did engage in classroom assignments. Such students may be classified as underachievers. These underachievers end up being under-identified as well. Despite demonstrating productivity related to personal interests, these students were seldom recommended. This is unfortunate, since involvement in gifted and talented programs may provide the intellectual stimulation many of these students seek through personal interests. Baum, Renzulli, and Hébert (1995) found that students who had the opportunity to explore advanced projects related to personal interests often reversed their underachievement pattern.

Gifted and talented specialists tended to rate students higher than classroom teachers. It may be that they concentrated more on the positive aspects of the student profiles, rather than the negative ones. Programs for the gifted often concentrate on student strengths and interests and the gifted and talented coordinators may have been sensitive to these features of the profiles. Classroom teachers are often cast in a diagnose and remediate role with students. Under such expectations, they may be more sensitive to student weaknesses. Classroom teachers who are asked to identify gifted and talented students should be encouraged to identify characteristics that indicate giftedness, rather than look for reasons why a child is not gifted.

This study indicates that teachers need better training to help them recognize the stereotypical beliefs they hold about gifted and talented students. Such training will go a long way toward improving referrals for gifted and talented programs.

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