The National Research Center on the Gifted and Talented

NRC G/T

1996 Winter Newsletter

University of Connecticut
City University of New York, City College
Stanford University
University of Virginia
Yale University

What You'll Find In This Issue...

NRC/GT Through the Year 2000

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THE RESEARCH AGENDA for The National Research Center on the Gifted and Talented (NRC/GT) will continue through the Year 2000. In October 1995, the United States Department of Education, Office of Educational Research and Improvement (OERI), awarded a five-year cooperative agreement to the University of Connecticut. The consortium of the University of Connecticut; City University of New York, City College; Stanford University; University of Virginia; and Yale University will extend and enhance our focus on critical issues in the field of gifted and talented education. Funding for the cooperative agreement is under the Jacob K. Javits Gifted and Talented Students Education Act of 1994. The legislation focuses on identifying and serving students who have traditionally been underrepresented in programs for the gifted and talented, including individuals who are economically disadvantaged, individuals with limited English proficiency, and individuals with disabilities.

During the first five years of the NRC/GT (1990-1995), principal investigators planned the Year 1 studies. Subsequent studies initiated in Years 2-5 emerged from the results of the national research needs assessment survey (Reid, Renzulli, & Gubbins, undated). With the new award, OERI outlined several topics to be addressed through the proposed research. These topics included:

- identifying, teaching, and serving gifted and talented students;
- improving the education of gifted and talented students who may not be identified and served through traditional assessment methods and programs;
- using knowledge and experience gained in developing and implementing gifted and talented programs and methods to serve all students; and
- understanding the effects of gifted education programs on the educational achievement of students schoolwide.

The topics cited by OERI reflect several of the research priorities from the national needs assessment. Since the completion of the survey in 1991, we have revisited and updated the priorities with our advisory panel and consortium members. The major priorities that emerged from the needs assessment are addressed in our proposed research agenda for 1995-2000. The priorities include: (1) identifying, teaching, and serving gifted and talented students with known and emergent talents; (2) developing effective professional development techniques to improve the nation's ability to work with students with high abilities; (3) creating alternative approaches to recognizing and nurturing talents and abilities of students who have been underserved in the past; and (4) applying the pedagogy of gifted education to all students.

Abstracts of the research proposals for 1995-2000 follow.

Maximizing the Effects of Professional Development Practices to Extend Gifted Education Pedagogy to Regular Education Programs

Karen L. Westberg
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Several studies conducted by The National Research Center on the Gifted

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and Talented (NRC/GT) have pointed out that classroom teachers have limited exposure to professional development practices regarding new techniques and new strategies associated with gifted education pedagogy. Given that classroom teachers often have the primary responsibility of meeting the needs of talented students in their classrooms, it is important to gather specific data on how the whole process of professional development in gifted education is addressed. In this five year study, a national survey of approximately 4,300 districts will be conducted during 1995-1996 (Year 1) to determine the purpose, scope, and content of professional development practices in gifted education.

In subsequent years, we will experiment with existing professional development modules on curriculum compacting, thinking skills, curricular options for high-end learning, and enrichment clusters to determine their effectiveness in providing administrators and teachers with theoretical and practical knowledge, skills, and model activities to meet the needs of talented students. We also will develop a new module on enrichment learning and teaching to help teachers apply gifted education pedagogy in regular classrooms.

Applying the Triarchic Theory to Ethnic Minority High School Students

Deborah L. Coates
City University of New York, City College
New York, NY

Students from Hispanic and African origin backgrounds are often underrepresented in programs for the gifted and talented and in higher education programs in mathematics and science. Reasons for such underrepresentation are complex and may include test performance, economic disadvantage, and educational practices. Sternberg (1985) developed a theory of intelligence responsive to the diversity of intellectual abilities that addresses issues of identification, instruction, and assessment. The application of Sternberg's theory will be studied. The purposes of the intervention will be: (1) to use the triarchic method of assessment and teaching to identify undiscovered gifted students among ethnic minority group students; (2) to use innovative strategies to teach high school students to use thinking skills based on the triarchic model; and (3) to develop supportive mechanisms to sustain the thinking skills.

Identifying, Teaching, and Evaluating the Talented Through Linguistic and Cultural Lenses

Shirley Brice Heath
Guadalupe Valdés
Stanford University
Stanford, CA

Oftentimes the identification of talents among young people is confined to the school environment. It is important, however, to go beyond school walls and consider and understand the recognition, nurturance, and application of talents. Students within and outside of school will be identified who exhibit talents for leadership, translation and interpretation, resilience, and teaching/demonstration.

Several populations will be the focus of using linguistic and cultural lenses to identify, teach, and evaluate talented students. The populations will include:

- Latino students in a middle-class community high school;
- Latino youth in community-to-school programs;
- White and Native American/Indian youth involved in community development and entrepreneurship in impoverished counties;
- African American youth in performing arts programs in urban centers; and
- Immigrant, local, and "sent up" youth (from juvenile detention centers) in rural comprehensive schools and county youth programs.

The Feasibility of High-End Learning in the Diverse Middle School

Carolyn M. Callahan
Carol A. Tomlinson
Tonya R. Moon
Donna Ford-Harris
Ellen Menaker Tomchin
University of Virginia
Charlottesville, VA

How can all learners, including gifted, minority, and limited English proficient students be appropriately served in a strong middle school environment? This study is designed to test the viability and impact of bringing together leaders and practitioners of middle school and gifted education to develop, execute, and test models of curriculum differentiation and alternative assessment strategies. One approach will focus on introducing a model of curriculum differentiation in a heterogeneous classroom, focusing on high-end learning. The second approach will investigate ways teachers use classroom performance assessments to evaluate and assess multiple levels of student achievement in heterogeneous classrooms. It also will assess the impact of using these strategies on instruction, student attitudes, and achievement.

Modern Theories of Intelligence Applied to Assessment of Abilities, Instructional Design, and Knowledge-Based Assessment

Robert J. Sternberg
Yale University
New Haven, CT

The effects of instructional strategies on gifted students based on Sternberg's (1985) triarchic theory of intelligence will be examined in grades 4, 7, and 10 in language arts, math, science, and social studies. According to the triarchic theory, intelligence has three aspects: memory-analytic, creative-

synthetic, and practical-contextual. The principal research question is whether the triarchic theory of intelligence can inform identification, instruction, and assessment. To test this question and others, three treatments are proposed: (1) standard instructional regimen, emphasizing recall learning, but also incorporating thinking skills; (2) standard instructional regimen, but also emphasizing critical (analytical) thinking; and (3) instructional regimen infused with triarchic (analytical, creative, and practical) thinking.

Giftedness and Expertise

Robert J. Sternberg
Yale University
New Haven, CT

Potential and performance have long been sources of discussion and reflection among educators who seek to identify and serve students' emergent or recognized giftedness. The types of abilities and skills identified among young children may not be predictors of adult giftedness. This study of giftedness and expertise will compare the relative importance of reasoning ability (as measured by psychometric tests) and of deliberate practice in achieving expert levels of achievement through a computer related task requiring complex reasoning. Gifted students will serve as the expert group and nongifted students will be the novices involved in prototypical and novel tasks.

The expert task performance of established adult leaders in English, mathematics, history, and biological science also will be examined to set the stage for comparing and contrasting the expert and novice states for student and adult performers. Knowledge gained from these strategies will be used to create and validate an assessment tool that measures what is required for expert studentship and transition into expertise in a discipline.

Identification and Assessment of Tacit Knowledge for Youth Leaders

Robert J. Sternberg
Yale University
New Haven, CT

When we think about giftedness, we often think about academic giftedness and occasionally about musical or athletic giftedness. At least as important, however, is giftedness in leadership. This aspect of practical intelligence is critical. In this collaborative effort with Shirley Brice Heath of Stanford University, we will identify the tacit knowledge (i.e., knowledge that is not openly expressed or stated) needed for success in youth leadership; and develop a separate instrument to measure tacit knowledge for youth leaders. Youth leaders will be interviewed and observed to provide preliminary information for a measure of tacit knowledge. The inventory will then be subjected to validity and reliability procedures to ensure its usefulness as a measure of identification and assessment of tacit knowledge for youth leadership.

This five-year research agenda of The National Research Center on the Gifted and Talented focuses on large scale, basic research accomplished through surveys and small to medium scale, applied research in classrooms. We will, once again, call upon our Collaborative School Districts in every state and two territories (Guam; Virgin Islands) to participate in these studies. The specific responsibilities of Collaborative School Districts are:

1. To serve as locations at which research data can be gathered;
2. To provide locations where visitations can be arranged to observe successful practices in operation, to participate in the preparation of consumer-oriented guidebooks and video training tapes, and to provide technical assistance to school districts that express an interest in replicating successful practices; and
3. To assist in the documentation of biographical information about students so that contacts can be maintained for longitudinal follow-up studies.

Districts will benefit from the opportunity to:

1. Receive announcements of materials and staff development opportunities for teachers and students;
2. Participate in experimental curriculum;
3. Network with other school districts throughout the country;
4. Access the NRC/GT's WWW site for the latest research;
5. Receive copies of the NRC/GT newsletters summarizing the latest research activities;
6. Provide guidance and direction for the establishment of state and national policies for gifted and talented education; and
7. Access copies of all products produced by the Center on a cost-recovery basis.

Since Spring 1995, two districts (Suffield Public Schools, Suffield, CT: Laurence Public Schools, Laurence, NY) have joined our network now totaling 339. We would like to extend an invitation to other districts to become a Collaborative School District. Just contact us at the NRC/GT address on the back of this newsletter and we will send you a demographic profile and other pertinent information. We are especially interested in expanding our network in several states and territories, including North Dakota, South Dakota, Idaho, Nevada, New Mexico, Arizona, Utah, Oklahoma, Hawaii, Louisiana, Tennessee, Wyoming, Alabama, Ohio, West Virginia, Alaska, Delaware, Rhode Island, Puerto Rico, and American Samoa. Although we have

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representation in all of the states, we would like access to more school districts, and we are interested in working with the territories.

We are excited about our research plans and will continue to share our progress with you through our semi-annual newsletters and other publications from the NRC/GT. Thank you for all of your support and continued interest in our work.

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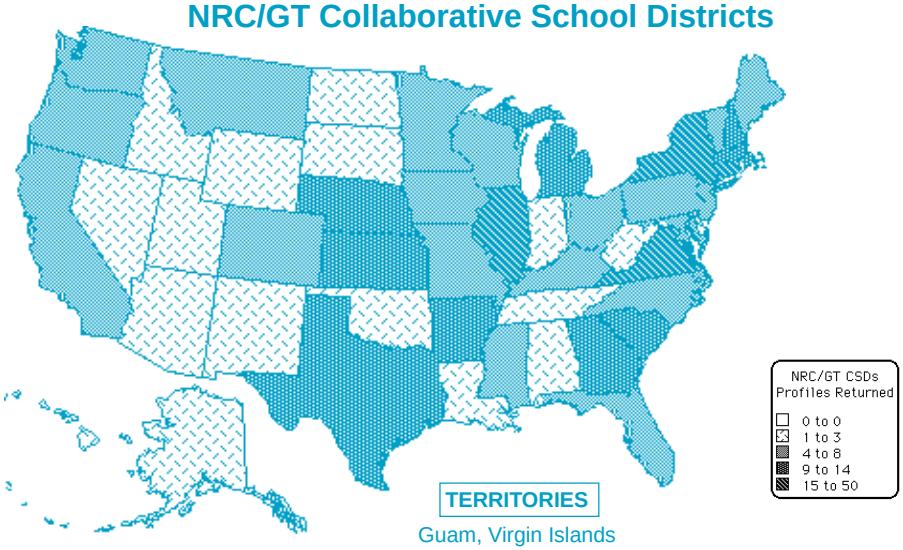
NRC/GT Collaborative School Districts



New Collaborative School Districts

Suffield Public Schools – Suffield, CT
Laurence Public Schools – Laurence, NY

NewsBRIEFS

Complete listings of NRC/GT publications and abstracts of selected publications are now available from our World Wide Web site at the University of Connecticut. Any computer user with access to the Internet can access this service. Our address is "www.ucc.uconn.edu/~wwwgt".

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Legal issues in gifted education continue to be of interest to parents, teachers, school administrators, and concerned citizens. Dr. Frances Karnes is collecting information on court cases and due process hearings. If you have such information from your state, contact her at the University of Southern Mississippi, Box 8207, Hattiesburg, MS 39406-8207.

* * *

A new guide to help teachers develop more authentic instruction, assessment, and student performance is available from the Wisconsin Center for Education Research. Authors Fred M. Newmann, Walter G. Secada, and Gary G. Wehlage base their suggestion on studies of 24 restructured elementary, middle, and high schools nationwide. The $9.00 guide is available from Document Service, Wisconsin Center for Education Research, 1025 W. Johnson Street., Room 242, Madison, WI 53706, phone (608) 263-4214.

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Genesis: Breathing Life into Learning through the Arts, a three-day working conference for teachers, artists, and administrators, will be held on the University of Montana campus in Missoula on June 19-21, 1996. Featured presenters include Howard Gardner, Mihaly Csikszentmihalyi, David O'Fallon, and Mary Clearman Blew. A $110 pre-registration is required and enrollment will be limited. For information contact: The Creative Pulse, UM School of Fine Arts, University of Montana, Missoula, MT 59812, phone (406) 243-4970.

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A new book by Robert Abelman examines television-related issues pertinent to children in general and intellectually gifted kids in particular. *Reclaiming the Wasteland* offers parents and teachers a prescription for accentuating the positive and avoiding the negative outcomes of children's television viewing. Paperback copies of *Reclaiming the Wasteland* may be purchased for $18.95 plus $3.50 postage and handling from Hampton Press, 23 Broadway, Suite 208, Cresskill, NJ 07626, phone 800-894-8955, fax (201) 894-8732.

* * *

School reformers and curriculum designers may find their efforts to shake up schools complicated by the way in which secondary school teachers view the subjects they teach. A study published in the November 1995 issue of *Educational Researcher*, a journal of the American Educational Research Association, indicated that math and foreign language teachers rated their subjects as significantly more sequential and more defined than did teachers of science, English, and social studies. These findings suggest that teachers work in contexts defined by the subject matter they teach.

NEWS Briefs

Still Searching…

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"The journey is the reward."
Peter Senge, 1990

EARLY ON, A TEACHER OF the gifted imparts to his/her students the idea that there are many approaches to solving a problem and many right answers for most questions. As teachers of the gifted, we often emphasize the *process* of learning with our students, rather than focus on the end product. However, when we conduct research projects, we usually take an opposite tack. We focus on the end product, the final results of the research project, rather than extrapolating lessons throughout the project's life. This article relates the story of a different, more reflective view of one such research project. What follows is a description of the process of searching for answers, the journey of tackling an issue about which one cares deeply, and what is gained through the process.

Background

Funded in September 1992 by the Jacob K. Javits Gifted and Talented Students Education Act, Project SEARCH, Selection, Enrichment, and Acceleration of Rural Children, had two major goals similar to a number of other Javits projects. The first was to develop a method of identification for gifted students who were underrepresented in our pilot schools: students who were poor, rural, and African American. Once a more sensitive procedure for identifying giftedness was devised, the next goal was to develop a model which nurtured the gifts and talents of these students. Project staff hoped that through an inclusive model in the regular classroom setting gifted students would bubble up to the top—that is they would become more easily identifiable through their performance (Swanson, 1995).

The project grew out of the local school district's efforts to identify more African American children for the gifted and talented program. Data indicated that the chances of White, middle income students being identified as gifted were much greater than the chances of African American students of poverty. Further, students in suburban schools were more easily identifiable than students in urban and rural schools. The decision was made to focus the search in rural schools serving students of poverty and to experiment with several nontraditional approaches to uncovering gifts and talents.

The Plan

Three pilot schools, located in the rural South, were selected for the project before plans for the research were clearly articulated. The principals agreed to participate, without really knowing what would be required. The principals agreed because they thought the project would help their students. All of the pilot schools were Schoolwide Title I, rural, and majority African American.

Based on a review of the literature and with input from pilot teachers and SEARCH's advisory board, project staff developed a nontraditional screening procedure to use for identification. All students were screened individually in their kindergarten year with four assessments: the *Raven's Coloured Progressive Matrices* (Raven, 1976), *Thinking Creatively in Action and Movement* (Torrance, 1981), a teacher assessment checklist (Orth, 1986), and a peer nomination interview (Hensel, 1991). Three cohorts of students were identified as potentially gifted based on results of their individual assessments, and these targeted students were followed throughout the project. The percentage of each school population identified ranged from 10-15%.

Along with the identification component of Project SEARCH came the development of an ongoing, sustained program of teacher training. Summer institutes, workshops and professional meetings, ongoing coaching/consultation with a master teacher, whole group meetings, and classroom demonstrations provided teachers with the opportunity to learn new strategies, implement the new strategies in their classrooms, reflect on their practice, and engage in dialogue with others in similar contexts. Curriculum was developed and piloted in classroom demonstrations and became the basis for assisting teachers in deepening their understanding of what "gifted and talented" lessons might look like with their students.

One of the early issues that project staff and pilot teachers had to struggle with was the non-prescriptive nature of the teacher training. While the project staff came into the project with clear notions about the presence of giftedness in all segments of the population, they did not come in with a recipe or cookie cutter approach to finding and serving these under-identified students. Working through the ambiguities of multiple possibilities, and allowing for an evolution of ideas was essential but extraordinarily difficult. The pilot teachers were accustomed to being directed and told what approaches worked best. They had a difficult time shifting to the role of decision-maker and problem-solver.

The model for nurturing the gifts and talents of Project SEARCH students

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gradually evolved out of the teacher training, pilot curriculum, and identification components of the project. Developing an inclusive model was much more difficult than anticipated. Working to change classroom practices of a diverse group of teachers, each with his/her own philosophy of education, was a process that took time and sustained effort. The level of learning and change that occurred depended on the teacher's receptivity and the school environment's support for risk-taking.

The Lessons … or Learning From Your Mistakes

If this article sounds similar to what you do with your students in your gifted class, then you're beginning to understand this journey. Undertaking a project such as this requires an understanding of the organic nature of change and a high level of patience and persistence. Mistakes are inevitable and must be used as springboards for learning. As Michael Fullan says in his discussion of change, "Problems are our friends" (1993).

The first mistake of Project SEARCH staff was belief in a magic bullet: the first Summer Institute. The proposed plan was based on the premise that the pilot school teachers would gather together during the first summer of the project and develop the model that would be the foundation of Project SEARCH. What happened? Only a handful of teachers and one of the three principals participated in the institute. Thus, lesson one was revealed: Teacher ownership is crucial.

The next mistake was underestimating the effects of a non-prescriptive approach. Project staff strongly supported the assumption that a non-prescriptive, context-responsive approach works best. However, when everyone is making his/her own path, finding his/her own way, how is progress towards project goals best assessed? How does a project end with results that are generalizable or replicable when the approach is non-prescriptive? How can teachers be convinced to shift their roles from trainees to learners? Project staff came to understand that clarity with teachers about how the teachers' classes would look and feel at the end of the project was essential. Teachers began to see what needed to be different about their teaching as their understanding of the desired project outcomes deepened. This mistake helped project staff devise a pilot curriculum that could be used across project classrooms. The pilot curriculum enhanced the nontraditional efforts used in identification and strengthened teachers' understanding of "gifted and talented strategies." The next lesson was that a nonprescriptive approach requires ongoing communication and strong support and encouragement for teachers.

From these mistakes, we created systems that successfully identify poor African American children and promote the use of gifted and talented strategies in regular classrooms. One Project SEARCH teacher commented, "Participating in this project is like getting paid to get an education." Project staff found substantive evidence that rural African American children are gifted and identifiable, but the process takes time, labor, and multiple ways of looking at children. A promising identification practice that emerged was the use of student portfolios. Student work samples were collected across project classes from tasks in the pilot curriculum. Establishing a rubric and assessing these portfolios was another way to find exceptional students.

Identification and labeling students as gifted began to lessen in importance as this project progressed. Many in gifted education are advocating for a broadened view of giftedness, but most continue to focus on methods of identification. Why not focus more on curriculum and instruction? Why not shift to a focus on building on students' strengths? (Renzulli, 1994). Why not work to improve the intellectual quality of the student's experience (Newmann, Secada, & Wehlage, 1995)? Project staff began to see the critical need to provide rich, challenging curriculum and instruction for all children, including the gifted. Challenging the student who scores in the 96th percentile on a Torrance test of creativity is just as important as challenging the student who has an IQ of 146. Providing for the student who can read and write music is as crucial as accelerating the first grader who is ready for algebra.

When it comes to changing teachers' practices, schoolwide involvement is essential. The culture of the school ultimately shapes the classroom environment. Recognition of the classroom teacher's reality means recognition of the obstacles a teacher faces when trying to change his/her practice. These realities include a lack of time for preparation and reflection and the measure of a teacher's worth by his/her "control" of his/her students (Lieberman & Miller, 1990). Teachers' fear of failure is an obstacle for experimentation with innovative instruction. Strong support must be in place if the teacher is to step into the unfamiliar territory of new and innovative teaching strategies.

Conclusion

While Project SEARCH's results were not based on a flawless research design, the changes that occurred were quite positive. The consulting teacher model developed as part of the project has continued to be used in project schools, supported by the local school district's Title I monies. The model is viable for students in the top quartile as well as the bottom quartile. The project's standardized tests scores indicate some positive achievement gains, supporting the use of this model with all students (O'Tuel, 1995). In fact, when federal

funding of Project SEARCH ended in September 1995, the local Title I director funded continuation of the consulting teacher, the teacher training, and support materials. This continued support and partnership with Title I has benefitted gifted students as well as students who are low achievers.

Another positive change has been the local district's use of the *Raven's Coloured Progressive Matrices* as another tool in the identification process. The *Raven's* has helped to identify more gifted African American students and gifted English-as-a-Second-Language students. The project has resulted in increased interest around the state in identifying underrepresented gifted students. Further, the local district has planned and implemented a summer enrichment program for potentially gifted youngsters, including those in Project SEARCH. The project staff secured outside funding for a third summer institute for project teachers and G/T teachers from around the state. Some teachers participated for the third summer in a row!

The changes in teachers' practices have been more subtle. Several of the teachers have emerged as leaders in their schools. Two teachers enrolled in Master's degree programs during the project. One teacher who had been very traditional in her instructional approach has embraced the "gifted and talented" approach of the project's consulting teacher, and they continue to work together closely. Model classrooms have been established in each of the project schools to serve as places in the school for teacher professional development through modeling and coaching.

What is gained through a project such as this? How do projects like this strengthen efforts for gifted education? Aside from the direct impact on students, the most valuable aspect of this project is the education for those involved. Over 30 teachers and principals had the opportunity to learn about how to do a better job of teaching their potentially gifted students. The partnerships formed among classroom teachers, G/T teachers and staff, and Title I teachers and staff created a more focused effort in improving the education of all students, including those who are gifted and talented.

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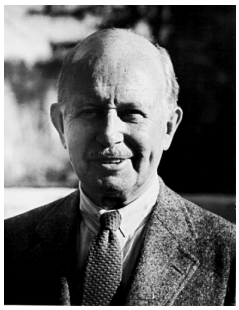
A Tribute to Paul F. Brandwein

E. Jean Gubbins
Joseph S. Renzulli
University of Connecticut



SCIENCE EDUCATION in the 20th and 21st century will continue to be influenced by Dr. Paul F. Brandwein—scientist, author, artist, master teacher, and humanitarian. Paul died in September 1994, and we miss his presence and enlightened wisdom about so many educational issues. We had the special honor of publishing Paul's last book entitled *Science Talent in the Young Expressed Within Ecologies of Achievement* for our Research-Based Decision Making Series. When we first approached Paul Brandwein about the prospect of documenting his well-tested approach to working with the young to nurture and develop their science-proneness, he did not hesitate to agree. He saw the book as an opportunity to capture his thinking about science and education for two special populations: gifted students and disadvantaged students. His interests, prior work, and continual commitment to making science a joy for students were a perfect match to the Javits legislation which supported our Center. As a teacher at Forest Hills High School in New York City, Paul translated theory into practice as he experimented with eyes-on, hands-on, brains-on, minds-on techniques in science. He continued his approach for decades, even as he moved from high school to colleges and universities around the country and to a large publishing house—Harcourt Brace Jovanovich.

Paul chronicled his theoretical and practical philosophies in several books—two of which have had a great impact on our field:

Brandwein., P. F. (1955). *The gifted student as future scientist.* New York: Harcourt Brace Jovanovich.

Brandwein, P. F., & Passow, A. H. (Eds.). (1988). *Gifted young in science: Potential through performance.* Washington, DC: National Science Teachers Association.

When you read these books and others by Paul, you become acutely aware of his forward thinking about education. He wrote what he believed, what he experienced, and what he wished for the children of the world. The scientific minds of the young could be opened in so many ways through the guidance and the talent of educators. Perhaps this belief was behind the reason for one of his large scale projects for Harcourt Brace Jovanovich. Paul was integral to creating the science series—*Concepts in Science*. To this day, the first author remembers vividly the book emblazoned with his name—Paul F. Brandwein. The series took on special meaning because it offered the novice teacher a hands-on investigative approach. This science series was more than just teachers' and students' editions for various grade levels—leaving teachers and students to navigate their way through the pages unassisted. No!—*Concepts in Science* was a premier series with all the necessary tools, materials, instructions, rocks, minerals, fossils, chemicals, beakers, plastic tubing, measuring devices, etc. to turn traditional elementary classrooms into scientific laboratories. The laboratory atmosphere that Paul knew so well was now available to all who accessed the well-designed, forward-thinking science series. The series may have been concurrent with or preceded other curriculum reform projects of the 1960s. We can't trace the original release date for the series; however, the large closet-size cabinets and small table top compartments in green and purple will never be forgotten because they held the tools and keys to experience the wonderment of science. Students would think and act like professional scientists as they hypothesized and conducted experiments. Science went beyond words on paper—it was what it should be.

For years, Paul visited classrooms around the country to witness his philosophy in action. As a researcher with a quantitative orientation, he also carried the tools of the qualitative researcher—pens and journals—as he observed classrooms and recorded copious notes. He shared some notes in *Science Talent in the Young Expressed Within Ecologies of Achievement* and they are highlighted here as illustrations of science-minded classrooms:

Observations of a Combined Fourth and Fifth Grade Class (1989)

Aim: To study the concept of weight and lead to a concept of mass.

A boy brought up a problem one Friday: "I saw a boy balancing his father on a see-saw. The father was sitting near the hinge at the center; the boy at the end of the see-saw. How does this work?"

Several hands went up, but the class was ending, and the children and teacher agreed to take up the problem on Monday. By then, a girl had "invented" a model: A thin metal ruler on a pivot; four checkers on the ruler near the pivot; two at the end.

"If you know the length of the see-saw," she explained, "you can balance the weights. So *W* (weight of the body) x *L* on the other side." She drew a sketch of the apparatus on the board. "I checked it up in a high school textbook, but I thought up the checkers as weights and made the fulcrum using the edge of a box." She then answered questions, particularly about her "formula." (Brandwein, 1995, p. 44)

Observation of a Rural District of Fourth Graders (1964)

Aim: To illustrate concept formation, based on prior experience and leading to a construct.

In the introduction to the lesson, the teacher probed what his students knew, asking what kind of farms were in the area, what the crops were, what types of plants and animals they cared for, and so forth. He elicited all this information apparently not only to prepare the children's mind-set but also to set them at ease. Then, the teacher held up four hens' eggs—two brown, two white—and asked, "If these were hatched what would come of them?" The response, almost in chorus, "Chicks." One girl asked: "Are the eggs fertilized?" The teacher cracked one open; it was hard boiled. Laughter. "Nothing but lunch will come out of this one."

Asked the teacher, "Suppose they were fertilized—then hatched. What would happen in the next weeks or so?" The boys and girls described how a chick was brought to full development into a hen or a rooster. They discussed such matters as diet, for example. But the teacher noticed that one boy was silent, appearing inactive, and the teacher passed him an egg.

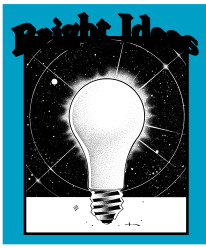
"Why not a duck, an ostrich?" the teacher queried. Softly, the boy said. "It doesn't have the DNA of these animals." With some encouragement, the boy was able to explain that DNA was in the cells of the growing chick. And, when asked—"What's DNA?"—he stood to answer, "deoxyribonucleic acid." He explained with some uneasiness that he learned about DNA first from a TV program; then, he went to an encyclopedia and to magazines; next, he consulted biology textbooks and had conversations with an older brother, then in high school. The construct developed before the end of the lesson: Living things inherit their traits from their parents. (Brandwein, 1995, pp. 41-42)

For decades, we only knew of Dr. Paul F. Brandwein as a scientist and an author. Then in 1981 he honored us with his presence at the University of Connecticut's Confratute, a summer conference/institute on gifted and talented education. Paul was a keynote speaker for an audience of hundreds of administrators and teachers from all over the world. He shared his talents and perspectives as a scientist in describing the historical, contemporary, and futuristic views of science education. He wove scientific theories and practical applications throughout the tapestry of musical compositions as he graced us with his artistic talent as a pianist. Paul combined words and music to send his message. That was the only time that the first author saw Paul Brandwein in person. The name on the cover of *Concepts in Science* took on a very special meaning.

Over a decade later, we were privileged to have several phone conversations with Paul as he prepared his manuscript for the NRC/GT. Paul talked about his work, his progress on the chapters, and his commitment to its completion. Our comments about the brilliance of his work were always greeted with "you're so kind." A man of genius, of scientific notoriety, and a master teacher was so humble. His comment gave us pause because we held him in such high regard. He was the one who was so kind in his unending commitment to science education. He truly made the science classroom a better place for children and teachers alike.

Paul's words were finalized for his NRC/GT monograph in 1994. Unfortunately, Paul never saw the published copy, since it was released in April 1995. He worked so long and hard on his manuscript, and we trust that it will influence the future of science education for decades to come. Dr. Paul F. Brandwein was truly the kind person, scientist, author, artist, master teacher, and humanitarian who has contributed so much to the scientific and educational communities.

Acknowledgments: The authors would like to acknowledge the contributions of Deborah Fort and Evelyn Morholt who dedicated so many hours to fine-tuning Paul's manuscript. Deborah Fort was thrilled when the book arrived at her door. She, too, was honored by the opportunities to collaborate with Paul on many projects. Unfortunately, Evelyn Morholt never saw the final copy due to her untimely death. We shared our gratitude with both collaborators many times, and we will always remember their contributions to this special project.



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Extending the Pedagogy of Gifted Education to All Students

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DURING THE 1994-95 school year, the University of Connecticut site of The National Research Center on the Gifted and Talented (NRC/GT) conducted a study to examine the effects of implementing an innovation called enrichment clusters with all students. Enrichment clusters are a new component of the Schoolwide Enrichment Model (Renzulli, 1994; Renzulli & Reis, 1985) that will be explained briefly later in the article. Major findings of this research are highlighted in this article and those readers interested in the complete results should refer to the technical report entitled *Extending the Pedagogy of Gifted Education to All Students* (Reis, Gentry, & Park, 1995). Additionally, for readers interested in implementing an enrichment cluster program in their school, a video training tape and manual have been produced as a result of this study. The videotape is entitled *Enrichment Clusters: Using High-End Learning to Develop Talent in all Students* (Gentry, Reis, Renzulli, Moran, & Warren, 1995) and will be available in April from the NRC/GT.

Enrichment clusters are designed to provide enrichment to all students during a specified time of the school week. The federal report *National Excellence: A Case for Developing America's Talent* (U. S. Department of Education, 1993) encouraged the use of gifted education strategies in general education and emphasized the role gifted education programs have had on general education:

> Over the past 20 years, while the regular school program focused on basic skills and minimum standards, programs for gifted and talented students served as laboratories for innovative and experimental approaches to teaching and learning. A variety of educational options were developed in programming and scheduling. Many new programs focused on complex thinking strategies and problem solving and used sophisticated teaching strategies . . . developed alternative teaching strategies and interesting curriculum approaches . . . . Now many educators believe that the knowledge and experience that gifted education has gained . . . can be used to upgrade all of education and are calling for this to be done. (p. 23)

Enrichment clusters meet these challenges as they are designed to offer all students an opportunity for challenging, self-selected, real-world learning experiences. Renzulli (1993) indicated that two reasons explain why practices that have been a mainstay of gifted programs are being absorbed into general education to upgrade the performance of all students. The first reason concerns the limited success of remedial-oriented compensatory education programs and practices, and the second reason is the success of practices developed in gifted programs and the need for these practices to be included in the regular curriculum. "All students should have the opportunities to develop higher order thinking skills and to pursue more rigorous content and first-hand investigative activities" (Renzulli, 1993, p. 2). The application of gifted program know-how into general education is supported by a wide variety of research on human abilities (Bloom, 1985; Gardner, 1983; Renzulli, 1986; Sternberg, 1984). This research provides a clear justification for much broader conceptions of talent development, and argues against the restrictive student selection practices that guided identification procedures in the past. This study was designed to add to the limited research base currently available which assesses the benefits of the extension of gifted education pedagogy to the entire school population.

The Enrichment Clusters

The enrichment clusters, one component of the Schoolwide Enrichment Model (Renzulli, 1977, 1994; Renzulli & Reis, 1985), are non-graded groups of students that share common interests and come together during specially designed time blocks during school to pursue these interests (Renzulli, 1994). "Like extra-curricular activities and programs such as 4–H and Junior Achievement, the main rationale for participation in one or more clusters is that *students and teachers want to be there*" (p. 64). Clusters involve all teachers and students as well as parents and community members. The model for learning used with enrichment clusters is based on an inductive approach to solving real-world problems through the development of authentic products and services. Unlike traditional, didactic modes of teaching, this approach, known as enrichment learning and teaching (Renzulli, 1994),

creates a learning situation that develops higher order thinking skills and authentically applies these skills to creative and productive situations. Enrichment clusters are excellent vehicles for promoting cooperativeness within the context of real-world problem solving, and they also provide superlative opportunities for promoting self-concept. "A major assumption underlying the use of enrichment clusters is that *every child is special if we create conditions in which that child can be a specialist within a specialty group*" (Renzulli, 1994, p. 70).

Clusters are offered within the school day at a time that has been decided upon by teachers and staff. In some schools, cluster time is a two hour block in the morning or afternoon one day each week. A brochure is sent home describing the clusters, and all students sign-up for clusters that are based on their interests. The title and description that appeared in a brochure about clusters, and a brief commentary about the cluster written by one of the facilitators is included below to provide further elaboration of enrichment clusters:

> Invention Convention *(Brochure Description)*
> **Facilitated by Robert Erikson, Physicist and Supervisor of Teaching Labs, University of Connecticut; Max Nam, Physics student at the University of Connecticut; and Sandra Rijs, Third Grade Teacher**
>
> Are you an inventive thinker? Would you like to be? Brainstorm a problem, try to identify many solutions, and design an invention to solve the problem, as an inventor might give birth to a real invention. Create your invention individually or with a partner under the guidance of Bob Erikson and his students, who work at the Connecticut Science Fair. You may share your final product at the Young Inventors' Fair on March 25th, a statewide day-long celebration of creativity.

Robert Erikson's commentary:

> In the Invention Convention Cluster, we worked with young people and tried to get them to come up with an idea, express that idea verbally, then be able to put it down on paper and come up with some kind of design. Once they came up with some dimensions and materials they needed, they could begin working to put together a project. In working on a project they had the opportunity to see what might go wrong, what might go right, and they had a chance to work with tools for the first time, and do things they hadn't done before. Each student selected his/her own project. If they weren't quite sure what they were talking about, we would prod them until they had a direction . . . but it was all on their own.
>
> There were two types of products I saw from this cluster—one was the finished product, the physical product they could grab hold of and work with and use. The other was the student's understanding what it means to take an idea and go all the way to the end, and his/her realization that it takes more than one try to finish. Students understood how to ask the question, "What do I do next? What if I did this?" The most enjoyable part of working with the cluster was watching the students as they began to dig in, pull out from inside, work towards a project, and see success with that project. Clusters are a superb idea.

Enrichment clusters are not intended to be the total program for talent development in a school, or to replace existing programs for talented youth, but they are one vehicle for stimulating the interests and developing talent potentials of the entire school population. They are also vehicles for professional development as they provide teachers with an opportunity to participate in enrichment teaching, and subsequently to analyze and compare this type of teaching with traditional methods of instruction. In this regard, it is hoped that clusters will promote a spill-over effect by encouraging teachers to become better talent scouts and talent developers, and to apply enrichment techniques to regular classroom situations.

Research Design, Methodology, and Treatment

The major goal of this study was to investigate the effects of the use of enrichment program strategies on the entire population of the school, including students, teachers, staff, and parents. A quasi-experimental design was used in this study with a combination of quantitative and qualitative methodologies. Quantitative methods included descriptive and inferential statistical procedures such as frequency, factor analysis, and multivariate analysis of variance and covariance with repeated measures. Qualitative procedures included: observations, interviews, and questionnaire data gathered through the use of participant observation (Spradley, 1980). Field notes, transcriptions of the interviews, document review, and all other collected data were coded and analyzed for patterns and themes. The coding process combined techniques described by Spradley (1979; 1980) and by Strauss and Corbin (1990).

A research team was used to facilitate and conduct the study consisting of a principal investigator, an on-site research associate, a research analyst, and two on-site research liaisons who implemented and collected the data. Teachers in both treatment schools

(continued on page 12)

(continued from page 11)
received training in how to implement enrichment clusters, and each teacher and parent in the school received an invitation to organize a cluster. The enrichment clusters met for 10 weeks in one school and for 12 weeks in the other school. Clusters were facilitated by teachers, parents, students, and community volunteers during one hour sessions that were scheduled weekly.

Sample

Two urban school districts agreed to participate in this study. Both were culturally diverse and contained a high concentration of economically disadvantaged students. One district had a minority population of 42.9%, and the other district's minority population of 35% consisted primarily of Hispanic students, many of whom had limited English proficiency. Two elementary schools were designated as treatment schools that would implement the clusters, while a third elementary school that was similar to the treatment schools in terms of size and ethnicity was assigned to serve as a comparison site.

Research Questions

The research questions that guided the implementation of enrichment clusters and the collection and analysis of data for the study were as follows:

1. What are the effects of the implementation of enrichment clusters on students' interests, attitudes about school, and product development?
2. What are the effects of the implementation of enrichment clusters on parental attitudes about school satisfaction?
3. How do teachers in the groups differ with respect to their attitudes about the use of enrichment activities for students?
4. Do teachers in the experimental sites use strategies learned in organizing enrichment clusters in their regular classroom teaching?
5. In what way is advanced content used in enrichment clusters?
6. How many students complete products in the enrichment clusters and what is the achievement level of students completing products?
7. Does the quality of student products differ among students of various levels of achievement?

Results

Following is a partial summary of the results found in this research study. The data analyses were conducted on categories of *program success*, *student interests*, *student attitudes*, *student products*, *parental attitudes*, and *teacher practices.*

1. It was possible to successfully implement enrichment clusters in low socioeconomic, culturally diverse urban schools in which these clusters can be adapted and tailored to fit individual school schedules and needs.
2. Both schools that participated in the study continued the program during the next school year.
3. Cross age grouping by interest was successful in enrichment clusters.
4. Community members were actively involved on a regular basis in schools through enrichment clusters.
5. Total schoolwide enrichment could be provided and gifted education pedagogy was successfully extended to students of all achievement levels using enrichment clusters.
6. Attendance was higher on enrichment cluster days than on non enrichment cluster days.
7. Approximately 90% of the students completed projects in clusters, and there were no differences in the number of projects produced when examined by achievement, gender, special program placement, or ethnicity.
8. The quality of products was examined and no differences were found among various achievement levels of students. This suggests that it is not the academic achievement level of the student that is important in product development, but rather the level of interest and commitment toward the self-selected project in the enrichment cluster. When students of common interest work together toward development of a product, achievement does not appear to predict the level of the process of product development or the overall quality of the resulting products.
9. In both treatment schools, parents' perceptions about enrichment and their satisfaction with enrichment improved after the implementation of the enrichment clusters.
10. Teachers who facilitated or assisted with clusters began to use strategies from enrichment clusters in their regular classrooms. These strategies included using both content and methods. Content included such areas as the development of centers related to cluster content, the integration of cluster content into the classroom curriculum and lessons, and the use of ideas and community resources gained from the clusters within the classroom.
11. Teaching methods were another area that was influenced by the enrichment clusters. Teachers reported several categories of methodological influences including: considering student interests, using hands-on activities, allowing for student direction and choices, using interest groups within the classroom, encouraging student products and independent work, and concentrating on thinking skills.
12. Approximately 60% of the teachers said that clusters influenced what they now do in their classrooms.
13. Teachers used advanced content and methodologies in the enrichment clusters and provided challenges and choices to the students. The types of advanced content and the frequency of use are depicted in Table 1.
14. Over 50% of the teachers that facilitated clusters in their schools indicated that they transferred the strategies that they had learned and used in their enrichment clusters into their classrooms, although this had not been requested of these teachers as a part of their participation in the study.

Implications

This research study indicated that one type of pedagogy often used in gifted education programs can be extended to students who are not usually included in special programs for talented students. The students who benefited

from this research study were from urban areas. Many were poor, had limited English proficiency, and had been repeatedly involved in remedial education programs. In one school, over 80 students were involved in special education programs and were bussed to this school because of its physical accommodations for students with disabilities. During the cluster program in this specially designated time in school, everything changed. Students left their classrooms and in a minute or two sped joyfully down the hallways to another room and another adult. Their evaluations of the program were extremely positive and indicated that enrichment clusters fostered excitement about learning and demonstrated the benefits of schoolwide enrichment for all students.

Most teachers genuinely seemed to enjoy facilitating the clusters and they did not regard it as just another preparation. Interviews indicated that the teachers looked forward to having an opportunity to share their interests with students who have similar interests and learning styles. Additionally, the implementation of the cluster program also resulted in the recruitment of many parents and community members into the school in roles that many of them had not previously pursued. This role allowed parents to share talents, areas of expertise, hobbies, and special abilities, and many of them were delighted to be able to be more involved in the school and have their children's teachers know them in a different way. The same was true for many community members who facilitated clusters. The implementation of enrichment clusters may then provide a triple opportunity: enrichment learning opportunities for all children, professional growth opportunities for teachers in differentiation strategies and in enrichment learning and teaching, and opportunities for parents and community members for more involvement in the school.

Table 1
Advanced Content and Methodologies by Frequency and Percentage of Use

Strategy	School A	School B	Total
1. Introduction of New Concepts and Advanced Content	52 (91)	62 (98)	114 (95)
2. Development of Product or Service	49 (85)	48 (76)	97 (81)
3. Teaching Specific, Authentic Methodologies	40 (70)	48 (76)	88 (81)
4. Use of Advanced Vocabulary	39 (68)	39 (62)	78 (65)
5. Use of Authentic "Tools" Related to the Topic	27 (47)	40 (63)	67 (56)
6. Use of Advanced Resources and Reference Materials	25 (44)	38 (60)	63 (53)
7. Use of Advanced Thinking and Problem Solving Strategies	26 (46)	27 (43)	53 (44)
8. Integration of Creative Thinking	24 (42)	27 (43)	51 (43)
9. Integration of Historical Perspectives	14 (24)	15 (24)	29 (24)
10. Development of Presentations or Performances	9 (16)	7 (11)	16 (13)
11. No Advanced Content Used	5 (9)	1 (2)	6 (5)

Note: Numbers in parentheses are percentages

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Stimulating Student Creativity: A Review of *Creativity in the Classroom*

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AS THE TITLE OF THE book suggests, *Creativity in the Classroom*, by Alane Jordan Starko, provides practical suggestions for teachers interested in how best to incorporate creativity training into the curriculum. The book is divided into two main parts, the first of which deals with theory and research as it pertains to an understanding of this ambiguous construct. What is particularly interesting about the first section is that it is "teacher friendly." It explicates a variety of theories in such a way that the teacher comes away with how such theories provide a foundation for classroom practice. The author points out the concrete implications of what may at first appear to be abstract conclusions. In the second section, a distinct shift is made from theory to practice. Emphasis is placed on stimulating student creativity in content areas, and a description of creative thinking strategies that cut across a variety of domains. The purpose of this review is to highlight what I consider to be the important and interesting aspects of each section to provide "food for thought" for those interested in pursuing the book in more detail.

Starko begins her book by examining the question that researchers often wish to avoid, namely, "What is creativity?" After reviewing a variety of definitions, mainly concerned with describing adult creativity, the author arrives at the conclusion that most definitions revolve around two main concepts: novelty and appropriateness. For the adult, an idea or a product is considered novel if it adds something new to a particular domain. One cannot simply reiterate what is already known and hope to be considered creative. Appropriateness, on the other hand, is determined by "the fit" between a creative work and the cultural expectations of a particular society. The appropriateness of a creative endeavor can vary from one society to another, and in the same society during different historical eras. As long as the creative outcome "meets some goal or criterion," (p. 6) it is usually considered appropriate. Although novelty and appropriateness are two concepts intimately linked to understanding creativity, the author questions how these terms can be effectively applied to children. Do their works have to add something new to a domain? Are they appropriate only if they mesh with societal expectations? The obvious answer to both of these questions is no. Starko describes novelty and appropriateness as they apply to children's creative products and ideas as follows,

> We will consider children's efforts appropriate if they are meaningful, purposeful, or communicative in some way. If students successfully communicate an idea or endeavor to solve a problem, their efforts can be considered appropriate. If they do so in a way that is original, at least to them, we can consider the efforts creative. (p. 7)

This practical definition forms the basis of the concrete suggestions the author provides for enhancing student creativity in the classroom.

As with most books that attempt to provide a comprehensive overview of creativity, *Creativity in the Classroom* describes the latest research and theoretical advances. The "investment theory of creativity" put forth by Sternberg and Lubart (1991, 1993) is discussed, as well as Gardner's (1993) findings pertaining to the biographical factors related to creative productivity in eminent adults. It should be noted, however, that the author does not overlook important findings from the past. A significant part of Chapter 2 is devoted to summarizing a host of theories ranging from Freud's psychoanalytic doctrines to Maslow's distinction between "special talent" and "self-actualizing creativeness."

Before embarking on practical considerations, Starko devotes an entire chapter to what she labels "talent development" and the ideas that underlie this concept. Her humanistic approach to creativity is firmly based on research conducted by Bloom and his colleagues (1985) who recognized that the development of talent can be separated into three relatively distinct phases: 1) the early years, characterized by playful exploration within the domain of choice, 2) the middle years which focus on the technical mastery of principles and techniques within the domain, and 3) the later years, with an emphasis on the individual as a creative producer. This third and final phase represents a radical shift for the student, from a solver of predetermined problems, to one who must find problems in need of solution. While the practical implications of this research may not be readily apparent, Starko does emphasize the need for content and process immersion, before one can hope to solve problems effectively.

More research dealing with the nature of problem finding must be done. Starko provides suggestions for helping students locate interesting problems. She points out that most of the problems students deal with in school have one pre-determined answer, and one pre-determined method for arriving at that answer. A shift needs to occur so that students are allowed to postulate their own problems related to a topic, and then go on to conceive of ways to

solve the problem in an efficient manner. Enabling students to select problems encourages divergent thinking in terms of the problems under consideration, and the solutions that are appropriate.

Amabile's (1989) emphasis on the relationship between creativity and intrinsic motivation is the final element considered by Starko as related to talent development. Simply stated, if a student does not find a problem interesting at a personal level, he or she will not put forth the time and energy needed to develop a meaningful solution. Amabile's research tends to point out that even positive, external motivation tends to suppress creative productivity. Of all the chapters in the book, teachers will most likely find Chapter 5, "Creativity in the Content Areas" to be the most useful. I say this because it provides numerous suggestions for incorporating creativity training into language arts, social studies, science, and math. As an organizing framework, the author points out several key considerations that apply to almost any content area. She emphasizes that creativity revolves around finding, focusing, and solving problems, as well as expressing ideas in unique ways. The student must assume the role of a creative person in a particular field, utilizing both content and methodology, to develop products that address specific problems.

What I liked most about the specific suggestions related to the content areas is that most seemed easy to implement. In fact, without realizing it, many teachers might already be fostering creativity in their classrooms. For example, in language arts Starko recommends the extensive use of writing to stimulate student creativity. It must be writing of a certain type, however, that emphasizes student selected topics and the writing process. With regard to social studies, teachers need to realize that it is not simply a collection of facts to be memorized. One must consider what the historian, geographer, etc. do to develop new theories and products. The big ideas involved in human history, as well as the methodologies used by practicing professionals must be employed.

In addition to specifics related to each content area, general strategies that apply to any domain are provided. Attention is given to the use of inductive teaching (in which students are presented with specific examples that they use to determine underlying principles and concepts), the use of simulation and role playing activities, and the importance of divergent questioning by the teacher. Popular techniques such as brainstorming, synectics, and creative problem solving are also described.

It should be readily apparent that fostering creativity in the curriculum will require creative forms of assessment as well. Traditional testing is simply not an adequate means of evaluating creative ideas and products. Starko calls for the use of ". . . authentic or performance assessment [which] means that students are evaluated on their performance of realistic, exemplary tasks" (p. 282). Such tasks, and the resulting assessment, focus on complex thinking and problem solving skills, are relevant and interesting to the students, and call for the development of an original product or a performance. The use of scoring rubrics is also deemed essential, as well as student self-evaluation.

Not only must assessment be reexamined, but the entire classroom organization as well. The teacher must first develop a sense of "psychological safety" by allowing students to take risks and experiment with new ideas. Students must be allowed to work independently for a part of each day, focusing on topics that make them want to learn. The development of interest centers can be helpful in this respect.

Starko also addresses the volatile topic of ability grouping. She is of the opinion that grouping which focuses on specific talent areas should be utilized to provide for the needs of high ability students. As she states,

> The most reasonable approach to grouping in schools is to avoid debating whether we should group and to decide what grouping arrangements best meet the needs of a given group of students for a particular activity. The effectiveness of rigid, long-term grouping based on ability can be questioned, but flexible, within- or between-class groupings based on particular academic needs is associated with increased achievement. (p. 277)

It is important to note that Starko does not rule out the use of cooperative learning with high ability students, but she does emphasize the need for individual accountability if it is to be effective.

There are numerous issues addressed by *Creativity in the Classroom* that I have not mentioned. Such topics include creativity traits, the use and abuse of creativity tests, and commercial creativity competitions. All are addressed by the author. To reiterate a point mentioned earlier, the greatest strength of this book is its emphasis on practical recommendations and specific techniques for fostering creativity in the classroom. Any teacher desiring to implement creativity into the curriculum will find this book invaluable.

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