Investing in Gifted and Talented Learners: An International Perspective

Edited by Cathrine Froese Klassen and Eleoussa Polyzoi

Selected papers from the 2009 WCGTC World Conference held in Vancouver, Canada

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Selected Papers from the 18th Biennial World Conference

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Introduction: Vision and Provision for Gifted Learners

As an introduction, this article provides a broad framework for rethinking gifted education and delineates some of the cautions that need to be observed in the identification criteria for diverse populations, enrichment programming approaches, and assessment considerations in gifted education. The core material for this volume originated with selected papers submitted to the 18th Biennial World Conference on Gifted and Talented Children, conducted by The World Council for Gifted and Talented Children, in Vancouver, Canada, August 3rd to 7th, 2009.

Prologue

The underlying theme that connects the selected papers is that of investing in gifted children and building human capital. Director of the National Research Center on the Gifted and Talented at the University of Connecticut, Joseph Renzulli, in the prologue, "The Empire Strikes Back: Redefining the Role of Gifted Education in the 21st Century," draws attention to what many have called a crisis in education and contends that methods adopted in recent decades have resulted in student boredom and public dissatisfaction. The remedies lie in an engagement-oriented pedagogy that moves away from rigidly prescribed curricula that have minimized the "sheer joy of discovery" (p. 1). This is particularly relevant for gifted and talented learners, who thrive in environments that provide challenges that meet their individual needs, potential, and interests.

Diverse Populations

While it is widely recognized that there are many students who are benefiting from gifted education initiatives, it is also acknowledged that there are many children whose gifts and talents are hidden or overlooked for a wide variety of reasons, including poverty, lack of opportunity, behavioral and learning challenges, and political constraints associated with immigrant and refugee populations, all of which may cause them to be ignored or serve to mask their potential. Prominent gifted-education scholar, Ken McCluskey, along with Andrea McCluskey, urges, especially in dealing with talented ADHD students, that we "offer a humane, flexible approach to help parents, teachers, and other caregivers turn negatives into positives and identify and nurture the talents of an often-misunderstood population" (p. 11).

Charlene Barva insists that the gifts and talents of high-achieving individuals with learning disabilities (LD) be recognized as part of the spectrum of intellectual diversity and maintains that "early (and accurate) identification of LD, for example, is critical to establishing learning skills and strategies important to [their] future academic success" (p. 25).

A similar case can be made for gifted immigrant and refugee children whose "problems associated with resettlement, such as securing housing, seeking employment, and adjusting to a new culture and language, often take precedence over identifying and providing for [their] educational needs…" (p. 29). Authors Carole Harris, Zenita Cunha Guenther, and Gillian Eriksson, working with minority, immigrant, and refugee populations in the United States, Brazil, and South Africa, respectively, suggest that the existing definitions of giftedness be filtered through a cultural sieve and be reflected in teacher training and programming for these disadvantaged groups. They conclude that "[i]ndeed, the future of the world depends upon mining the talents that, at present, [for these groups] lie below the surface" (p. 36).

Enrichment Approaches

Programming approaches to address the issues of diversity underscore the importance of teacher sensitivity, both in terms of the socio-emotional challenges facing gifted learners, who may be experiencing discrimination from unintentional or intentional disinviting behavior by their teachers, and in terms of providing appropriate, discipline-specific, intellectual

enrichment opportunities. Australian specialist in inclusive education, June Slee, who works with marginalized groups, addresses the issue of teacher attitude toward the gifted. She stresses the importance of teachers and students developing the necessary social and emotional competencies to avert the formation of negative mindsets that are detrimental to the full realization of their potential. To a significant degree, such competencies can be cultivated incidentally through rich, stimulating enrichment activities that target students' distinct proclivities and talents.

Errol Moore notes the by-products of the Music Heartland Project undertaken in New Zealand. The results of this comprehensive project show that extended, creative musical projects appear to accelerate the growth of mature artistic understandings, personal efficacy, and unique musicianship in gifted children.

Not exclusive to the arts discipline, ambitious extra-curricular school projects have been designed in the scientific field, not the least of these being the School Lab Oberpfaffenhofen, in southern Germany, under the headship of Dieter Hausamann. This lab is operated by The German Aerospace Centre, the national research center for aeronautics and space, with the objective of attracting students to science and technology. Like the previous two enrichment projects, this hands-on lab program focuses, first, on teacher education. These advanced labs are specifically designed for highly talented secondary-school students and require a high level of teacher expertise in dealing with topics such as environmental spectroscopy, meteorology, satellite navigation, robotics, flight-team simulation, and mobile rocket research.

Halfway around the world, in Mexico, a three-year pilot project to support talented primary and secondary students in science and mathematics was initiated in 2008. This Adopt a Talent Program, known by its Spanish acronym PAUTA, and PAUTAmor in the state of Morelos, consists of intensive workshops for science teachers, who are trained in both the specialized content and in pedagogy that moves away from the rigidly prescribed, conventional approach. National Coordinator of PAUTA, Janet Paul de Verjovsky, and her team developed and delivered a series of teacher workshops, emphasizing creativity, scientific skills, and positive dispositions towards the discipline, and provided teachers with instruments to identify optimal secondary-school candidates for future student workshops to take place in the following two years.

Assessment Considerations

The changes necessary for reforming the education system involves the key elements of redesigning instruction and teacher professional development. Together, however, these two strategies are still not sufficient to effect the change that the preceding authors have promoted. Solidifying such change also requires monitoring the effectiveness of interventions and ensuring their success. Assessment must be targeted and continuous at every stage. Dorit Neria and Miriam Amit, in developing the Kidumatica program in southern Israel, advocate for equity in the student-selection process by considering inclusive criteria, regardless of the children's culture and socio-economic background. Kidumatica, a mathematics club established in 1998, was designed to cultivate sophisticated and creative mathematical thinking in youth exhibiting mathematical aptitude. While the program was created for the benefit of its participants, the originators of the club, in this paper, are concerned about the selection process and ensuring that the "right" students get into the program—irrespective of their culture, background, and test-taking ability.

Although appropriate student assessment is a critical feature of successful innovations, the program, itself, must be subjected to evaluation. Eleoussa Polyzoi, Cathrine Froese Klassen, Jeff Babb, Stephanos Gialamas, and Christiana Perakis Evloyias evaluated the High Performing Student (HPS) Program at ACS Athens, an accredited Kindergarten to Grade 12 International Baccalaureate school in Greece. Adapting Williams' Performance Levels of a School Program Survey (PLSPS), the authors investigated the teachers' perceptions of the school's performance in six domains: intellectual, leadership, creative-thinking, visual and performing arts, psychomotor, and affective abilities. The assessment tool proved effective in highlighting the multiple strengths of the HPS Program and has provided direction for further program development and consolidation.

Acceleration and enrichment programs conducted outside the school setting may be more challenging to evaluate than those established on school campuses; nevertheless, university lecturer, Martina Endepohls-Ulpe, undertook such a task in the assessment of the "Frühstudium"[1] program at the University of Koblenz-Landau, one of the program options offered for students from secondary schools at some German universities. Students participate in selected university courses while continuing their studies at school, thus saving time in their future studies, while enriching their knowledge in several fields. Based largely on data gathered from various questionnaires, the evaluation centered on the benefits of the program, the promotion of the program at the school level, and the degree of support for the program by the secondary-school teachers. The results indicated that while "Frühstudium" is worthwhile as an enrichment opportunity for students, it has aspects that still require improvement.

Reforming instruction, improving teacher professional development, and monitoring the effectiveness of interventions all still presume a sound and flawless selection process of students—the fundamental basis of any program for the gifted and talented. Whether it is child refugees in Brazil or South Africa, immigrants in Israel, the disadvantaged in America, the at-risk in Canada, or the "excluded" in Australia, equity in the student-selection process must consider inclusive criteria, based on the child's culture and socio-economic background. This, however, poses an inherent difficulty, as language is often a factor in such cases. Professor Emeritus of psychology at George Mason University, Jack Naglieri, in his design of a nonverbal ability test for identifying gifted children (the NNAT2), has made a pivotal contribution to the field of gifted education in this respect. With the use of research-supported, nonverbal questions, the test can ensure that educators assess children fairly, especially those from diverse cultural and linguistic backgrounds, and include them in programs for the gifted. Naglieri's innovative test has arisen from his conviction that "[r]ecognition of the extraordinary value that highly intelligent children have for the future of any country cannot be overstated" (p. 117).

Conclusion

With elemental, structural change in the educational system, equity, inclusion, improved identification instruments, innovative programs, and the means to assess and improve them, we can convert our liabilities into assets, our losses into profits, and reap the desired gains in human capital, as we turn our vision into unparalleled provision in gifted education around the world.

Cathrine Froese Klassen and
Eleoussa Polyzoi
Editors
April, 2011

[1] "Frühstudium" means going to university early.

Prologue. The Empire Strikes Back: Redefining the Role of Gifted Education in the 21st Century

Joseph S. Renzulli

Abstract

Many national education leaders and politicians characterize the current challenges facing our schools as a crisis in the American education system. The methods that have been adopted, in recent decades, to address the achievement gap that exists between advantaged and disadvantaged students have produced flat-line academic growth among the most able students, rampant boredom, and public dissatisfaction with an education system that is immune to anything but the superficial trappings of change. Reform initiatives in the educational system have consisted of structural changes, primarily, and have not produced the anticipated positive results. Current learning theory indicates that student engagement and an inquiry-based, inductive pedagogy are the keys to higher achievement. To effect real change will require a recognition of and attention to the achievement-gap problem and a meaningful application of rapidly advancing technology. While technology has radically changed everyday life, in education, the applications are little more than electronic functions of the drill-and-practice forms of teaching. An engagement-oriented pedagogy—beyond online worksheets and online encyclopedias—must be able to address students' strengths, match resources to students' personal profiles through imaginative uses of technology, and provide appropriate teacher training. Students need to learn not only the basic skills but also the technological skills of inquiry that will create the motivation and engagement largely lost by rigidly prescribed curriculum and learning that has minimized the sheer joy of discovery.

The Three-Trillion Dollar Misunderstanding

How did we get into this mess? Why hasn't the estimated three *trillion* dollars spent on school reform since the 1960s made more of an impact (Miami-Dade County Public Schools, 2008)? We've tried just about everything—smaller schools, year-round schools, longer school days, single-sex classes, after-school mentoring, school uniforms, vouchers, charter schools, school-business partnerships, merit pay for teachers, paying students (and even parents) for higher scores, private management companies and for-profit schools, takeovers by mayors and state departments of education, distributive leadership, site-based management, data-based decision making—and just about every scheme imaginable into which someone can insert the words "standards-based," "accountability," or "brain-based." Additionally, every buzzword in a profession that already thrives on too much jargon, eventually, creeps into the repertoire of policymakers, shifting the focus off student needs and appropriate pedagogy for meeting these needs and onto inflexible bureaucratic solutions that ignore individual learning needs. All of these suggested solutions, usually launched with much fanfare, endless and usually mind-numbing workshops for teachers, and little, if any, research or track record for success, have been offered as silver bullets that can "save" our schools and raise the test scores of our lowest-achieving students. The sad fact is that these schemes simply have not worked!

What do all of these reform initiatives have in common? Most are built on structural changes, designed by well-intentioned policy-makers or agencies (usually far removed from the classroom), and calculated to have an impact on entire school districts, states, or even the nation. More important, however, is that these structural changes have drawn mainly upon (and even forced) a low-level pedagogy that is highly prescriptive and didactic—approaches to learning that emphasize the accumulation, storage, and retrieval of information that will show up on the next round of standardized tests. We have become so obsessed with content standards and test scores that assess mainly memory that we have lost sight of the most important outcomes of schooling—thinking, reasoning, creativity, and problem-solving skills that allow young people to *use* the information driven by content standards in interesting and engaging ways.

Are There Reasonable and Practical Alternatives?

Over the past decade, the mainstream diet for the majority of low-income and struggling learners has been dominated by a remedial and compensatory pedagogy that has not diminished the achievement gap, but, as research has shown, has actually contributed to its perpetuation (Ford, Howard, Harris & Tyson, 2000; American Educational Research Association (AERA), 2004). Many of these programs are designed to find out what a child can't do, doesn't like to do, and sees no reason for doing, and, then, teachers are told to spend the majority of classroom time beating him or her to death with it. This pedagogy of prescription and practice simply hasn't worked! Documentation of this failure is plainly evident in one national report after another (National Assessment of Educational Progress (NAEP), 2005; Center on Education Policy (CEP), 2008), and, yet, we continue our search for yet another quick fix through structural rearrangements of schools, rather than through alternative pedagogical modifications that deal directly with the enjoyment, engagement, and enthusiasm that result from a more inductive and investigative brand of learning. The solutions offered, by whatever new names we give them (e.g., competency-based, outcomes-based, standards-based), are always reiterations of the same pedagogy—the same drill-and-practice model for learning that simply has not worked. Furthermore, the universal criterion for accountability always remains the same, again with new names given to the same old achievement tests that mainly measure memorized factual information. It is the singular reliance on these tests for accountability, at the exclusion of other important performance-based outcomes, which forces the pedagogy of prescription, a pedagogy that drives good teachers from their profession and that lobotomizes those teachers who remain. Is it any wonder that some of our very best teachers are fleeing urban schools where prescription has become the almost universally practiced pedagogy?

Learning Theory 101: The Short Course

All learning, from diapers to doctorate, exists on a continuum ranging from deductive, didactic, and prescriptive, on the one hand, to inductive, investigative, and inquiry-oriented, on the other. Students who have not achieved are subjected to endless amounts of repetitious practice material, guided by the didactic model. Then, when scores do not improve, we often think that the obvious solution is simply to redouble our efforts with what has been popularly called a "drill-and-kill" approach to learning: an approach that has turned many of our schools into joyless places that promote mind-numbing boredom, lack of genuine student and teacher engagement, absenteeism, increased dropout rates, and other byproducts of over-dependence on mechanized learning. Proponents of popular, but highly prescriptive, reading programs frequently boast about test-score gains, but the endless drill and practice only prepare students for taking tests correlated to the worksheets *rather than actually learning to read*, let alone enjoying reading and making it an important part of their lives (Reis et al., 2004). Many students subjected to over-prescription never pick up a book on their own, a sad commentary on how we have messed up the teaching of reading by turning it into the teaching of test taking.

With this kind of a track record, shouldn't we be smart enough to blend the benefits of an inductive and investigative pedagogy into a system that has mainly failed our at-risk populations, and shouldn't we also be smart enough to note the rising dissatisfaction of middle-class parents whose children are also

becoming subjected to the same drill-oriented, test-prep curriculum? One high-school student recently described her Advanced Placement (AP) courses as "…nothing more than *high-speed* test prep." Two Ohio students, from an affluent school district, wrote in a letter to their governor, "Schools once renowned for their unique learning programs are becoming nothing more than soul-less factories that churn out those that can excel at standardized tests, while discarding those who can't." Is it any wonder that a parent from a high-status community speculated that there was, indeed, a sinister conspiracy afoot to close the achievement gap, and the conspiracy consisted of dragging down the scores of high-achieving students!

Research on the role of student engagement is clear and unequivocal. High engagement results in higher achievement, improved self-concept and self-efficacy, and more favorable attitudes toward school and learning (Herrington, Oliver & Reeves, 2002; Ainley, 1993). There is a strong body of research that points out the crucial difference between time spent and time engaged in school activities. In the recently published international PISA study (Organization for Economic Cooperation and Development (OECD), 2007), the single criterion that distinguished nations with the highest and lowest levels of student achievement was the degree to which students were engaged in their studies. This finding took into account demographic factors, such as ethnicity and the socio-economic differences among the groups studied.

The Most Important Outcomes of Education

The pedagogy of prescription has, perhaps unintentionally, but, nonetheless, clearly demonstrated that it has withheld from low-income children the exact kinds of thinking skills that are necessary for successful participation in today's higher education and our growing global economy. The word "perhaps" is used because I don't think there is a clandestine conspiracy on the parts of policymakers and the textbook and testing cartel to keep low-income children poorly educated, thereby, limiting access to economic mobility. Make no mistake—neglect, mismanagement, and a lack of courage to challenge unsuccessful practices is the equivalent of a *bona fide* conspiracy.

If failed approaches have continued to produce dismal results, perhaps, it is time to examine a counterintuitive approach based on a pedagogy that is the polar opposite of that used by Pavlov to train his dogs! Accountability for the truly educated mind in today's knowledge-driven economy should, first and foremost, attend to students' ability to perform the following operations:

- plan a task and consider alternatives;
- monitor one's understanding and the need for additional information;
- identify patterns, relationships, and discrepancies in information;
- generate *reasonable* arguments, explanations, hypotheses, and ideas, using appropriate information sources, vocabulary, and concepts;
- draw comparisons and analogies to other problems;
- formulate meaningful questions;
- apply and transform factual information into usable knowledge;
- rapidly and efficiently access just-in-time information and selectively extract meaning from that information;
- extend one's thinking beyond the information given;
- detect bias, make comparisons, draw conclusions, and predict outcomes;
- apportion time, schedules, and resources;
- apply knowledge and problem-solving strategies to real-world problems;
- work effectively with others;
- communicate effectively in different genres, languages, and formats;
- derive enjoyment from active engagement in the act of learning; and
- creatively solve problems and produce new ideas.

These are the student-engagement skills that grow young minds, promote genuine enthusiasm for learning, and, as our research has shown, increase achievement (Renzulli & Reis, 1985). Although student engagement has been defined in many ways, I view it as

the infectious enthusiasm that students display when working on something that is of personal interest in an inductive and investigative manner. It takes into account student learning styles and preferred modes of expression, as well as interests and levels of knowledge in an area of study. It is through these highly engaging approaches that students are motivated to improve basic skills and bring their work to increasingly higher levels of perfection. True engagement results from learning activities that challenge young people to "stretch" beyond their current comfort level, activities that are based on resources and methods of inquiry that are qualitatively different from excessive practice. Our research has shown that teaching students to think critically, analytically, and creatively actually improves plain, old-fashioned achievement (Renzulli & Reis, 1997; Renzulli, 2008). Our guiding principle in this kind of learning is simply "No Child Left Bored!"

Moreover, the key role of engagement cannot be over-emphasized for students whose achievement has been hampered by limited experiences, resources, or supports. In a longitudinal study comparing time spent versus time engaged on the achievement of at-risk students, conventional instructional practices were found to be responsible for students' increased risk of academic delay (Greenwood, 1991). Another study reported important differences in achievement outcomes favoring engaged over disengaged students of similar ability (Greenwood, 1991). Hours of drilling on American College Testing (ACT) questions in Chicago high schools may be hurting, not helping, students' scores on the college-admission exam, according to a study released recently by a university-based research organization (Samuels, 2008). The Consortium on Chicago School Research (2008), based at the University of Chicago, found, in their 2005 report, that teachers in the 409,000-student district would spend about one month of instructional time on ACT practice in the core classes offered during the junior year. The ACT scores, however, were lower in schools where Grade 11 teachers reported spending 40% of their time on ACT-test preparation, compared to schools where teachers devoted less than 20% of their class time to this activity. The boredom factor was cited as an explanation for this seemingly counterintuitive finding.

Although focusing on the engagement-oriented operations, listed above, may be counterintuitive to the "more-practice-is-better" pedagogy, we need look only at the track record of compensatory learning models to realize that we have been banging our collective heads against the wall and following an endless parade of failed reforms that have been forced through the schoolhouse door by people far removed from classrooms, schools, and local-level decision makers.

How did we allow committees of bureaucrats to write endless lists of content standards without equal or even greater attention to standards for good thinking and the kinds of authentic assessment that shows how good thinking is demonstrated? How did we allow textbook companies to stuff their books with increasingly monotonous practice materials that prescribe and dictate what teachers must do every minute of the school day? And how did we give the test publishers the gun that is held against the collective heads of every superintendent, principal, teacher, and student in the nation? Even state education commissioners, some of whom are responsible for buying into various silver-bullet solutions, are now being "held accountable" for low scores in their states.

If we are going to break the stranglehold that the perpetrators of failed practices have had on our schools and the lives of children, we need some leaders at all levels—federal, state, and local—courageous enough to explore bolder and more innovative alternatives that will provide all students with highly enriched learning opportunities typical of those in the nation's very best public and private schools. This is not to say that we should abandon a strong curriculum that focuses on basic competencies, nor should we forget to demand accountability data to evaluate returns on investment for alternate approaches to addressing the problem. We need to move the focus away from memorizing content and toward the kinds of thinking skills or operations mentioned earlier. We also need to develop accountability procedures (not just tests) that show us how well students are learning to *apply* their thinking to authentic problem-solving situations. This kind of accountability may not put the bubble-sheet companies out of business, but it will help force the issue of building a richer school pedagogy.

We also need to infuse the curriculum with a series of motivationally rich experiences that promote student engagement, enjoyment, and a genuine enthusiasm for learning. Common sense and our own experience tell us that we always do a better job when we are working on something in which we are personally engaged—something that we are really "into" and that we truly enjoy. How many *un*engaged students have you seen on the school newspaper staff, the basketball team, the chess club, the debate team, or the concert choir? Their engagement occurs because these students have some choice in the area in which they will participate; they interact in a real-world, goal-oriented environment with other like-minded students interested in developing expertise in their chosen area; they use authentic problem-solving, interpersonal, and creative strategies; they produce a product, service, or performance that is evidence of the level and quality of their work; and their work is brought to bear on one or more intended audiences other than, or at least in addition to, the teacher (Renzulli & Reis, 1985). The engagement that results from these kinds of experiences exemplifies the best way to approach joyful and engaging learning, one that differs completely from the prescriptive and remedial education approach to learning that is common in low-income classrooms.

Is There a Way to Make Real Change Rather than the Appearance of Change?

Recognition of the achievement-gap problem and the effect that failed solutions have had on schools that serve all of our young people has resulted in some very predictable activity. The usual national commissions and new rounds of federal, state, and foundation reports calling for "bolder and broader approaches" have, at least, recognized the existence of the crisis facing our schools, but we must be cautious of looking for approaches that emphasize the same structural solutions without primary consideration to the pedagogy that is at the core of any sustentative changes in learning. We must also be cautious about seeking solutions from the same people and practices that caused these problems in the first place. Requiring all students to take *x* number of courses, raising passionate calls for more teacher and administrator training, demanding a more rigorous standards-based curriculum, extending the regular school day and year, providing tutoring and homework helpers, and conducting summer school will not bring about sustainable change unless we change *how* teaching is done.

Three Strategies for Creating a 21st-Century Pedagogy

To a large degree, we have become what our technology has made us. We began communicating more effectively because of inventions, such as the telegraph, the telephone, and the Internet, and because travel became faster and more efficient with the inventions of the steam engine, the airplane, and jet engines. In his book, *The Power Makers: Steam, Electricity, and the Men Who Invented Modern America* (Klein, 2008), Klein documents the well-known, economic principle that supply creates its own demand. Education changed dramatically when the technology evolved from books that only families and schoolmasters had in hand to textbooks from which all students could learn simultaneously. When schools gained the technology of copy machines, easily reproducible workbooks and practice materials became a mainstay of the learning process. This technology has driven both what and how young people have learned for most of the past and present century. Students memorize factual material and engage in endless practice simply because such material is available. Supply creates its own demand!

Almost every area of modern life has made imaginative uses of technology, while, in education, we have settled for electronic applications of the same old technology that did not differ pedagogically from standard drill-and-practice forms of teaching (e.g., online worksheets). These early generations of educational technology may have given teachers some extra "helpers," but, because they were based on a knowledge-acquisition pedagogy, the skills that students need for success in the 21st century are still only by-products of present-day models of teaching and learning.

How can we bring about the changes in the engagement-oriented pedagogy necessary to turn things around? Although I will not argue that technology without planned teacher involvement and technology-savvy teachers is the answer to our prayers, we now have the next generation of education technology that

can give teachers the tools to do several important things to promote high-engagement teaching and learning. We must, however, be careful not to use this technology to recreate electronic forms of the same old pedagogy upon which we are trying to improve. This technology goes beyond the online worksheets, electronic encyclopedias, and online courses that were the earliest applications of technology for classroom use.

Although it may sound like a cliché, the advent of the Internet and easy access to most of the world's knowledge by young people is literally changing the time-honored learning theories that have guided curriculum and instruction for several centuries. Teachers and textbooks are no longer the gatekeepers of knowledge, and the old curriculum paradigm that consisted mainly of to-be-presented knowledge is giving way to, what I call, just-in-time (JIT) knowledge—the knowledge that students seek out when it is necessary to solve a problem, whether posed by the teacher or self-selected by a student (or small group) due to personal interest. Students will obviously need to learn the basic skills of the three Rs, but they will also need to learn technological skills of inquiry in order to make efficient use of JIT knowledge. Among these skills is the ability to

- identify trustworthy and useful information,
- manage overabundant information selectively,
- organize, classify, and evaluate information,
- conduct self-assessments of web-based information,
- use relevant information to advance the quality of one's work, and
- communicate information effectively in various genres and modes of expression.

This use of JIT knowledge is the paradigm that is available to all young people, and it will create the motivation and engagement that has largely been lost by a to-be-presented curriculum and a brand of learning that minimized the sheer joy of finding out things on one's own. So, let us now look at three applications of this new generation of education technology to modern-day learning.

Assessment of Student Strengths

The first innovative use of this next-generation technology is that teachers can now get a comprehensive look at all the major characteristics of their students, characteristics that go beyond simply knowing about their standardized achievement test standings. Using a computer-generated student profile, developed at the University of Connecticut, we are able to provide information quickly and easily about student interests, learning styles, and preferred modes of expression, as well as about student perceptions of their strengths in the traditional, academic subject areas (Reis & Renzulli, 2008). The simple assumption underlying the use of this technology-generated profile is that the more teachers know about these learner dimensions, the better able they will be to make decisions about what materials and activities have the highest potential for engaging the learner.

Matching Resources to Student Profiles

Although differentiation is an important, contemporary goal of much of today's efforts to make learning more meaningful for young people, the sad fact is that most teachers simply do not have the time to seek out the resources that can accommodate the varied learning needs of an increasingly diverse school population. The second way technology can affect pedagogy is by giving teachers easy access to the wealth of enrichment and engagement-oriented material that is available through the Internet and through materials and activities that have been purposefully selected and placed into easily assessable databases. Now, let's examine the "magic" of combining these two uses of technology. Through advanced programming techniques, a search engine can examine thousands of multiply classified,[1] high-engagement resources and match these resources to information about learner characteristics revealed in student profiles. This tool provides teachers with the means for true differentiation based on individual student profiles, with the computer doing the heavy lifting! In view of the number and diversity of young people that teachers must

[1] Examples include subject areas, reading level, state standards, interests, learning styles, and expression modes.

deal with every day, it would be impossible to achieve this kind of personalized learning without the use of technology. What is even more important is that the easy availability of highly engaging resources, in combination with the matching capability of the technology, "forces" the kind of engagement-oriented pedagogy with which we are trying to infuse the curriculum.

Teacher Training

The recommendation is to reexamine the ways that we train teachers, especially already employed teachers who have not had access to the technology courses now routinely available in most undergraduate teacher-training programs. Research shows that most school-based professional development that is occasional or short-term has little or no effect on teachers' classroom behaviors, and most teachers can tell their own horror stories about sitting through endless hours of "spray-and-pray" workshops. Never-ending lists of glittering generalities, flashy slide shows, flavor-of-the-month innovations, and strategies with no research support are paraded out by seductive speakers. I have no argument with a certain amount of professional development in both general and content-specific teaching strategies. All teachers should be constantly improving their subject-matter competencies, but the focus of professional development in a technology-driven pedagogy should be on strategies that allow teachers to help young people master the already-mentioned technological skills of inquiry. The acquisition and application of these skills will turn our teachers into the proverbial "guides-on-the-side" rather than simply traditional disseminators of information, which have characterized so much of our education system in pre-technology approaches to learning. This transformed role of teachers and approaches to instruction will bring about the sought-after differentiation and changes in engagement and motivation that have eluded us in reform efforts thus far.

National Resolve and Bold Action Needed

Many national education leaders and politicians characterize the current challenges facing our schools as a crisis in the American education system. It will not be easy to turn around a school system whose leaders have made massive financial and policy investments in one particular brand of learning, nor will it be easy to circumvent the powerful influence of the textbook and test-publishing industries that have thrived on a prescriptive curriculum and standardized-test-driven approaches to accountability. However, a gentle and evolutionary, rather than revolutionary, approach to school reform is possible if we begin to take advantage of the remarkable advances that have taken place in information technology, advances that have brought within reach the equivalent of a dozen teaching assistants in every classroom, all day, every day. This technology now makes it possible to assess students' interests, learning styles, and preferred modes of expressing themselves quickly and easily. What formerly took teachers weeks or even months to learn about student strengths can now be assessed in less than an hour, through computer-generated profiles. Powerful search engines can examine thousands of high-end learning resources that are matched to individual student profiles. True differentiation, much talked about but seldom achieved, can take place if we can let the technology do the hard work of finding and matching resources that are engagement-oriented rather than practice-oriented.

Leon Lederman, the Nobel Prize winning physicist, recently said, "Once upon a time, America sheltered an Einstein, went to the Moon, and gave the world the laser, electronic computer, nylon stockings, television, and the cure for polio. Today, we are in the process, albeit unwittingly, of abandoning this leadership role" (Berger, 1994). Every school and classroom in this country has in it young people who are capable of continuing this remarkable tradition of discovery and invention. The tradition, however, will not survive without a national resolve and bold action on the parts of policymakers at all levels to change the pedagogy that drives instruction in classrooms that serve all of our young people. You don't produce future scientists and inventors, such as Jonas Salk, George Washington Carver, Thomas Edison, Sally Ride, or Marie Curie, by forcing them to learn in a one-size-fits-all, drill-and-practice curriculum or by spending hundreds of hours preparing for state achievement tests. You don't develop the potential of thousands of Leonard Bernsteins, Aretha Franklins, or Miles Davises without providing them with highly engaging opportunities in

music that typically are only available in out-of-school opportunities and mainly to the children of the well-to-do. You don't develop world leaders, such as Martin Luther King, Golda Meir, Eleanor Roosevelt, and Mahatma Gandhi, by having them memorize endless lists of facts that today's technology-savvy kids can find when they need them with a few clicks of the computer keyboard. You also don't produce the next generation of talented writers, such as Rachel Carson, Langston Hughes, and Tennessee Williams, by having them spend endless hours completing mindless worksheets in preparation for the next round of state mastery tests. It is only through expanding our pedagogy, engaging all students, and making imaginative uses of technology that America's schools will be able truly to engage our children and develop their creative potential, as well as their love of learning.

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PART 1: DIVERSE POPULATIONS

1. Meeting the Socio-Emotional Needs of Talented ADHD Students

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Abstract

As the term, itself, indicates, ADHD is typically viewed as a disorder and, certainly, hyperactive and inattentive children present some interesting challenges at home, at school, and in the community. This article highlights many of the problems associated with ADHD and acknowledges that the prognosis for condition is, sometimes, far from benign; however, an attempt is made to put a more positive spin on things by recasting reality and pointing to the creative strengths that frequently go hand in hand with it. To illustrate, with proper support, might not stubborn behavior in childhood grow into determination in adulthood? Might not inattentive daydreaming turn into creative invention, overactivity into productive energy, and off-the-wall behavior into outside-the-box thinking? The overall intent is to offer a humane, flexible approach to help parents, teachers, and other caregivers turn negatives into positives and identify and nurture the talents of an often-misunderstood population.

Well over a decade ago, it was observed that ADHD (attention-deficit hyperactivity disorder) had become the "disorder du jour" in North America (Armstrong, 1996), and, judging from the abundance of current articles, books, DVDs, and training sessions on the topic, society's obsession with "hyperactivity" remains unabated. Certainly, children, youth, and adults continue to be referred, in extremely large numbers, to school resource centers, psychological clinics, and medical facilities for diagnosis and treatment of the condition.

It is not the purpose here to delve unnecessarily into questions of definition and treatment. These issues have been dealt with in comprehensive fashion elsewhere (American Psychiatric Association, 1994; Barkley, 1998, 2000; Goldstein & Goldstein, 1998; Rief, 2005; Weyandt, 2001). In general terms, though, we will touch on the highly visible primary characteristics of ADHD (e.g., excitability, overactivity, impulsivity, disorganization, distractibility, and inattention) and the more covert secondary ones (e.g., learning problems, emotional vulnerability, low self-concept, peer relationship issues, and familial distress).

The Downside

Longitudinal research has shown that a disproportionate number of youngsters with ADHD typically run into significant problems as they grow into adolescence and adulthood (Lambert, 1988; Weiss & Hechtman, 1993). Indeed, as Whalen and Henker (1991) have noted, the prognosis for hyperactivity is "far from benign." It really isn't surprising that ADHDers—many of whom have difficulty following rules, staying on task, and behaving appropriately—encounter problems at home, at school, and in the community. Due, in large part, to their impulsivity and lack of social judgment, they also often have a tough time making and keeping friends. Melmed (2001) has asserted that, because of school failure, loneliness, isolation, and a virtual ongoing assault on self-image, ADHD children are usually very unhappy individuals.

Amber of Yesteryear

At a personal level, we've lived it. Our daughter, Amber, who has become a poster child for ADHD in our part of the world, was troubled and troubling throughout her childhood and beyond. To summarize succinctly, one principal told us she was "the worst child" who ever attended school in his district. Quite simply, she behaved in impulsive and dangerous ways, got into everything, regularly lost even her most prized possessions, lied in patently ridiculous fashion, seemingly lacked the ability to concentrate, and consistently ran afoul of her peers. Before she even reached fourth grade, Amber had, at one time or another, been described by a variety of professionals as functionally illiterate, learning disabled, predelinquent, and schizophrenic. Not that we were on a Holy Grail-type quest for diagnosis, but the label of ADHD was conferred on her as she neared the end of her time in elementary school.

To make things come alive, we'll share a couple of stories we've related earlier (McCluskey & McCluskey, 2001). The first illustrates the social-emotional impact of the disorder:

> As she grew (and continued to run into problems at home, at school, and with her friends), Amber began to realize how different she was. In Grade 3, there was an episode that tore at our heartstrings. We were called to school, yet again, because Amber had been involved in an incident on the playground: She was caught kissing an ugly stray dog. We were thoroughly put out by her behavior, and asked, in our meeting with the principal, "Why Amber? Why this final ignominy? Why were you kissing the stupid dog?" Her response broke our hearts: "It's my only friend!" (p. 66)

The second example emphasizes the academic concerns, (which, of course, also affect emotional outlook):

> In that fifth-grade year, it was highlighted to us that Amber's basic skills were far from what they should have been. One day, before heading off for school, she took the time to leave a note for her older brother, who was sick that particular morning. Amber's goal had been to compose a kind, compassionate note, for she can be very considerate at times. She had attempted to write, "Get well soon, Chris. From Sweetie Pie." Now, where she got off calling herself "Sweetie Pie" we don't know, but that was her intent. Unfortunately, Amber misspelled "sweetie," and she also misspelled "pie" (as "piy"). Further, exhibiting her usual poor penmanship, she messed up the "y." The net result was that we ran downstairs to the kitchen table and picked up a note that read, "Get well soon, Chris. From Sweaty Pig." While such an effort might be humorous at home, we can appreciate that receiving work of this caliber could be distressing for teachers. It was embarrassing for us, as parents. Amber was again ripping our reputation to shreds in the educational community. (p. 60)

Disorder or Gift?

Nonetheless, we slowly learned to resist dwelling too much on Amber's problems, and, instead, decided to do our best to put a positive spin on things and help nurture whatever abilities she might possess. Bloom (1985) has stated that there are three central ingredients in developing talent in childhood: early recognition, nurturance, and motivation. In other words, whether the potential of young people is maximized or not depends very much on the identification of their talents by parents, educators, and other caregivers, on the opportunity to practice and build upon their strengths, and on somehow inspiring them to engage in such practice. We didn't want Amber to miss out on any of these elements.

Learning Disabilities Associations across the continent distribute material which suggests that Beethoven, Mozart, Verne, Einstein, Churchill, and other figures of note all displayed marked learning or attention problems. Contemporary entertainers have been identified as well: witness Henry Winkler, Whoopi Goldberg, Robin Williams, Jim Carey, and so on. All these uniquely talented individuals have overcome personal challenges to make their mark in the world. Various biographers have noted that Leonardo da Vinci would frequently lose concentration and bounce from task to task, that Robert Frost and Frank Lloyd Wright were unfocused daydreamers, that Thomas Edison was described by one teacher as "addled," that Nikola Tesla was highly distractible and accident-prone, and that Samuel Johnson lived in a state of perpetual motion (Cramond, 1995). In the world of more formal academe, as well, researchers have observed

that many of the traits of ADHD children are also evident in those who are deemed gifted, talented, or creative (Baum, Olenchak, & Owen, 1998; Cramond, 1994, 1995; Webb & Latimer, 1993). Many hyperactive young people exhibit keen powers of observation, lively humor, originality, spontaneity, and sensitivity—characteristics also associated with creativity. Csikszentmihalyi's (1990) conceptualization of "flow" as the intense, totally absorbing concentration shown by some gifted and talented people has a parallel in the "hyperfocus" of certain ADHDers described by Hallowell and Ratey (1994). Other similarities include excitability, sensation seeking, sensitivity to environmental stimulation, a tendency toward depression, and spontaneity in problem solving (Cramond, 1994, 1995).

Along the same lines, Rimm (1995) has recognized that some underachieving ADHD children can be extremely talented. Hartmann (1995, 1997) and Nadeau (1996, 1997) have presented several success stories illustrating how ADHDers of various ages can embrace and use the condition to their advantage and, in effect, live life in a stimulating "fast forward" style. In short, some individuals have demonstrated the ability to put the positive side of ADHD to good use at home, at school, and in the workplace (Hartmann, 1997; Nadeau, 1997; Solden, 1995). Nadeau points out that medication, counseling, and other treatments may, at times, be valuable in helping the process along.

Although he acknowledges the problems associated with ADHD, Hallowell has made it clear that he resents the term "disorder." In his words, there are

> advantages to having it...such as high energy, intuitiveness, creativity, and enthusiasm, and they are completely overlooked by the 'disorder' model. The disorder didn't keep me from becoming a doctor, and it hasn't kept many others from far greater success in a wide variety of fields. (Hallowell & Ratey, 1994, p. xi)

Kaufmann, Kalbfleisch, and Castellanos (2000, p. 12) have echoed that thought: "ADHD is not a defect that must be 'cured'.... [T]he condition can not only inhibit, but enhance the realization of gifts and talents." It goes without saying that the social context makes a tremendous difference. Back in the era of the hunters and gatherers, for example, those with hyperactivity might well have had an advantage. For today's ADHD child in a traditional school setting, however, "disorder" might well be quite an accurate descriptor.

Overlooking Talented ADHDers

If truth be told, we are unconvinced that ADHD necessarily goes hand in hand with giftedness, talent, or creativity. The literature in this regard, while interesting, is speculative and inconclusive. Besides, we're not overly worried about any formal connection or comorbidity.

The concern for us is that the symptoms of ADHD may, in many cases, mask underlying talent. The fact that we would expect at least the same proportion of gifted children within the ranks of ADHDers as in the normal population means that there are a significant number of hyperactive people around whose talents have likely gone unnoticed. Preoccupied as they often are with problems of basic survival, it is likely that parents and teachers of ADHD children (to say nothing of the youngsters themselves) rarely have the time or inclination to consider talent and its development. They are probably much more worried about getting through all their day-to-day trials and tribulations. Also, few diagnosticians think about uncovering creativity when assessing youngsters who are encountering difficulties in school (Cramond, 1995). All things considered, it may well be that ADHDers are less likely to have their talents identified and nurtured than most other children.

Kaufmann, Kalbfleisch, and Castellanos (2000, p. 11) have argued that accepting the fact that ADHD and giftedness can co-exist (and examining the interaction between the two conditions) "is a more productive way of looking at the problem than agonizing about a false dichotomy." In some cases, gifts and talents may be enhanced by the presence of ADHD. With hyperactive students, part of the challenge is to help them cope with the downside of their condition, while at the same time employing the upside as a foundation for talent development.

Unhappily, the necessary supports, encouragement, and opportunity aren't always available, and when troubled youth, including ADHDers with unique potential, are blocked from legitimate paths to goal attainment, they sometimes look for an outlet for their talents in socially unacceptable directions. By way of

example, misdirected talent can help wayward young people become "successful" members of youth gangs (Baker, McCluskey, & McCluskey, 2003).

Negatives Can Become Positives

For the past 20 years, we've worked directly with at-risk youth and adults who have somehow "fallen through the cracks." To be more precise, employing a combination of Creative Problem Solving (Treffinger, Isaksen, & Stead-Dorval, 2006) and mentoring (McCluskey & Torrance, 2003) has helped many of these marginalized individuals learn to make more productive educational, career, and life decisions. Outcomes have been well documented in terms of significantly reducing recidivism among Native-Canadian inmates in the *Second Chance* project (Place, McCluskey, McCluskey, & Treffinger, 2000), reclaiming relationship-resistant, high-school dropouts in *Lost Prizes* (McCluskey, Baker, & McCluskey, 2005; McCluskey, Baker, O'Hagan, & Treffinger, 1998); and increasing graduation and employment rates among disenfranchised Aboriginal teens in *Northern Lights* (McCluskey, O'Hagan, Baker, & Richard, 2000). More specifically, in *Lost Prizes* and *Northern Lights*, some 65% of the young people returned to and performed well at high school, entered and succeeded at community college or university, or moved on to a responsible, full-time job.

Interestingly, a re-examination of intake documentation has revealed that well over 50% of the more than 200 participants in these and related programs were referred at some point during their school years for hyperactivity or learning disabilities. It's easy to see how disenchanted, discouraged, and disconnected ADHDers can simply be lost to the system. Many of the individuals with whom we had the opportunity to work were, in fact, able to change direction and turn their lives around, but only after a liberal dose of concrete support, training, and opportunity were provided.

In all of these programs, hitherto hidden talents often emerged and, in some cases, appeared to be heightened by the presence of ADHD. It begs the question: Did Leonardo da Vinci, Thomas Edison, Samuel Johnson, and their like attain eminence in spite of ADHD, or because of it? Also, was their condition a problem to be coped with, an asset to be embraced, or both?

By changing direction a bit, parents and teachers can lighten the load somewhat for at-risk young people. Tonemah (1992) has expressed the view that educators tend to overfocus on remedial programming at the expense of strength building. Torrance, Goff, and Satterfield (1998) said something similar:

> We must reject the assumption that deficiencies motivate proper behavior and instead accept the more realistic belief that giving attention to successful behavior motivates the attainment of potential. This means recognizing, acknowledging, and using their potential to build success, skills, and abilities rather than wasting energy and resources by focusing on their deficits and neglecting their strengths. (p. vi)

By reframing or "recasting reality," we are more likely to notice and respond to the strengths of problem youngsters and recognize that negatives in childhood can evolve into positives later in life (McCluskey & McCluskey, 2001). It's essential to understand that, as children grow and mature, there can be a shift from stubbornness to determination, from bullying to leadership, from impulsivity to bravery, from inattentive daydreaming to creative invention, from disruptive fidgeting to productive energy, and from off-the-wall chaos to outside-of-the-box thinking. In many ways, it's all about how we, as parents and educators, perceive and react to the behavior of vulnerable children and youth.

Meeting Social-Emotional Needs

How do we, then, get from despair to satisfaction, from exclusion to inclusion, and from wasted potential to productivity? It's not easy.

Kaufmann, Kalbfleisch, and Castellanos (2000, p. 12) have identified the challenge clearly:

> Educators of gifted students with ADHD face a formidable task in that they must provide opportunities for students to apply their strengths while ameliorating their deficits….[T]his is more daunting for gifted students with ADHD because of the striking disparities these conditions can create.

Cramond (1995) has offered 10 useful suggestions for parents and teachers to follow

when ADHD is suspected, including being alert to the possibility that difficult behaviors may indicate special talents, (as well as problems), asking children what they are thinking about right after any daydreaming episodes, requesting that creativity checklists are completed along with those for ADHD, and providing opportunities in and out of school to develop creativity and self-efficacy.

Clearly, there are no magic answers, but we do have a few oft-overlooked tips to keep in mind when working with talented, hyperactive young people:

Offer acceptance and let them be who they are. Initially, in an effort to get Amber to behave "well," we may have tried too hard to force conformity. A quotation usually attributed to Mark Twain comes to mind: "Don't try to teach a pig to sing. It won't work, and besides, you'll annoy the pig."[1] Nylund (2000) has warned that we ought not to suppress talent by unnecessarily medicating our Huckleberry Finns. In our case, we certainly didn't want to lose the essence of Amber.

Be kind. The educational literature is chockfull of systematic approaches designed to improve classroom management, discipline, and student behavior. However, one very powerful strategy—simply being nice—is all too frequently forgotten. Long (1997) has emphasized "the therapeutic power of kindness" in interacting with at-risk children and youth. So often, "niceness" is the critical ingredient in reaching out to and engaging recalcitrant young people who desperately need to be accepted by others.

Find them friends. Many ADHDers crave the companionship of peers, but their impulsive, unpredictable behaviors get in the way and turn off potential friends. Rejection, loneliness, and alienation typically result. To us, it makes sense to intervene to support the social interactions of ADHD children and youth. It's possible, unobtrusively, to structure play and work settings to set the stage for successful relationship building by selecting empathic peers who have some understanding of and tolerance for the situation. We've had a couple of educators indicate to us that it's not their job to find friends for challenging, marginalized students. We disagree. Helping ADHDers form friendships is, perhaps, the most important thing anybody can do for them.

Let them help. Struggling ADHD students often find themselves overwhelmed by well-intentioned programs designed to improve their conflict resolution, anger management, and academic skills. It can, however, become subtly dehumanizing when one is always the helpee and never the helper (McCluskey, 2000). Not surprisingly, difficult children are less likely to get perks, rewards, and the opportunity to be helpful. It's interesting to see them visibly blossom when they have the chance to tutor younger students, run notes to the principal, or otherwise contribute and learn something about altruism. Importantly, though, such opportunities should be real, genuine, and valuable, and not obviously contrived (Curwin, 1992).

Avoid simplistic, cookbook approaches. By way of example, it is often assumed that firmness and structure are "good" for ADHDers. Might it not be the case, however, that too much structure will intimidate and stifle creativity in some hyperactive children? Although one must have rules and expectations, at times, it is wise to lighten up, show tolerance for ambiguity, and select appropriate teachable moments. We must continually ask ourselves, "Is this the hill I want to die on?" (With ADHDers, there are a lot of hills.) It is possible to think paradoxically and create "flexible structure" (e.g., by using "oral" tests that allow students to express their thoughts through conversation, movement, dance, or art). Similarly, kindness and firmness are not mutually exclusive: one can smile and still be serious. Using a style of "kind firmness" allows parents and teachers to show both caring and due diligence with hyperactive children and teens.

Encourage reasoned decision-making and responsibility. Feldhusen (1995) has stressed the importance of having gifted students recognize and take charge of developing their own talents. Likewise, others have offered suggestions to help ADHDers contain their volatility, cope more effectively, and manage their own condition (Amen, 1996; Frank & Smith, 1994; Goldstein & Goldstein, 1991; Nylund, 2000; Parker, 1988; Quinn & Stern, 1991; Walker, 2005; Weiss, 1994).

[1] The quotation is often attributed to Mark Twain, possibly as a result of the expression appearing in the film, *The Adventures of Mark Twain*.

Counseling and problem-solving sessions can teach inattentive, overactive students to slow down, think before they leap, and make better decisions.

Focus on long-term planning. Relationship building has been described as an endurance event (Brendtro, Brokenleg, & Van Bockern, 1990). It takes time. Given that there is no magic cure for ADHD, one has to be prepared to hang in there for the long haul, especially since hyperactivity is more often than not a lifelong phenomenon rather than a child-specific condition (Hallowell & Ratey, 1994; Kelly & Ramundo, 1993; Murphy & LeVert, 1995; Nadeau, 1996, 1997; Weiss & Hechtman, 1993; Wender, 1995). As mentioned earlier, with time, age, and increased maturity, ADHDers may be able to channel their energy and abilities in productive directions. For them, academic, vocational, and interpersonal success may come later in life. As a consequence, caregivers need to be patient, to refrain from expecting too much too soon, and to be ready to seize opportunities whenever they materialize (e.g., many ADHD individuals might not be ready for post-secondary education until long after most "continuous" students have taken that step). Career planning should be an ongoing part of the process. Obviously, as Hartmann (1997) observed, ADHDers would be best to avoid traditional "nine-to-five" desk jobs and to focus, instead, on other intriguing and stimulating opportunities that are available.

Become talent spotters. Recognition and nurturing of talent should become a top priority for all educators (McCluskey & Treffinger, 1998; Treffinger, 1998). Young (1995) has suggested that teachers ought to search diligently for indicators of special interests and abilities in their students (to the point of keeping a notepad on hand to record such observations), to design flexible activities and curricula that permit potential to surface, and to be on the lookout for talent over an extended period of time. Essentially, the notion is that all educators should view themselves as talent scouts who observe, listen, and gather information about the gifts of young people, including those with challenging behavior problems, in a variety of contexts.

Think enrichment. Educators don't typically try enrichment approaches when dealing with ADHD or other difficult students. In contrast, the first thought is, usually, to implement a "we-will-cure-what-ails-you" program. However, once one makes a conscious effort to identify talent in such populations, the next logical step is to develop it through enrichment. Type III enrichment activities allow students the opportunity to become actual investigators of real-world issues, to gather data, to employ problem-solving strategies, and to produce creative products in relevant situations (Renzulli & Reis, 1997). This type of action-focused, hands-on formula—which allows students to become "practicing professionals"—would seem to be ideal for hyperactive youngsters. And, certainly, it has been shown that employing contextually relevant, higher-order programming can have an extremely positive impact on at-risk underachievers (McCluskey, Baker, O'Hagan, & Treffinger, 1998; McCluskey, Baker, & McCluskey, 2005; Renzulli, Baum, Hébert, & McCluskey, 1999). Exciting programming through research, mentoring, problem solving, and self-directed learning should not be the sole prerogative of gifted education. Some ADHD students thrive on this sort of thing. Excellent programming models are available to guide us in enriching the educational curriculum for all students (Renzulli & Reis, 1997; Treffinger, Young, Nassab, & Wittig, 2004).

Amber Today

Gradually, oh, so gradually, we began to take a more strength-based perspective and recognize some of Amber's talents. Today, she has good friends in her life and, most importantly, she is now a dynamic mother of two wonderful children aged 12 and nine years. (Imagine this: she's the only mother of our acquaintance who would wake the babies up to play!)

Nine years ago, Amber decided she was going to become an early-years teacher who "will be nice to the kids and show people how to do it right!" She has done precisely that. Amber is soon to begin her fourth year of teaching in an inner-city classroom and reaching out in her inimitable way to challenging students with special needs. A few days ago, she took us for a visit to her school. (Amber has been away for a spell because of knee surgery.) It was a revelation to see how excited her young students were to see her back in the building—it would be difficult to describe the buzz of activ-

ity, the joyous hugging, and the frenzied shouting of the little ones. Our daughter truly seems to be making a difference.

For us, the negatives have, indeed, turned into positives. Amber has the boundless energy and infectious enthusiasm that make learning fun—and there is not a child born on the face of this earth who can wear her out! It took a long, long time, but our parental agony has turned to ecstasy and pride in her accomplishments.

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2.
They tell me I'm smart, so why do I have so much difficulty with 'laerning'?

Charlene J. Barva

Abstract

Most research on learning disabilities (LD) among adults has been conducted using males, an emphasis that has resulted in a limited knowledge of this disorder among females. Although an increasing number of high-achieving women with learning disabilities enter post-secondary institutions, LD in the adult female population is a much under-examined area. This research study explores the experiences of eight high-achieving female students with learning disabilities, attending two different universities in Alberta, Canada. Two semi-structured individual interviews were completed with each participant, and one large focus group was conducted. Interviews were analyzed using van Manen's (1990) hermeneutic, phenomenological approach. Two main themes emerge from the data analysis describing the nature of the participants' experiences: self as learner (involving personal beliefs, attitudes, and values as motivational forces for learning) and self as learner in relationship (focusing on their learning environment in relation to family, friends, educators, and others). A descriptive analysis and interpretation of the sub–themes within each of these two main themes is presented, along with a discussion of the implications for educators and parents as advocates for high-achieving female adults with LD, specifically pertaining to the importance of early identification and appropriate intervention.

> I have been told many times how 'lucky' I am to be only mildly learning disabled. 'It could have been much worse,' they say, an attitude which perplexes me … In my view, I am not lucky or unlucky; I'm just learning disabled. (Emma, participant)

Emma was one of the participants in my doctoral dissertation study, which integrated a hermeneutic, phenomenological research method with a feminist perspective to explore the educational experiences of high-achieving women diagnosed with learning disabilities (LD). Eight women who were enrolled in either undergraduate or graduate programs at the University of Calgary and University of Alberta were interviewed for this study. Before proceeding with a description of the study, it is important to clarify the term "high-achieving," as it is often used interchangeably in the literature with "high-ability" or "gifted" or both (Holliday, Koller, & Thomas, 1999, p. 268). For the purpose of this study, the term high-achieving refers to those women who are currently enrolled in or have graduated from a post-secondary institution.

Since its recognition as a federally designated handicapping condition in 1968, the field of LD has grown to represent approximately one-half of all students receiving special education services (about 5% of the school-age population) in the United States (Kerka, 2000). In Canada, approximately 5 to 10% of students in public schools have been identified as learning disabled (Statistics Canada, 2001). Coupled with these figures is a substantial increase since 1990 in the number of students with LD taking post-secondary education. The majority of research on LD has focused on students in primary and secondary schools, due to a belief by many clinicians that this condition can be remediated if addressed early enough. Current information indicates that LD is life-long (Gerber & Reiff, 1994). In the last ten to fifteen years, the field of LD has begun to direct in-

creasing attention to the varied and complex needs of adults with LD, prompted by increased advocacy and research, significant American legislation, and the changing demands of the workplace (Gerber, Reiff, & Ginsberg, 1996; Kerka, 2000).

Despite this trend, there has been little research about adults with LD and even less investigation related to the experiences of high-ability women with this condition (Levine & Nourse, 1998). Most research on LD has been conducted on male samples or on the learning of pre-adolescent and adolescent females and then extrapolated to adult women (Hayes & Flannery, 2002). This has resulted in limited knowledge of the disorder among adult women (Vogel, 1990). More important, in studying adults with LD, researchers in the field have been committed to a traditional empirical approach which emphasizes statistical data collection and analysis (Kavale & Forness, 2003) and studying children and adults with LD from the "outside in." Little investigative attention has been paid to studying LD from the vantage point of those who, themselves, have been diagnosed as LD, or what Gerber and Reiff (1994) referred to as the "personal, detailed contours of individual's lives, lived with, and in spite of, disability" (p. 9).

Impetus for the Study

This research study was an attempt to address the prevailing lack of information and understanding about adult women's learning and education that currently exists, especially as it relates to high-achieving women with LD. The impetus for this study arose from my own professional and personal experiences.

Following three years of employment as an educator, and newly graduated with a Master's degree, I began my professional career as a school psychologist with the Calgary Separate School District. In this position, I encountered many high-achieving students (mostly male) who were referred for assessment, placement, or both, on the basis of an identified academic weakness or disability. Few females were identified or referred for assessment and, if they were, it was because they were mentally challenged. I began to wonder why so many more males than females were being identified with LD. Did females not struggle with similar learning issues? Was there something that was being overlooked by educators and me with regards to learning by females? My experience working with students with LD was about to change as I embarked on a new career with the Calgary Board of Education.

I have worked as a school psychologist with the Calgary Board of Education for eight years, and it continues to be my place of employment, albeit, more recently, in a new capacity as a specialist in gifted education. Prior to this new role, my work primarily involved assessing and diagnosing students with exceptional needs. Beginning two years ago, I noticed an increase in the self-reported identification of bright females diagnosed with LD in senior-high school, especially in Grade 12. These women were referring themselves for assessment because of their difficulties with learning in many of their academically oriented courses. Many of them had a history of learning difficulties that were not formally noticed. Even their current educators were not aware of their learning problems. I was amazed at the number of females who were referring themselves and surprised that no one had previously noted these difficulties.

Self-identified bright women came to me out of frustration and anger, and many demonstrated low self-esteem, poor self-confidence, and depression. Many of them felt that the school system had let them down and that they now were going to start "taking charge." I was shocked that so many females with LD were being overlooked, confused as to why these women were identifying themselves at this point in their academic career, and saddened that the school system had let so many high-ability women "slip through the cracks." Research in the area of high-ability women with LD indicates that women are not normally identified because they are able to mask or hide their learning difficulties and compensate for them through their strengths (Bireley, 1995). For many of these bright women, however, signs of difficulties with learning were present even though they were able to cope very well. These incidents, arising from my professional work, helped to plant the seed that would take root in my research project.

On a more personal level, I have a good friend, who, I am sure, has LD and is definitely gifted, although he has never been formally diagnosed. His lack of diagnosis is not surprising, however, given that the concept of LD has

only existed for about 40 years (Kerka, 2000), and knowledge about LD is just starting to be disseminated in the public realm. Learning has never come easily for my friend. Throughout his academic years, he struggled severely in the areas of reading and writing. In Grade 6, he was sent to a special school for literacy intervention. While he notes that this was a very difficult experience because he was mainstreamed with students with diverse disabilities, including those with severe behavior problems, he is also grateful for the support he received in terms of learning strategies that would help him succeed in his learning. He was integrated within the regular curriculum for his remaining school years and continued to struggle academically. Educators often commented on his remarkably creative ideas and his high motivation but also on his weakness in synthesizing these creative thoughts on paper. His difficulties with reading and writing have never disappeared; however, he has developed some excellent coping strategies that have contributed to his success today. He has a remarkable interest in learning and in seeking ways to help himself learn. He has become his own best advocate. My friend has gone on to complete two university degrees and is outstanding in his field of work, having been recently nominated for an excellence award and having received an international award for his work in environmental conservation. In retrospect, he is positive about his accomplishments but, at times, feels that if he had had the proper interventions in place throughout his schooling, he could have achieved much more. Fascination with my friend's background, my Master's work with its focus on women's development, and my professional work experience led to my interest in this research phenomenon.

As previously noted, the participants in this study consisted of a diverse group of eight women diagnosed with LD who were attending undergraduate or graduate programs at either the University of Calgary or University of Alberta. One group and two semi-structured individual interviews were conducted in order to gain further understanding of the phenomenon. The analysis of my work was based on the work of van Manen (1990) in which learner coping strategies are developed by the researcher in the recursive process of examining data, developing emerging themes, and integrating this information with the literature on high-achieving women and LD.

Results: Interpreting the Women's Words

Two main themes, with various embedded sub-themes, emerged as being representative of the educational experiences of high-achieving women with LD: Self as Learner and Self as Learner in Relationship.

Self as Learner

The first main theme, Self as Learner, focused on the individual or cognitive (intrapersonal) aspects of learning, including the women's beliefs, attitudes, and values as motivational forces in their learning. Many of the women spoke of the impact of their LD upon learning as a transformational process that affected their self-identity and, ultimately, led to greater self-acceptance of their LD. Four themes were revealed within this larger theme: Something is Wrong with Me, Learning to Compensate, Taking Back Control, and New Images.

Something is Wrong with Me. This sub-theme highlights the problem of having LD but not being aware of it. It refers to the women's difficulties with reading, writing, or math and their feelings of frustration, confusion, and despair. Dawn, for example, recalled her experiences with reading:

> I was a very slow reader and I inverted a lot of letters and words…To me, a *p* looked like a *q*, a *d* looked like a *b*, and, what was that again, does *t* come before *s*, or is it before *r* ?…It didn't matter how many times it was explained to me, I could never keep up with the class.

Hallahan and Kaufmann (2003) write about the difficulties of living up to seemingly impossible standards, without knowing why they are so impossible when they seem easy for others. Further, the frustration associated with this can have a profound effect on self-esteem. One woman became very shy, quiet, and withdrawn and, eventually, entered into a six-year battle with depression. She notes that her self-esteem and self-confidence "took a real nosedive," and she credits a warm and supportive relationship with her therapist for bringing her back "from that dark and lonely

hole." Despite these women's adversity, they learned ways to compensate and cope.

Learning to Compensate. Orenstein (2001) used the term "bypass" to refer to the ways in which both people with detected and undetected learning disabilities get around their cognitive problems. The individual learns to compensate, usually without any help from others, by employing ingenuity and creativity to overcome a problem (Orenstein, 2001). For some of the women, spending additional time and effort was one way to create a bypass around areas of failure. This is exemplified by Ann's comment:

> I always knew that I had to work ten times as hard as anyone else….[E]very night, my mom would sit down with me as I tried to memorize my times-tables….[W]e used 300 flashcards (I remember the exact number), and we would practice and practice for hours on end. I hated it, but it has always been like that....[E]ven at university now, I attend classes and then spend additional time afterwards writing and re-writing my notes so I can understand them better….[I]t's very time-consuming. I knew that I could do whatever I wanted to do. It just took me a lot longer time to do it.

Another coping skill Ann used was to become very compliant, "the teacher's pet," as she noted. It was important for Ann to have her teachers and peers like her because, as she stated, "'If I'm good, people will like me.'"

Emma noted the time it took her to complete university:

> It's taken me six years to get through undergraduate school. I repeated a lot of classes. I'd tape everything and listen to it over and over and over again…If I start doing bad[ly] [sic] in a course, and I don't feel like I should be doing bad[ly] [sic], then I'll drop it and start all over again so that I do [well] [sic]….It's taken me forever and ever and ever, and I can't wait to be finished.

Many of the women in this study spoke of relentless hours spent in trying to develop a new skill or to complete an assignment, and no matter how time-consuming or difficult, there was a continued push to learn, a desire to excel, and a desire to be perfect. Perseverance and motivation were some of the qualities to which the women referred. Some of the women found ways to compensate for their academic difficulties by using skills that were outside of the academic domain. A few of the women found that it was much easier to cope by becoming "behavior problems" rather than to deal with the pain of their learning struggles.

Taking Back Control. According to Reiff, Gerber, and Ginsberg (1997), control refers to the drive to manage one's life. Being "in control" is vital to our sense of well-being and is a key element for success (Reiff et al., 1997, p. 101). For many of the women in this study, the experience of having LD, particularly in the school-age years, meant a loss of control. Individuals were left feeling "helpless," "frustrated," "stupid," and "alone." Most of the women were able to "gain a sense of control" over their environment through a formal diagnosis (and labeling) of LD. For some of the women, labeling had positive effects, in that they recognized the importance of the label in identifying their problem and bringing about greater self-evaluation. Others experienced the labeling as quite negative, carrying with it a connotation of personal imperfection, social demotion, or a loss of certain future hopes. They questioned why the learning disability categories had to be classified around negative attributes, rather than focusing on the strengths or positive attributes.

Judy, for example, found that accepting the label of LD was more difficult, as she associated LD with shame, stating that

> [e]ven though I recognize that it is not my fault…nor does it reflect on the kind of person I am or my intelligence…there is still a part of me that feels that telling people that I have a learning disability could shape the way they view me.

Jennifer found there is a misconception towards people with LD because it is not something you can see like a physical disability. She found it frustrating to have to explain to people what LD is because most perceive LD to be a developmental delay, "a disability of slow learners."

Emma hated the term LD particularly because it denoted having "a disability or lacking the ability to do something." She was adamant that, yes, she had a problem, but, no, she did not have a disability.

Nevertheless, the diagnosis and labeling of LD, whether positive or negative, or both, provided a type of reality check for the women, with a confirmation that there was something real going on with which they struggled and that it was not all imagined.

New Images. New images is the ability of many of the women to look back on their experience and perceive their LD as no longer negative and unwanted but, as one participant put it, as "blessings in disguise." Many of the women spoke of the transformation in their life that had taken place and how this change affected their self-identity and the self-perception as women with LD. One important aspect of this transformation was the ability to recognize one's LD which, for these women, usually occurred through their diagnosis. For many of the women, this recognition was the realization that they did things differently and that it was okay to be different from everybody else. Another aspect in the change process involves acceptance of the LD. Acceptance and understanding of their disability led many of the women to new-found feelings of empowerment that allowed them to take action, to seek out appropriate alternatives, and to make good choices for themselves. Judy elaborated:

> I'm not a whole, perfect person, and I've got some missing parts…but I have all these other talents and skills, and a lot of people have missing parts. I have not let my disability ruin my life….I've pursued my career in an area I know I can do well in….I don't sweat the small stuff anymore, I try to get through everything the best I can, and that's all I can do.

Like Judy, many of the women were able to take charge of their own learning environments and develop many different creative coping strategies. In their acceptance and understanding, they developed a "voice," which is a pervasive and powerful image in women's stories about learning.

Voice implies communication and connections with other people, as well as the ability to express thoughts and feelings so that they can be heard and understood by others (Belenky et al., 1997). Reinharz (1994) pointed out that, historically, women have been denied the right to speak, and women's efforts to claim a voice can be acts of resistance and rebellion against domination. Specifically addressing women's development as learners, Belenky et al. (1997) theorized that, as women develop, they change their positions toward self, authority, truth, and voice. They progress from a position of silence, in which they are unable to express their own ideas, to one of received knowing, in which they attribute ideas to experts outside themselves. An important shift occurs when they move to subjective knowing, in which they firmly establish their own identity, self-confidence, and self-esteem as learners. Finally, they arrive at a learning stance in which they creatively integrate their own knowledge and experience with that of others and make something new out of it for themselves and society—constructed knowing.

Self as Learner in Relationship

The second main theme to emerge from the women's narrative was that of Self as Learner in Relationship, which focused on the interactive, interpersonal nature of learning, that is learning within the social and cultural context. This theme was centered on the social meaning that women attributed to their learning environments within the context of their relationships with family, peers, educators, and significant others, such as mentors or special friends. Four sub-themes are included under this broader theme: Self and Family; Self and Peers; Self, Educators, and the Learning Environment; and Self and Significant Others.

Self and Family. In their study with highly successful adults with LD, Reiff, Gerber, and Ginsberg (1997) found that these individuals were able to survive rocky moments growing up with LD because they had some kind of significant support. In this study, parents were identified as valuable sources of support. The parents' influence, indeed, cannot be underestimated, as reflected in the women's comments. Judy, for example, described the extent of her parents' involvement with her schoolwork:

> My dad helped me with my math, algebra, and geometry, and my mom helped with spelling and writing. I started bringing things home before high school. My mother went over every paper I wrote. My dad would always go to the school and ask the teachers how I was doing. Reminders would be pinned to the refrigerator about bringing home the work I was having trou-

> ble with. My parents really did get me through high school.

Jennifer recalled that she had always needed her parents' help to write papers. Noting that her parents would never actually do the work for her, she indicated that this help was life-saving:

> With reports, papers, and stuff, I always needed somebody. When I wrote a paper, my mother would edit the paper for me. When I had a book to read, my father would read the book to me, explain the whole thing, and then we'd answer questions about it. My parents also hired a tutor twice a week to help me with my reading and grammar. They weren't so concerned about marks but about always doing your best. I wouldn't have done so well if they had emphasized high marks and achievement.

Parents would often help their daughters with writing assignments or would request weekly performance reports to scrutinize their performance. They also had very high expectations of them.

For some of the women in this study, both parents were instrumental in providing support and encouragement. For other women, it was the influence of one parent that was particularly significant. While some of the women commented that they had difficulty completing their academic work without their parent's (or parents') remedial or emotional support or both, some also resented or rejected such assistance and wanted to manage their difficulties themselves. Whether the women accepted or rejected parental help, most women reported having many arguments about grades and studying. The women's reactions to such assistance also reflected anxiety and confusion regarding what their academic difficulties and parental dependence meant for their personal identity, future autonomy, and intellectual competence—all sensitive issues for young adults.

Self and Peers. At every level of academic and social development, peers play a very significant role. For individuals with LD, research has indicated that peer relationships may pose particular difficulties. Students with LD have been found to be less accepted and more rejected than their non-disabled peers, and many students with LD tend to occupy a lower social status than other students (Kuhne & Weiner, 2000). Some of the women in this study found themselves in these kinds of situations and described struggling to get along with peers. They spoke of being the outsiders, rejects, or nerds. Keely recalled:

> I couldn't read or spell words. When it was my turn to read out loud, I would feel like such an idiot. I got teased badly by the other students, mostly boys, in my class. They would call me names, like retarded and stupid. I knew I wasn't dumb or retarded, but kids can be so mean. It got to the point where I didn't want to go to school; I was forced to go.

Teasing and name-calling by their peers in elementary school were common occurrences. The existing social difficulties were only exacerbated as the women entered adolescence. Ann and Wendy, for example, both recalled painful experiences of being bullied by their peers. Ann talked about the sexual harassment that she endured throughout high school and about feeling that she was "the victim" because, although she told her parents and teachers about the harassment, nothing was done. Like Wendy, Ann also felt very different from her peers in that she "just didn't know how to relate or fit in." Wendy noticed her social difficulties becoming more severe as she entered junior-high school:

> I never was a member of any social group, but as I moved into junior-high school, I was singled out by some of my peers, mostly girls, and ostracized. I tried to become friendly towards them, but I've always had difficulty with friendships…. [T]hey just didn't accept me. In high school, I continued to be an "outsider," and my best friends were the delinquent "rejects."

Not all of the women were affected negatively by their peers. Some of the women reported adapting well to being an outsider. As children, they accepted the fact, or at least rationalized, that they marched to a "different beat."

Self, Teachers, and the Learning Environment. For many of the women, the most vivid memories of LD began with school, and, like peers, teachers were cited as a powerful influence in both negative and positive ways. A common experience for many of the women was having judgmental teachers. Many of the women vividly recalled their teachers' negative

attitudes, as well as incidents in which teachers reproached them, making them feel "ashamed" or "embarrassed," or destroyed their hopes and dreams. Many of the women felt that their teachers blamed them for the difficulties they were having and that their teachers became frustrated and angry with them because of their disabilities. Judy vividly recalled a painful experience in high school when a teacher locked her out of the classroom because she was "two minutes late" in arriving for a quiz. This particular teacher accused her of being lazy and unmotivated and, by locking her out, wanted to teach her a lesson about working harder. The situation got resolved only when her father intervened with the principal, on Judy's behalf. Judy questioned why she had to go through such a painful, emotional experience and resented that she always had to "prove" herself to her teachers. She poignantly summed up her school experience:

> I remember coming [home] from school and being exhausted most of the time. I'd always have to be a step ahead of them [the teachers] so that they wouldn't ask questions like "Where's your homework?" or "Why didn't you do it?" I wouldn't know what to tell them. I didn't know why I didn't do it. I'd sit down and I wouldn't say anything. It was frustrating. I wanted the information everybody else was getting, and I wanted to get it the *way* they were getting it, and it was also more frustrating when some teachers reacted with that ignorance. I mean, as each class went on, not only did they act like they didn't care, but they were almost rude and condescending about it, like it was my fault, that I was just lazy, and that I had a lot of good excuses. There were times when I was ready to quit!

For some of the women, these experiences continued through to post-secondary education, as they also recounted professors who reacted negatively to their diagnosis and failed to understand or provide modifications for them. One participant, Margaret, described her negative experience in requesting accommodations and the reaction of one of her professors in graduate school:

> I remember asking one of my professors if I could have some extra time on an exam, and he said, 'Well, why should I give you anything extra? That wouldn't be fair to the other students….You don't look like you're learning disabled.'

Margaret felt that there was a complete lack of understanding by many educators about LD, and especially towards brighter students with LD. While most of the women recalled painful and negative experiences with teachers at all levels of their education, they also remembered some teachers as being very positive and caring and having a significant positive impact on their learning.

Self and Significant Others. Some of the women spoke of the importance of mentors or other especially supportive people—family members and educators—to help them deal with their learning difficulties and become successful. According to Orenstein (2001), mentors are people of wisdom who can be trusted to respect both an individual's strengths and weaknesses. Mentors can see others' potential and foster growth. Keely, who suffered from depression for six years, referred to her therapist as being her mentor. She credited her therapist with believing in her and helping her to believe in herself. Wendy, like Keely, also suffered from low self-esteem and long-term depression. She spoke highly of her therapist for "giving [her] the courage to move ahead and never failing to give up."

Two of the women spoke of the LD specialists as being very important to their feelings of self-confidence and success. Several explained how their partners or friends read to them, edited their work, did various routine tasks that their disability made difficult, and reminded them of important information when their memory failed them. For these women, support from a special person or friend was an integral part of their learning success.

Implications

The results of this study have significant implications for both educators and parents whose role is vital for the high-achieving female with LD. For educators, the findings indicate that teachers will have to take a systematic and ongoing approach to identifying, implementing, and evaluating classroom-based interventions and accommodations to assist high-achieving females who demonstrated characteristics of LD. Early and accurate identification of LD, for example, is critical to establishing learning skills and strategies important to future aca-

demic success. Particularly important is the role that sex differences play in early identification. Teachers must be more astute in recognizing the less visible characteristics of all students with LD if these students are to benefit from early identification. Another particularly important finding is how the stories of these women awaken us to the reality of how the women experienced school. For many of them, school was generally a place of negative experiences. Witherell and Rodis (2001) propose the concept of intellectual diversity as a socially responsible, pedagogically sound model for shaping classroom culture. Intellectual diversity is based on the idea that teachers need to appreciate not only their students' cultural and ethnic diversity but also their intellectual diversity, which is to say, their "differences of mind" (Witherell & Rodis, 2001, p. 167).

With respect to parents, research suggests that, particularly in the early years of schooling, parents are considerably more effective in identifying high-ability children with LD than teachers are (Kavale & Forness, 2003). Parents must become more aware of and involved in their child's learning. Parents need to participate in educational programs so that they can learn relevant educational concepts and be kept abreast of new knowledge in the field of LD. They may find it beneficial to join support or discussion groups, attend lectures, watch videotapes or DVDs, and participate in case-study presentations in order to increase their understanding of LD. A collaborative problem-solving, working relationship between the home and the school (and other outside agencies) is critical for enhancing the learning experience for all students with LD.

As a final comment, I believe that one of the most powerful contributions of the women's narratives gathered in this study is the way that they propose a shift in how learning disabilities may be conceptualized. The concept of LD has been understood from a neurological or psycho-educational perspective, but the women's stories suggest that it may be more meaningful to think of LDs, primarily, as constructs that influence and mediate a person's sense of *being* and *identity* or of self-in-relation-to-self and of self-in-relation-to-others. Undertaking this research project has been a personal journey, as well as an educational one, and one that will have a profound effect on my practice as a school psychologist.

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3. Gifted Immigrants and Refugees: The Gold Unmined

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Abstract

Although immigrants and refugees may have a profound effect on the global talent pool, problems associated with resettlement, such as securing housing, seeking employment, and adjusting to a new culture and language, often take precedence over identifying and providing for the educational needs of gifted students. International waves of immigrant and refugee groups have differed dramatically over the decades, but attitudes and educational interventions that tap into the potential of immigrant and refugee learners have changed little. In this paper, we present a very brief historical review of the immigrant and refugee influx in three countries: the United States, Brazil, and South Africa. This is followed by a discussion of consequent challenges and suggested solutions as they relate to identifying and meeting the needs of gifted immigrants and refugees. The paper concludes with a discussion, based on the collective, three-country review, about how we can better serve this gifted group within the global community.

International waves of immigrant and refugee groups have differed dramatically over the decades, but attitudes and educational interventions that tap into the potential of immigrant and refugee learners have changed little. Individuals emigrate for a variety of different reasons. They may leave their home country to escape poverty, to seek educational betterment, to avoid persecution, or to flee the ravages of war. Such concerns will often take precedence over identifying and providing for the educational needs of gifted and talented children as families adjust to a new environment and as they seek to deal with the immediate concerns of housing and employment.

Immigration and refugee movements, always in a process of flux, necessitate countries absorbing large numbers of individuals into an educational system that is often unprepared to meet their unique needs. This is particularly true of those who are gifted; most are lost in a maze created by an inadequate identification, placement, and programming process.

To understand the complexity of immigrant and refugee influx in the countries targeted in this study—the United States, Brazil, and South Africa—requires, at least, a brief examination of the nations' historical background. In this light, consequent challenges and possible solutions, as they relate to identifying and meeting the needs of gifted immigrants and refugees, can be considered with greater insight.

Gifted Immigrants and Refugees: American Gold Unmined

Historical Context

Since its founding, the United States of America has been a nation of immigrants with a rapidly diversifying population of young children, transforming the country's demographic, particularly since the turn of the 20th century. Over the past decade, the number of students whose native language is other than English

has grown significantly in American classrooms (Garcia and Cuéltar, 2006), a trend that will likely continue into the foreseeable future (Crawford, 1999; Garcia, 2001).

According to Foner (2008), the new groups of immigrants and refugees of the last few decades differ from those who came through Ellis Island in the early part of the 20th century. Recent immigrants originate largely from Third-World, non-Caucasian, linguistically diverse countries, with the greatest numbers being Hispanic and Asian.

The 2000 American census reported that close to 47 million (46,951,595) individuals in the United States speak a language other than English at home (Garcia and Cuéltar, 2006). This reflects a significant 47% increase from the 1990 census figures, representing over 20 different languages, with the largest increase being Spanish.

Early immigrants came to America for a variety of reasons. The Chinese, for example, who came in the early 19th century for economic betterment, entered primarily through San Francisco and were largely employed in building the railroads. Few were refugees escaping from untenable political conditions. The large numbers of Irish who emigrated in the mid 1800s to escape the famine settled around the Boston area. They had difficulty procuring work, discouraged by the infamous "Irish need not apply" signs put up everywhere by business owners. Examples of more recent refugee groups include Cambodians who escaped the Khmer Rouge, Cubans who often risked their lives coming to Miami by boat, the "lost boys of Sudan" who escaped the ravages of war, and Russian émigrés who resettled in the United States after the breakup of the Soviet Union in 1989. Currently, immigrants constitute an unprecedented 37.5 million of the American population, with major groups being represented by Mexicans, Chinese, and East Indians. Mexicans make up almost a third of all new immigrants (Foner, 2008).

Perpetuation of Old Patterns

In the *melting pot* theory, it was assumed that once new immigrants and refugees became Americanized, all cultural barriers would eventually disappear (Harris, 1991a). The assumption that assimilation would yield better opportunities for gifted immigrants and refugees (Zhou, 1999) is no longer tenable. Assimilation, in fact, decreases the productivity of gifted immigrants and refugees, and, as they become more Americanized and less visible, there is a significantly smaller chance of them receiving specialized programming (Ngyuen, 2008).

The legacy of the past has helped shape the immigrant experience and the reception of new immigrants and refugees (Foner, 2008). Although objectivity is essential to the identification process of gifted immigrant and refugee children, educators' stereotypical assumptions persist and frequently interfere with their delivery of effective programming (Manning and Guang-Lee, 2001).

Current Concerns

One of the most serious problems of immigrant and refugee children is their placement in schools, with the general practice being by age and little attention being given to their previous education. Students, for example, may have had little or sporadic schooling, possibly even no schooling, before coming to the new country (Harris, 1991b). A case in point is that of the "lost boys of Sudan," singular groups of unaccompanied minors escaping brutal ethnic cleansing, who made the long trek across Africa to the relative safety of refugee camps (Chanoff, 2005). Only 5,000 out of 20,000 in the original group survived. There were two subgroups of refugees: those under 18 years, who were placed in foster homes and those over 18 years, who were given jobs but no educational support. Although a few of the over-18 group made it to graduate school, most were not evaluated appropriately to allow them continue their studies (D. Chanoff, personal communication, November 25, 2008).

Still another problem that emerged is the misdiagnosis of children as learning disabled when, in fact, they exhibited a mere learning difference, based on a different learning style or linguistic challenge with the English language. Many immigrants, consequently, were over-represented in special education classes (CERI, 1987; Harris, 1991b). Some were clearly capable of honors-level work. Arroyo (cited in Garcia and Cuéltar, 2006) identified, for example, a group of capable refugees from El Salvador fleeing government violence in the 1970s who arrived in the United States without language skills. In addition, Korean immigrants, who came in the 1970s and 1980s,

experiencing severe economic hardships, were processed through an educational system without regard for their potential.

Gifted Education Models

Flexibility in identification and programming for gifted immigrants and refugees is exemplified by only a few projects in the United States. One example of a promising program is Open Gate (Fox, 2001; Kitano, 2003), a California program with four classrooms serving highly gifted students from third to fifth grade and teachers certified as educators of the gifted by the district. The Open Gate program is located in two elementary schools in a large, highly diverse, urban area. Project CLUE (Clustering Learners Unlocks Equity), in the Indianapolis Public Schools (Neumeister, Adams, Pierce, Cassady, & Dixon, 2007), directed to the gifted who are immigrants, is another outstanding program, but such initiatives are far and few between, and, for the most part, immigrant children are caught in a paradox: they do well initially, and sometimes better than their native-born peers, but, as they continue to assimilate and become more Americanized, they are less likely to be identified as gifted and placed correctly, with positive outcomes deteriorating over time (Nguyen, 2006).

Implications

The ethnic culture, it appears, has a protective effect during the assimilation process, with some progressive deterioration as immigrant children adjust to the host country. Immigrant children often have strong family bonds (Nguyen 2006), but acculturation may involve cultural erosion, cultural conflict, and adjustment problems, on the one side, and assimilation, linguistic adjustment, physical health issues, and psychological difficulties (i.e., in the case of refugees), on the other. In addition, there may be weakened coping strategies that originate in conflicts within the family, within the social arena, and within the school environment, giving rise to identity-related issues, altered self-concept, underachievement, and isolation (Harris, 2003a). Specific programming and curriculum development that speaks to these various needs, without prejudicial attitudes, assumptions, or instructional complacency, is sorely needed for educational excellence.

Suggested Solutions

According to Hannahs (1983), cultural compatibility with the mainstream culture is often necessary for academic achievement. Giftedness, however, must be considered and understood within a cultural context (Sternberg, 2004; Harris, 1991b) and needs to be taken into account during the process of identification and intervention. An understanding of giftedness, its characteristics and behaviors, in the light of diversity and cultural congruence, should be incorporated into teacher training to assist educators in their search for giftedness among immigrants and refugees. This will allow schools to provide more appropriate educational experiences, which will enable this population to maximize its considerable but hidden gifts and talents (Harris, 2003b).

Gifted Migrants: Brazilian Gold Unmined

Historical Context

The pattern of immigration in Brazil is different from that of the other case studies in this paper. According to historians (Botelho, 1998), the major immigration influxes occurred at the end of nineteenth and the beginning of the twentieth century. These immigrations were connected with government efforts to mitigate the end of slavery and its effects on agriculture and farm work. Such immigrants were mostly Europeans who were being pressed out of their homeland by a combination of population increases and corresponding shortages of agricultural jobs. They came earmarked to work in predetermined agricultural areas, such as coffee plantations, which attracted mostly young families with children. These groups received assistance to ensure acceptable living conditions for them, and their children were included in the regular schools (Botelho, Braga e Andrade, 2007).

More recently, the population drift in Brazil has been that of a migrant rather than an immigrant type. A large number of people have moved out of their home regions within the country, mainly from the north and northeast to the southeast, for virtually the same reasons as those of the immigrants—poverty and adverse social conditions (IPEA, 2010). Within these pressed-out-of-home groups, there are the ignored gifted children—the unmined gold. The focus in this section of the paper is, there-

fore, on internal migration in Brazil and its consequences for the education of gifted children and youth.

Throughout its history, even before its independence from Portugal in 1822, Brazil has faced the enormous task of promoting social integration for millions of its citizens who remain marginalized, unable to improve their lives or reach any noticeable degree of personal or social advancement. Entire regions of Brazil still live in conditions of economic, social, and cultural deprivation, its people excluded from achieving any measure of growth and development.

As a result of such circumstances, large numbers of people, especially the most able youth, are pushed out of their communities, in a desperate search for a better life (IPEA, 2010). Most of them, even the very able, never realize their dreams. Swallowed by the cruelty of an impersonal megalopolis and relegated to jobs far below their ability, they suffer from great bitterness, frustration, and failure. Many are overcome by poverty or are victimized by or attracted into organized crime, often resulting in their lives ending prematurely (Antipoff, 1992).

Often faced with health issues, lacking education and regular-paying jobs, families send their more able children to work as early as possible, without any kind of legal protection. Recent data (SINE, 1995) show that over 26% of all children in poverty-stricken areas have to work; for example, 18% of the total work force in the progressive town of Fortaleza are between 10 and 17 years of age. The largest proportion of children in the labor market is found in Brazil's northeastern region, comprising about 50% of the national labor force, with over 500,000 irregular child-workers aged 10 to 14 years. Other children, often younger than 10, have their social and artistic talents exploited by agents in highly publicized media appearances that cause intense public exposure for short periods of time. This often leaves them in a situation worse than before they were "discovered." (*Folha de Sao Paulo*, Outubro 2007).

Perpetuation of Old Patterns

Such conditions have continued to exist undisturbed, as reflected in the constant media reports in the national newspaper, *Folha de Sao Paulo* (2007; 2008), with sad stories like Pedro's. At age 10 years, Pedro, a very bright and outspoken child, was noted as being highly gifted in dealing with numbers. He could perform complex mathematics tricks in his head, which led him to be shown live on television and admired. Meanwhile, he worked selling home-made popsicles at a nearby gas station, where people would stop to give him mathematics problems to solve, in return for a little money. As the story goes, he was right most of the time, even with complex calculations, such as finding the square root for 56,169 or the cubic root for 9,261. Sometimes, he would startle the audience, giving all the right answers up to a decimal fraction. At 14 years, he still worked at the same gas station, but now at the gas pump. At 18 years, he secured a minimum-salary job in a fast-food store, where his task was to hand out sales-order slips to the clients. Nothing happened in his life that could be linked to his potential, and he seemed aware of it. When asked what he expected for his future, he said, philosophically, "Nothing has changed…and things will probably stay as they are…No hopes, no dreams, no expectations of any sort…And what a loss for the community and the country!" *(Folha de Sao Paulo*, Março 2008, p. 8).

Current Concerns

Is there any hope for people like Pedro? The main path to develop young people's potential and abilities has to be through education. It, however, is becoming ever harder to cultivate such ideals within our community, when companies seek cheap labor by recruiting able youngsters to the work force. Formal education, offered primarily through the public-school system, after decades of well-documented criticism, still shows a painful inability to deal with more able and talented students.

Implications

As far back as 1946, Antipoff wrote,

What is often waiting for gifted children in school? A climate of insufferable boredom that transforms these gifted children into agitated, loud, misbehaving boys and girls that mediocre teachers feel unable to contain in their classrooms without bitter complaints." (Antipoff, 1946, p. 11)

Has anything changed in nearly three quarters of a century? It can be said that there has been very little change, particularly for those who try to better their lives by migrating to the big cities. Recent studies at the IPPUR (Instituto de Pesquisa e Planejamento Urbano Regional), in Rio de Janeiro, show that children living in the slums do worse in school than children from equally poor families living elsewhere. Moreover, when attending public schools in slums located near *rich* neighborhoods (an existing situation in Rio), students perform still worse than those who attend school in other poor neighborhoods; this indicates that the risk of failing or evading school increases when a child lives in a slum near an affluent section of the town. The researchers expected these schools to offer some advantages, due to better living conditions in the neighborhood, but that proved not to be the case. Living in a slum is not only a bitter disadvantage for these students, but living in a slum located in the richer part of town turns out to be a yet worse disadvantage (Ribeiro, Franco, and Alves, 2007).

Gifted Education Models

What are we doing? Although not focusing on slum children, our Center for Talent Development (CEDET) attends to over 800 students enrolled in the public schools (Guenther, 2003). CEDET's mandate is to provide support, stimulation, and encouragement to higher-ability children needing instruction that is more ample and complex than that typically offered in a regular school. Once identified as gifted, the children follow an individualized education plan, according to their potential, needs, expressed interests, inclinations, and personal choice. This procedure represents an alternative to the usual "enrichment activities" approach which has proved not to leave any long-term results in adult life (Freeman, 2006). In an attempt to broaden their world, the Center brings volunteers from the community to guide content work with the children. Over 1000 volunteers have worked at CEDET since its inception, usually 60 to 70 in each semester.

Suggested Solutions

What more can be suggested? Obviously, our public-school system needs considerable improvement. No matter how optimistic the government may be, our public education has not improved enough. Even the educational authorities are known to enroll their children in private schools. That option is not the answer for our unmined talents; our talented children have to be sought out, and appropriate services must be provided for them.

Gifted Immigrants and Refugees: South African Gold Unmined

The African continent is facing a new age of migration, as civil conflict, political violence, and extreme poverty continue to prevail. South Africa, being one of the most economically stable democracies, with a liberal constitution and an excellent health-care system, has attracted immigrants from a range of backgrounds. Currently, South Africa has 48 million people, speaking 11 official languages (Languages of South Africa), of which 5 million are illegal immigrants (Illegal Immigration, South Africa). Legal immigrants come mostly from Nigeria, United Kingdom, Mozambique, Portugal, India, Zimbabwe, Pakistan, China, Germany, and Taiwan. Illegal immigrants come mostly from Mozambique and Zimbabwe (Statistics South Africa, 2003).

Asylum seekers in South Africa number well over 100,000, the largest contingent being from the Democratic Republic of Congo (12.2%) and Zimbabwe (10.1%), with large representation from Ethiopia, Somalia, and Pakistan (Redden, , 2008). With the economic collapse of Zimbabwe and a growing cholera epidemic, thousands of refugees have attempted to enter South Africa (Gordon, 2008). In every major city, large informal refugee settlements have arisen; some refugees live in garages or warehouses, while the fortunate few have built mansions on the beaches of Cape Peninsula. Their presence threatens the local African community, which faces unemployment and a high rate of HIV/AIDS. In 2008, the refugee influx generated widespread xenophobia, resulting in violent attacks and the tragic death of 42 immigrants (Igglesden et al, 2009). It was reported that

> [a]ttacks occurred mostly at night. Among the victims were people from Bangladesh, Burundi, DRC, Kenya, Malawi, Mozambique, Nigeria, Pakistan, Somali, and Zimbabwe, as well as South Africans from minority language groups. (Igglesden et al., 2009, p. 20)

Problems of Identification and Placement

In post-apartheid South Africa, forms of separatism have been rejected by the South African Government, with the new constitution having been designed to prevent possible discrimination (South African Department of Education, 2008). Due to the influence of the current constitution on educational philosophy in South Africa, the field of gifted education has been largely ignored and deemed inequitable. The general approach has been one of inclusion, with a stress on outcomes-based educational objectives and instructional differentiation. Past programs for gifted and talented students are viewed as elitist and Eurocentric, divorced from the realities and injustices of the inferior education that the majority of African students have experienced.

Differentiated instruction is viewed as an appropriate strategy for high-ability students. Innovative programs have stressed higher standards and content acceleration in mathematics, science, and languages. They also stress programs that accelerate students and bridge gaps in learning that have stemmed from previous, unfair educational systems; however, many immigrant students come from extremely impoverished, marginalized groups and communities in crisis. Students' abilities are often masked by hunger, homelessness, inadequate resources, inequitable programming, lack of opportunities to learn, and a culturally unresponsive curriculum. This problem is confounded by the rise of HIV/AIDS in Africa and outbreaks of ethnic conflict. In addition, language issues and differential standards for assessing students may serve to mask their high abilities.

Approaches to Intervention

Gifted immigrants from upper-income families typically attend independent schools, are linguistically competent, and meet stringent intellectual standards. Schools address the needs of such immigrants through a variety of services. Three distinctive schools—a school for refugees, a state high school, and a leadership academy—serve as models for what can be achieved.

Three2Six School for Refugees. This project is a school for the children of refugees and is operated after regular school hours and uses the premises of an independent Catholic school, Sacred Heart College. The program serves about 200 Kindergarten to Grade 6 refugee children with asylum-seeker permits that make them ineligible to attend state schools. The students are destitute, speak multiple foreign languages, and have cultures different from that of the local community. Students are bused from the refugee communities of Yeoville, Berea, and Hillbrow to Johannesburg and given lunch, school uniforms, and school materials.

The school is operated by teachers who volunteer their services. The languages of instruction are English and French, the core languages of the majority of refugees from Central and Western Africa. Many of the teachers are refugees themselves; they receive training and mentoring by the more seasoned teachers at Sacred Heart. Instruction is offered in mathematics, language, and social studies, with a focus on acculturation. This school is viewed as an interim or bridging school with the objective of, ultimately, transitioning these students into the state-school system. The principal of the school, in an interview with the third author, expressed the hope that "the school need no longer exist in five years" and that these students would, by then, be receiving regular-school instruction and have secured immigrant status.

Palmview Secondary School. This state high school is set in a high-crime area in one of the poorest communities in Phoenix, KwaZulu-Natal. It serves 980 students, 60% of whom are South African of Indian and Asian descent, 30% of whom are African, and 10% of other origins. The school incorporates homeless learners from "informal settlements," who live in extreme poverty. The school has 20 teachers, seven of whom are not fully certified, and the average class size is 45 learners. Facilities in this school are sparse; it has no gymnasium, no auditorium, and no technological aids in the classrooms.

What is astounding about this school is the fact that, in 2007, this school achieved a 100% pass rate in the Grade 12 Independent Examination Board national examinations (IEB), one student won the National Debating Championship, and three students won Provincial Debating competitions. Strategies accounting for the excellence achieved in this school include firm discipline, high expecta-

tions, performance monitoring of every student, a mentoring program offered by teachers for individual Grade 10 students, faculty in-service training, regular contact with parents, a supportive school, and general enrichment, including inviting motivational speakers for the benefit of all students. The teachers in the school identify 60 students, the top three students in each class, for the "High-Flyers Club." This Club provides a range of enrichment activities, including presentations by leaders in the community, visiting lectures, field trips, and access to mentors.

The African Leadership Academy. This is an independent boarding school, situated in Johannesburg North, with outstanding classroom facilities and technological supports, science laboratories, residences, and a minimal library. It opened in 2008 with 97 high-ability students who were identified and selected from 28 African countries. Students were identified in each country, based on teacher nomination, student school-achievement scores, and performance on the African Leadership Academy admission test. Criteria for admission include a high grade-point average (ranking in the top 10%), a high score on the school-admission test, which assesses leadership potential, entrepreneurial spirit, dedication to public service, and a passion for Africa.

Since many of the students come from low-income backgrounds, they receive scholarships to attend the academy. Teachers are representatives from different countries, including Ghana, Kenya, Morocco, Tanzania, France, England, China, United States of America, and South Africa. Students work towards challenging and rigorous Cambridge examinations with an Afrocentric curriculum.

There are three components in this curriculum: (a) The Multidisciplinary Academic Core (consisting of mathematics, science, English, foreign languages, African studies, and three A-level courses), (b) the Leadership, Entrepreneurship, and African Studies (LEA Curriculum), and (c) the Culminating Service Project. The curriculum is problem based and includes discussions, case studies, guest speakers, mentorships, collaborative projects, new technology applications, and visual and performing-arts projects. While this school does not address the needs of the immigrant community directly, it offers an exemplary curriculum that is appropriate for diverse, gifted students who speak a range of languages and come from many different countries. Considering the current political conflicts in Africa and the variety of challenges facing the country, these students have the potential to become South Africa's future leaders.

Conclusions

Although there are many common challenges and suggested solutions associated with appropriately identifying and servicing gifted immigrants and refugees worldwide, there are also differences that are unique to individual countries. Although only three countries are represented in this brief analysis, albeit from three different continents, it is, nevertheless, possible to deduce global implications, while recognizing issues, separately, as they relate to each country's changing immigration and refugee patterns, mobility, and geopolitical factors.

In the United States of America, a nation built on immigrants with multiple languages and cultures, the identification of and educational programming for its gifted has had its challenges (with findings suggesting that assimilation decreases productivity). According to Nguyen (2008), as immigrants shed their native language, culture, and identity, their achievement levels decline towards the achievement levels of average students. Misdiagnosis and inappropriate placement of immigrants and refugees in special education programs has been documented in the literature (Harris, 1991b). Since cultural compatibility with the dominant group seems to be essential for immigrant and refugee students to realize their potential, we suggest that definitions of giftedness and planning in the United States, alternatively, be filtered through cultural understanding, teacher training, and programming that speaks to the individual's cultural base and learning style and acknowledge that ethnic culture has a protective effect for gifted immigrants and refugees.

In Brazil, despite decades of well-documented criticism, the public-school system still shows a painful inability to deal with the more able and talented students. Consequently, the onus falls upon commercial companies to fill the need for training gifted and talented youngsters. Brazilian children attending public schools in slum areas located near rich neighborhoods have a greater risk of failing

because the economic contrast between affluence and poverty conditions is exacerbated, emphasizing disadvantage and a widening of the achievement gap. At least for this group, a more equitable course of action must be found.

Africa is undergoing a renaissance with the evolution of new ways of thinking and identity and education systems that reflect an Afrocentric perspective. Providing an appropriate education for its gifted immigrants is a fundamental part of this vision. This is addressed with a rejection of all forms of separation and with sensitivity to past inequities. Differentiated instruction for all high-ability students, regardless of race, is also seen as a priority. Successful programming for gifted immigrants is exemplified by the creation of schools for refugees, the identification of highest-performing students, and the establishment of a leadership academy.

Implications of the findings from the three countries discussed, one in each of North America, South America, and Africa, all point to a changing world picture and the importance of recognizing and educating the gifted among migrants, immigrants, and refugees. In the light of the move towards cultural congruence, an effort should be made to avoid the perpetuation of harmful, repressive patterns, including adhering to stereotypical views, importing negative values from their country of origin, and focusing exclusively on acculturation within the receiving country. Indeed, the future of the world depends upon mining the talents that, at present, lie below the surface. Recognition of educational problems faced by countries with large numbers of immigrants and refugees is only a first step, and every effort should be made to maximize this valuable human capital. This can only be accomplished through the use of appropriate identification and effective intervention procedures that address the needs of this population and provide working models that incorporate viable, flexible, and adaptable solutions.

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PART 2: ENRICHMENT APPROACHES

1. Teachers' Attitudes and Gifted Students' Socio-Emotional Competencies

June Slee

Abstract

Failure to address educational concerns, including academic advancement, psychological problems, and co-morbid learning disorders, can lead to gifted students experiencing difficulties in developing socio-emotional competencies. These have a positive impact on learning outcomes. Teachers' attitudes and pedagogies are central to the promotion of these competencies in gifted students. In this paper, field vignettes illustrate how some teachers intentionally and unintentionally affect their gifted students' social and emotional development. Teachers of gifted students require positive attitudes, advanced pedagogical skills, and, most importantly, the capacity to program for socio-emotional learning, both formally and informally. Strategies are outlined in this paper to guide teachers in the development of gifted students' socio-emotional competencies and, thereby, in the provision of equitable educational opportunities.

Gifted students in regular classrooms may fail to develop social and emotional competencies if their academic and emotional needs are not met (Davis & Rimm, 1994; Gross, 2004). This paper suggests, conversely, that unless gifted students are socially and emotionally competent, their academic work is likely to suffer. Field-work vignettes, included in this paper, illustrate instances where a combination of teacher attitudes and student skill deficits adversely affects gifted students' socio-emotional learning outcomes (Slee, 2007). While some teachers fail to nurture social and emotional competencies in gifted students, others assume they have these skills inherently. The field studies show there is little evidence to support this assumption and much evidence to challenge its validity.

In order to enhance the development of social and emotional competencies that have a positive impact on learning outcomes, teachers of gifted students require positive attitudes and advanced pedagogical skills. Most importantly, however, they need to include socio-emotional learning as an integral part of the curriculum. In the latter part of this paper, a discussion of pedagogical strategies is provided aimed at assisting gifted students to gain socio-emotional competencies, in inclusive settings (Cook, 2004; Slee, 2008), and, as a consequence, enjoy more equitable educational opportunities.

Socio-emotional learning (SEL) refers to educational programming which focuses on feelings, attitudes, and behaviors. Elias and Schwab (2006) define SEL as the process of gaining competency and intrinsic motivation for emotional self-awareness and self-regulation; safe and responsible behavior; and assertive, empathic, and skillful interaction.

Social skills are best described as learned sequences of individual behaviors that combine to form satisfying interactions. Essential social skills focus on the importance of positive peer relationships and include developing self-control, learning to reflect empathy, interacting positively with others, and expressing feelings sensitively (Larrivee, 2009). They are the building blocks of social competence and are taught informally and formally. Groundwater-Smith, Ewing, and Le Cornu, (2007, p. 130) claim that "like other skills, social skills need to be taught" and stress that the educator needs

to teach children "the explicit skills of relating positively to one another, working successfully in groups and working collaboratively." Teaching social skills—self-awareness, self-management, social awareness, relationship building, and responsible decision-making—in the inclusive classroom should be a curriculum priority as they are the core components of socio-emotional learning and lead to positive and productive interchanges with peers (Casel, 2003).

Teacher Support for Inclusion

The 1980s initiative to include students with disabilities in regular classes with same-aged peers was a significant paradigm shift for Australian educators. A recent government report found that teachers are still only moderately supportive of the inclusion of gifted students in the regular classroom, but this is a more positive view than had been held previously (DEEWR, 2007). For many years, in most Australian states, gifted students have had the option of competing for a place in an "Opportunity" class. Competition for limited places was strong, and, although gifted students were traditionally classified under the aegis of special education, those who did not gain entry to the Opportunity class remained in regular classes. With the move to inclusion, teachers were expected to accommodate their needs as thoroughly as they would for students with disabilities; however, teacher capacity to design and implement differentiated curricula based on individualized educational plans depended on the resources, culture, and support within the schools. Certainly, in the early days of inclusion, these components were limited, having a notable impact on the quality of inclusive practices and teacher enthusiasm for them.

Today, teachers still hold ambivalent attitudes towards inclusion with many finding that it adds to the overall stress of their work with few tangible returns.

Attitude and Behavior

Externalization of teachers' negative attitudes has detrimental effects on gifted students' academic and social learning. While it is not possible to be certain of how teachers feel about gifted students, it is possible to observe how they behave towards them. Teachers of gifted students need customized support to build up their knowledge, confidence, and capacity to deliver differentiated instruction. Before this, though, they need to examine their attitudes and behaviors towards gifted students.

In the 1990s, as an itinerant support teacher of behavior in a large Australian city, I received many referrals to assist gifted students who were failing academically and socially in inclusive settings. Some of these students expressed frustration and anger, disrupting teaching and learning, while others simply withdrew from learning altogether. Few of these students had been identified as gifted and were, consequently, languishing academically and socially. Although the referrals were student-based, I found, in most cases, teachers' attitudes towards the gifted students were a significant contributing factor to their negative behavior. In 1984, Purkey and Novak introduced a seminal model of teacher behavior as a change agent in the classroom. The model is supported with vignettes from the field illustrating interactions between teachers and gifted students. These vignettes suggest that teacher behaviors can consciously or unconsciously impede gifted students' socio-emotional development.

Purkey and Novak (1984) describe four types of teacher behaviors towards students: (1) intentionally disinviting, (2) unintentionally disinviting, (3) intentionally inviting, and (4) unintentionally inviting. It is important to appreciate the authors' definition of an invitation, namely,

> a summary description of message—verbal and nonverbal, formal and informal–[that is] continuously transmitted to students with the intention of informing them that they are responsible, able, and valuable. Conversely, a disinvitation is intended to tell them that they are irresponsible, incapable and worthless (Purkey & Novak, 1984, p. 10).

This model allows teachers to assess their behavior and provides them with criteria against which they can measure and compare their interactions with students.

Field Vignettes

The following vignettes of teacher behavior towards gifted students are based on my field experience as a support teacher of behavior.

Each vignette will be discussed in relation to Purkey and Novak's (1984) framework.

1. Intentionally Disinviting Behavior: The Mouse That did not Run up the Clock

> James is one of the twenty new entrants sitting expectantly on the mat in front of Miss Woods. She welcomes the five-year-olds to her class and asks, "Does anyone know 'Hickory, dickory, dock, the mouse ran up the clock'"? James calls out, "I do, Miss! And, I know them in French and Latin, too!" Miss Woods ignored James and, instead, asked a girl sitting with her arms folded: "Jane, can you tell us the words? You can? Then let's hear them, and James, in future put up your hand and don't call out."

Later, at morning recess, Miss Woods told her colleagues of this precocious five-year-old:

> Says he knows the words in Latin and French, too. I tell you what, the sooner he is out of my class of normal kids, the better.

It is significant that among the "normal" children in her class, Miss Woods had four students with learning disabilities, another one who came from pre-school labeled as a selective mute, and at least three more who demonstrated weak socio-emotional competencies. Yet, only James was identified by teachers in the staffroom as a potential challenge.

Miss Woods' behavior towards James was intentionally disinviting. She ignored his request, reprimanded him for calling out, and spoke disparagingly about him in the staffroom. Why did she react in this fashion? Her language in the classroom and staffroom indicated that she resented giftedness, believing it to be elitist. Her comment that "the sooner he was out of her class of normal kids, the better" was quite revealing. The use of the word "normal" suggested that she did recognize giftedness in James, but she was not prepared to teach to it. What really prompted her comment to her colleagues and her belittling behavior towards James? Was it that Miss Woods was not prepared to teach James because she had a negative attitude towards gifted students, or was it because she felt inadequate, as she had neither human nor material resources to design and implement an individual program which would challenge James?

2. Unintentionally Disinviting Behavior: A School with no "Name"

> Mary's parents were keen to have their daughter win a place in an Opportunity class, a homogeneous setting for gifted students in a local middle school. On the day of the entry examination for admission to the class, they accompanied their daughter to her local primary school for an interview with the principal. While waiting outside his office, they overheard him conclude a phone conversation by saying, "Well, I'd better go. I have some parents coming in to talk about getting their kid into the 'Opportunity' class. I don't know why they bother. She hasn't got a chance coming from this school." Hopefully, the principal would not have said this if he had realized that Mary and her parents were outside his office. As such, it could be called unintentionally disinviting, but, nonetheless, it had a devastating effect on Mary's examination performance that afternoon.

My field records show that gifted students are subject to more unintentionally disinviting comments than other students. Mary was a gifted student, and her parents wanted her to be challenged in a gifted, homogeneous setting. Parents who support their children through this process are often considered "pushy" by the referring school's teachers. The principal's comment that he did not know why Mary's parents were pursuing entry to the Opportunity class and that "[s]he hasn't got a chance coming from this [his own] school" is curious, given that the school is under his leadership. Mary, as a student there, is, unintentionally included in his low assessment of the school, and his remark may have, inadvertently, affected her chances to demonstrate her strengths at the entry examination later that day.

Unintentionally disinviting behavior demonstrated towards gifted students includes asking them to help other students with their work when they, the gifted students, are finished, rather than giving them more enriched and appropriate learning opportunities or accelerating them through the subject, or both. It also includes a failure by the teacher to notice and

question changes in students' academic and social behaviors. The student who is seldom praised, largely ignored, and subject to teacher put-downs is likely to stop trying, academically and socially, and to seek attention in undesirable ways.

3. Intentionally Inviting: Growing a Gift

> A young teacher phoned me one day and asked if I could see him the next time that I was at his school. He had a student in his class who had arrived recently from another state, and he felt that she had superior learning ability, and he didn't know what to do to meet her needs. When I saw him later that week, he gave me a list of the concerns he had. He wanted to know how to identify giftedness, how to accommodate this student in his mainstream class, where he could read "good stuff" about giftedness, whether it was possible to study the subject online, whether he needed to teach the student social skills, and whether there were any teachers in the vicinity who could mentor him.

This vignette describes intentionally inviting behavior which promoted the gifted student's successful inclusion in her new class. The first step in promoting this accommodation was the teacher asking for support. By initiating this action and seeking answers to his questions, he indicated that he was intentionally inviting the gifted student to be part of his class.

4. Unintentionally Inviting: A Flower Bloomed in the Desert

> Ms Forbes was overwhelmed by the challenges of teaching mathematics to Year-7 boys in a large, metropolitan secondary school. Most of the students did not want to learn, so she let them do what they liked, and, as a result, it was a totally unruly place, bordering on being dangerous. I was called in by the principal to offer some support, and, between ducking missiles, I saw a small boy at the back who seemed to be working. I went up to him and asked why he was working (as it certainly wasn't the culture of that class). He didn't hear me correctly and exclaimed that he was working. I told him I could see that and decided to drop the irony and inspect what he was doing. It was clearly advanced mathematics. He told me it was university-level work. Why, then, was he in this class, the lowest level of Year 7? He said he had repeatedly been placed in lower-level classes because when he was initially asked to do Year 7 mathematics, he had refused, finding it boring and his teacher thinking it too hard for him. Now, he was happy, as he could literally do what he wanted to do, and he wanted to do "hard" math.

This is an extreme example of unintentionally inviting teacher behavior, but it does make the point that the teachers need to be aware of the reasons students find teachers' behavior inviting. This type of behavior towards the gifted student can have serious ramifications, as it can lead to uneven rates of development or asynchrony (Winner, 2000). While gifted students are allowed to work continuously at advanced math, or sit at the back of the class, all day, every day, and produce outstanding artwork, or work privately on the computer, regardless of the subject area, it is to the detriment of balanced, academic- and social-learning outcomes and does not serve them well for future learning, employment, and social opportunities.

Understanding Teacher Behaviors

Why did the teachers in the first, second, and fourth vignette act negatively towards gifted students? Was it because Australians and New Zealanders pride themselves in their non-elitist, egalitarian approach to each other, believing that "Jack is as good as his master"? In Australia and New Zealand, the notion of egalitarianism pervades the education system and so, generally, inhibits the development of various education methods tailored to suit the needs of the individual's talent. To suggest differentiation of programming for the gifted to some teachers conjures the specter of elitism (Larsson, 1986).

When inclusion was first introduced, Australian teacher unions expressed concern that educators were ill-prepared and, in some cases, this was interpreted by teachers as opposition to inclusion, per se. Parents, allied professionals, and department officers were as ill-prepared as teachers for the complexities of the inclusion movement, and education lacked leadership in this area. The move to fully inclusive classrooms in the 1990s reignited the debate on the status of gifted students in regular classes. It was commonly believed that gifted

students did not need extra support, academically or socially, and that they did not experience social or emotional difficulties (Moltzen, 2000). My observations suggest that gifted students are still perceived as being able to make it on their own and, compared with students who have obvious disabilities, their needs are not seen as priorities (Slee, 2007).

Initially, the most challenging role for the regular teacher was to make special provision for gifted students. It is understandable that teachers who had an immediate and enduring interface with gifted students may have felt overwhelmed by the enormity of the task. Teacher attitudes can be affected by the learning characteristics of gifted students, which can be misinterpreted by teachers and lead to discord. Gifted students use superior learning processes (Munro, 2004), which can make high demands on teachers' preparation and teaching time; for example, they learn faster than other students because they know what learning entails, and they understand new concepts with ease and constantly seek more challenging work.

My field records show that identifying a gifted student can be difficult (Slee, 2007). In some cases, the student may not want to excel since the class culture does not support this. Berk (2008) states that some very able middle and secondary students deliberately mask their high-level ability. Certainly, the fear of being called a "nerd" is pervasive in schools. Often, a previous teacher has failed to recognize the student's exceptionality, and it remains unidentified as he or she progresses. In many cases, teachers have focused on what they considered more pressing concerns in the classroom and failed to identify gifted students.

Teaching Gifted Students Socio-emotional Competencies

The first step, as demonstrated in the third vignette, is to identify the gifted student. Failure to achieve early identification can result in the gifted developing dual exceptionalities, that is, being gifted and lacking socio-emotional competencies. The responsibility for initial identification of giftedness normally falls on the teacher. There is some evidence, however, that teachers often confuse conformity, neatness, and good behavior with being gifted and talented (Colangelo & Davis, 2003; Davis & Rimm, 2004). It is essential that teachers discuss their concerns about identification with school personnel who can facilitate the assessment process. In the meantime, the teacher should collect data to inform his or her decision making.

What information should be used in the identification process? Observations made over time in different contexts should produce examples of superior intellectual learning ability, specific academic aptitude or exceptional achievement in particular subject areas, creative or productive thinking, high intrinsic motivation, and critical thinking (Woolfolk and Margetts, 2007). There is also a need to identify concomitant social and emotional behaviors, including instances of anti-social or obsessive behavior and being the object of ridicule or bullying. If such factors are present, the student may experience low self-worth, pessimism, anxiety, depression, and even paranoia. These factors may affect academic performance, which can, in turn, make identification of giftedness more difficult for teachers.

Teachers must examine their attitudes towards gifted students and, if warranted, begin to change them. The first step is to acquire knowledge and skills that will inform inviting behaviors, including pedagogical approaches to programming that enhance socio-emotional learning. Academic, social, and emotional learning domains are interdependent, so it is essential that socio-emotional learning is taught as part of the curriculum, both formally and informally, regardless of whether approaches of acceleration, enrichment, or both are used.

According to the Australian Council of Deans of Education (ACDE), the role of education in the 21st century is about students developing self-awareness, self-management, social awareness, relationship skills, and responsible decision making (CASEL, 2003). The self-aware gifted student has a realistic understanding of his or her feelings, interests, values, and strengths, which contributes to a heightened sense of self-efficacy. The socially aware gifted student is able to empathize with others, understand social consequences of behavior, and act on the basis of social rather than self interest. Self-management is also referred to as self-regulation. The gifted student, competent in self-management or self-regulation, is able to monitor and adjust his or

her behavior to achieve targeted outcomes. Relationship skills involve learning to interact positively with others, resisting peer pressure, developing situational awareness, avoiding conflict, and seeking help when necessary. Responsible decision making is an essential skill for all students. It involves being able to make decisions that have no harmful consequences for others and that contribute to academic and social gains. Each of these core competencies must become part of the gifted students' overall pedagogical outcomes if they are to progress as socially and emotionally competent learners.

Specific Strategies

The premise of this paper is that gifted students, like all students, need to be taught core social and emotional competencies through the formal curriculum. These competencies, as identified by Goldstein (1999), an acknowledged expert in this area, are taught through five core strategies: modeling, role-playing, performance feedback, generalization training, and problem solving.

Teacher modeling. This strategy consists of the teacher identifying and praising a desired social interaction exhibited by a student in the presence of another student who lacks skills in this domain. If a non-gifted student is commended for using a social skill that a gifted peer fails to use (e.g., anger control) then, the learning can be bi-directional. It is equally important for non-gifted and gifted students to realize that they can teach their peers.

Small-group role-playing. Students can practice the sequences of a social skill by acting out scenarios that represent real-life situations. Students should be given the opportunity to play each role. The dynamics of the group are important. In the acquisition stage, two students with social skill deficits should not be placed in the same group. If education is meant to prepare students for a society characterized by interdependence and cooperative effort, teachers must provide all students with frequent and meaningful opportunities to work cooperatively in groups (Jones & Jones, 2001).

Performance feedback. The gifted student should receive constructive feedback from the teacher and peers during role-playing of social scenarios. The relationship skills must be reinforced in real-life in order to be authentic and become internalized. Teachers should provide many opportunities to reinforce unrehearsed, as well as rehearsed, demonstrations of socially and emotionally competent behaviors.

Teaching for generalization. Often, skills that are taught in the classroom stay in the classroom (Slee, 2008). Generalizing, the capacity to apply newly acquired skills in settings other than those in which they were learned, may be challenging for some if it is not taught explicitly. A major problem with teaching social competence is that newly acquired skills tend to be specific to the situation. Skills should be taught so that they can be generalized across settings and people. Generalization is likely to occur more quickly and be more effective if naturally occurring social reinforcers are used, including verbal comments and nonverbal gestures, such as smiles and eye contact (Rosenberg, O'Shea & O'Shea, 2006).

Problem solving. Problem-solving techniques should be taught, particularly when gifted students encounter difficulties using social skills. Even if they already have such skills, they may still lack the capacity to discern when and where each should be used. Problem solving for the student consists of identifying the reason for the failure in reaching a goal and constructing and implementing an alternative plan for a more successful outcome in the future.

Conclusion

This paper, examining the role of teacher attitudes and behaviors on the gifted students' development of social and emotional competencies, showed, through field vignettes, that teachers can exhibit behaviors, either intentionally or unintentionally, inviting or disinviting, that may impede students' academic, social, and emotional growth. Possible reasons for teachers' negative behaviors towards gifted students exist within the framework of Australia's inclusion movement. Teachers with anti-elitist attitudes may feel challenged if they lack the appropriate pedagogical skills, particularly in the process of identifying gifted children. Teaching for socio-emotional learning has posed difficulties for teachers whose attitudes are not aligned philosophically with the practice of inclusion and has proven detrimental to the development of gifted students'

social skills. This has necessitated the teaching of social skills explicitly, as an integral part of the formal and informal curriculum. The teachers' use of strategies, such as modeling, role-playing, performance feedback, generalization, and problem solving, may help to ensure that gifted students will have the opportunity to develop social and emotional competencies and, thereby, also be afforded a more equitable and challenging education.

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2.
Keys to Creativity Through the Music Heartland Project

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Abstract

In music education, encouragement of musical creativity among gifted children is often neglected in favor of technical and interpretive expertise, typically regarded as more essential in the discipline. Yet, in gifted and talented education literature, creativity is frequently cited as integral to the very idea of giftedness. This paper considers the effects of extended projects on creative aptitude and musicianship. It is based on data from Music Heartland, a Dunedin school-based project (2003 – 2005), which offered significant support for children's development of creative music products. Three examples of music are considered from a range of acoustic- and technology-based projects created by children after short periods of instrumental development. In the field, this music might be regarded as unique rather than original, apart from the acceleration of their technical skills. The results of the project show that extended, creative activity appears to accelerate the growth of significant musical understandings, independence, personal efficacy, and individual musical proficiency. Confirming the findings of Hargreaves (1999) and views of Piirto (1999), tentative guidelines are offered, that may be pertinent for schools or other providers, which seek to foster a broad sense of musicianship among musically gifted children, thereby finding ways to encourage a community of authentic creative activity.

Music Heartland was one of 17 gifted and talented projects that received three years of Ministry of Education funding in New Zealand, the first such initiative in that country. Between 2003 and 2005, nearly 250 children were nominated from a hub of eight south city primary and intermediate schools. One-hundred and sixty of these entered what was called a first ensemble stage. Of those, about 60 were selected to proceed to the more advanced stages of the project.

The program was loosely based on Renzulli's three-level Enrichment Triad Model (Renzulli & Reis, 1985), although, in retrospect, Music Heartland's Stage One level was, possibly, more intense than Renzulli's Type I activities. The yearly program included ensemble work, keyboard and theory, other instrument learning, and creative work. The focus on instrumental learning reflected the author's wish to engage children deeply, since research in New Zealand (Crooks, Smith, & White, 2009) suggests that children rate playing an instrument as the most enjoyable aspect of music at school, even though it may be only an occasional experience.

Literature Review

In evaluating children's creative outputs in the Heartland project, three literature threads became significant: the significance of society and culture in innovation, the significance of domain in conceptions of creativity, and the challenges around domain evaluation where the intention is to engender creativity.

Csikszentmihalyi (1996, p. 182-183) describes the production of novelty as the result of an unquenchable curiosity and fierce determination to succeed, regardless of the environmental influences of family or school. Important for educators, he suggests that domain training is increasingly necessary for high-end creative outputs to be produced. More recently, Renzulli (2004) and Gardner (2007) have highlighted a need for social conscience and appropriate leadership to be fostered within the creative outputs of children and adults (Renzulli, 2005a, p. 66; 2005b, p.

270). Morrisey's (2001) evaluation of Jimmy Hendrix's work, however, reveals, that careful scrutiny is advised where there is a likelihood of moral overtones overshadowing what might be considered creative.

Evaluating creative products is a complex undertaking. A predominance of international literature favors giving a student the opportunity to produce creatively, rather than relying on testing for evaluating creativity. Concerning breadth, Han and Marvin (2002) encourage educators to facilitate the development of success in one domain, as it is the most likely path to wider creative ability. According to Csikszentmihalyi and Wolfe (2000), while one might think of creativity as an identifiable, intrapsychic process, the evaluation of it occurs at an intersection of the individual, a domain, and the field.[1] Therefore, what is deemed creative reflects the predisposition of those assessing, including their "past experience, training, cultural biases, current trends, personal values, and idiosyncratic preferences" (p. 82).

Given the intention to empower children in their creativity, the frame, purpose, and significance of creative outputs merits careful consideration (Parkyn, 1984, p. 59; Piirto, 2002, p. 148). The significance of that is shown by New Zealand research data (Keen, 2004, p. 272) which suggests that gifted and talented students place a low value on learning processes that call for imaginative responses, in spite of schools recording evidence to the contrary. As a framework for creative outputs, authors, such as Piirto (1999, p. 154), Parkyn (1984, p. 56), and Fraser (2004, p. 159), advocate the need for exploration without the pressure for quick results in creative scenarios. Piirto, for example, identifies the enhancers of creative aptitude as an accepting environment that is sensitive to a specific product, the provision of space or solitude, and a collaborative spirit among students and teachers (Piirto, 1999, p. 154). Philosopher Suzanne Langer suggests that, in the music sphere, creative exploration is context driven and requires deep connection with subject matter (1942, p. 141).

New Zealand psychologist, George Parkyn (1984), in his description of appropriate creative work for gifted learners, supports the need for incubation and wait-time and underplays cognitive operations. While acknowledging that the artist eventually needs to convert creative ideas into perceptible form, Parkyn describes the pre-cognitive events as unconscious processes that are too complex to put into words (1984, p. 57). In this respect, curriculum frameworks can, all too readily, curtail desirable qualities of creative exploration, in favor of "getting it right." This poses a risk to the reflective potential of learning in the arts discipline, where the producers "constantly reflect on and refine their creative inventions, connect ideas with other musical and non-musical experiences, and transform these understandings into new contexts and new paradigms." (Dunmill, p. 75)

The significance attributed to children's creative outputs varies markedly within the literature. Citing Csikszentmihalyi's emphasis on field, Elliott (1995) proposes that the musical musings of the young child can be categorized as novelty and without substance to the domain (p. 221). Hargreaves (1999, p. 24), however, notes that there is a blurred line between improvisation and creative product. He cites Sawyer (1999) in describing everyday creativity which has improvisational thinking at its heart (p. 29). In highlighting potential in the social creative process, Hargreaves observes elements such as the individual wanting to make a contribution (social or collaborative), some brokerage of leadership within the composition, and cultural framing. Finally, in regard to what is significant about children's creative outputs, John Paynter (2002) stresses that creative activity or "early making up of [musical] pieces" engenders judgment, decision making, and the courage to stand up to those decisions (Paynter, 2002, p. 224).

Learning That Occurred in Heartland Creative Programs

The goals of creative learning in the Heartland programs were multi-fold: collaboration among classroom teachers, individual and shared work among students, purposeful composition, and the children's musical exploration and understanding of the discipline. The expected outcomes of the program included (a) an increased understanding of the elements of music and their interplay, gained through practice and discussion, (b) an ability to compose for the classroom, for conventional instruments

[1] Csikszentmihalyi's conception of "field" is the body of expert people and knowledge within the domain.

and voice, and for different audiences, (c) a growing awareness of sound quality, musical effects, and mood, (d) one to two compositions, developed individually or collaboratively, of up to two-minutes duration, and (e) engagement in workshops and reflecting on their own musical composition or performance and that of other students or composers (Heartland, 2003).

The organization of creative projects was complex because it included cross-curricular activity, multi-school and cross-grade-level grouping of children, an increasing desire on the part of teachers to group children according to ability, and the infusion of choral elements into some projects.

There was wide diversity in the in-depth projects, with various musical and curricular applications. Some projects were based on stories or themes; some were associated with distinct cultures; others utilized technology; and yet others focused on improvisation in various genres or composition for specific instruments.

Children worked independently and performed during designated sharing times. The expectation was that children would come to understand that creative work is a celebration of the practical skills and musical knowledge developed through the project.

Twenty-two creative projects were developed and performed for peers, schools, the wider community, and for the Heartland sharing times. In any given year, approximately 60 children (aged 7 to 13 years) were involved as a first-, second-, or third-year participant in ensemble, instrumental, or creative work. While all students involved in any part of the Heartland project were invited to be part of the creative projects in 2003, it was surprising that by 2005, schools and tutors were increasingly more open about their desire to bring together the highest-achieving children in the creative projects.

Evaluation of Creative Products

The pieces which the children created were evaluated according to the schema in Appendix I. The schemata were compiled largely from the New Zealand arts exemplars (Ministry of Education, 2003) and the National Education Monitoring Project (NEMP) achievement research (Flockton & Crooks, 2004). The intention was to evaluate the expressive and cohesive elements of the compositions, as well as their technical features.

Insight into the children's compositions can be gained by examining samples of their projects. Three exemplars, reflecting the diversity of interests and representative of children of all ages and their length of involvement in the Heartland project, are "Trash Band," "Journeys," and "Where We Belong."

"Trash Band"

"Trash Band," one of the earliest pieces of the project, was composed in 2003 around the theme of recyclable materials as instruments. The United Kingdom phenomenon, *Stomp,* was the inspiration for it. The project involved thirteen children, aged eight to ten years, from two schools. The piece begins with a single rhythm, played on recycling bins, and builds in intensity through a layering of several polyrhythms played on other sound sources, such as large coke or plastic milk bottles. The characteristics of the *Trash Band* piece include the following:

- a wide diversity and complex adaptations of base rhythms, some of which are intricate and feature an interplay of duple and triple meters;
- an application of many scoring devices, including long periods of rest and a variation of dynamics for instrument types and for the whole ensemble;
- layered and unbundled rhythms and inventive applications of instruments, creating diversity of texture, subtle tone-color shifts, and mood intensity;
- multi-layered rhythms revealing complex-level hocketing[2] devices; and
- structure demonstrating applied knowledge of overarching balance and mood shifts.

Within their performance, children provided leadership and responded to variations in performance dynamics, and sub-groups took responsibility for sustaining rhythmic consistency. There was overall accuracy in the playing, a good response to challenging

[2] Hocketing is a term applied to ensembles, such as bell ringers or Solomon Island Pan Pipes, where individuals are responsible for playing a few pitches on appropriate instruments where these occur in a melody.

rhythms, and sensitivity in the children's treatment of the enviro-instruments. There was also a balance of parts throughout and a regular variation of texture. There was little doubt that the children took enormous pleasure in thinking about and exploring a diversity of music elements.

"Journeys"

"Journeys" was created specifically for the Southern Sinfonia's 2004 school concert program and was performed for more than 3,000 children. The composition and rehearsal processes were extensive (approximately 36 hours), as it was essential for the child composers to be confident performers.

The music represents a condensed history of the Aotearoa region of New Zealand, reflecting the traditional tikanga, the music of new settlers and their integration, and ending with a song in a popular style about living in New Zealand. The arrival of new cultures and their integration into the mainstream is shown by snippets of music traceable to their country of origin. The music also includes historical features, with early sections being atmospheric and chant-like, indicative of the early music of the Māori.

"Journeys" reveals an elaborate use of musical devices, creative dynamics, and intricate instrumentation, which were assessed accordingly.

Story threads. Music was utilized to support storylines and related images. There were numerous short threads or fragments that suggest activity or culture. The music demonstrated the assimilation and application of musical understandings as part of the creative process.

Harmonic devices. There was a range of drone and pedal points, used as sustaining and linking devices, typically on the fifth of the relevant diatonic or pentatonic scale. Approximately two-thirds of the way through the piece, the pedal became the familiar drone of the bagpipes, then harmony for a reel. Counterpoint occurred between "Shortnin' Bread" and "In Excelsis Deo." Several melodies were chorded, the most distinctive being the hornpipe and the final song using alternating B^b minor and F chords, creating an energetic and effective resolution to the composition. In addition to the chordal progressions, several short, melodic sections near the beginning of the composition were characterized with passing, dissonant harmonies. The weaving pentatonic section was clearly a representation of new Asian settlers.

Instrumentation. Most of the "Journeys" composition was carried out using electronic keyboards and percussion, which remained the key tone colors in the finished product. The total composition of about twelve sections reflected careful consideration of instrumentation. All but guitar were used for melodic figures, and all but voice were called on in an accompaniment role. There were unusual pairings of tone colors, for example, a successful short question-and-answer section between clave and electronic keyboard.

Structure. For the most part, sections dovetailed through a rhythm being carried over, a restatement of rhythmic or melodic material, or, sometimes, a sustained drone. Some transitions, however, seemed more awkward with moments of insecurity about where to go next. Transition issues possibly reflected the significant performance pressures more than creativity matters. Accuracy might have been improved by the use of pauses to signify the beginning of new material or gradual fading to round off previous material. Although the ideas of multiple composers were woven together, there was an overall congruence in the thematic ideas within each section.

Symbolism. In regards to the musical content, the short sections frequently presented a known music idea intended to evoke an image, time, or place. Typically, there was an opportunity for longer sections to have evolved from these components; however, the composition moved on purposefully which, sometimes, left a feeling of being unresolved. Some sections featured an individual's work, for example, the opening melody played by one student. Other sections reflected creative exploration and arrangement, involving short duos and whole-group sections, a good example being the final song—a combination of "Shortnin' Bread" and "In Excelsis Deo."

Performance evaluation. While student-involvement levels varied markedly, most students showed sensitivity to each other in performance, reflecting the collaborative work

Table 1. *The Structure, Voicing, and Chord Progression of "Where We Belong"*

Introduction	Verse	Verse	Chorus	Improvisation	Verse	Verse	Chorus
Picked guitar, which introduces the chord progression for the verse: *G, G/F#, Em, G/D, C, D7	Verse melody with solo singer over established chord progression*	Flute melodic solo over established chord progression*	Solo singer takes top line, with other voices harmonizing on coloring notes of repeated chord progression: **Em, Em/D, C, B	A middle, eighth-like section in which there is improvisation on piano, guitar, and conga drums, all developed around the chord progression established in the verse*	Verse melody with solo singer over established chord progression*	Verse melody combined with the flute melody, acting as a counter melody over established chord progression*	Chorus repeats **and fades to close on mediant minor chord Bm

The * and ** indicate the placement of the two-chord progressions used in the song.

evident earlier in the project. Technically, the range of devices used across all music elements showed the students' ability to manipulate sound and their awareness of the effects of varied melodic structures, intervallic construction, simpler harmonic devices, and diverse textural effects.

The extent of challenge varied across sections of the composition, and the music reflected the technical instrumental capability of the children. With regards to tone color, balance of voices, mood and texture contrasts, and song character, however, a surprisingly high level of innovation, sophistication, and ownership were evident. The cohesion of the piece revealed that thought had been given to the emotional impact of the music, from its mother-earth-like atmospheric beginning to the final song. The diversity of blends, contrasts, and use of restatement showed that the participants applied relatively advanced knowledge of music elements successfully in this creative context.

The degree of learner independence in creating "Journeys" was difficult to assess as, no doubt, guidance and direct facilitation were critical to its overarching structure. Nevertheless, it was evident, in rehearsals and performance, that desirable variation emerged as different individuals contributed to thematic sections, and that, for the most part, the performers were obviously engaged when presenting their personal components or supporting others.

"Journeys" gave evidence of children responding to the demands of the composition process, including taking starter thematic ideas and exploring them, reworking, sharing, reflecting, and consolidating. The music contained numerous, familiar musical icons; however, over its eight-minute duration, originality, as well as conviction about the worth of personal creative ideas, seemed evident among the young composers.

"Where We Belong"

"Where We Belong" is one of the last pieces that the Heartland children created, composed as one component for a presentation at a Ministry of Education gifted and talented conference in 2005. The group presented approximately 30 minutes of music, including arrangements and instrumental pieces. The children were from four schools, representing a wide socio-economic spread, and were chosen as the most talented and committed children in Heartland at that time. The development of the complete program was half or whole days each week, spread over a 10-week school term.

Memorable melodic ideas showed genuine variation between verse and chorus. The verse melody was wide ranging and created a poignant mood through the use of a major sixth, repetition, and flowing rhythms appropriate to the lyrics. In the chorus, the melody became the top line of a stepped, descending sequence, reinforcing the repeated chord progression (See Table 1).

This arrangement has effective structural features befitting its popular ballad style, including the placement of verse and chorus sections

and its four-bar phrases. The major-minor alternation between verse and chorus also acts as an effective structural and contrasting device.

The instrumentation consists of two keyboards, three guitars, conga drums, flute, and solo and harmony voice parts. Even with the benefit of a sound system, this is a difficult combination to balance; hence, the performer's responses to dynamics and mood shifts reflected a strong sense of commitment. In this regard, the children's responses and confidence in each other, as performers, is traceable to the qualities encouraged in the creative processes that produced "Where We Belong."

Technically, the melodic and improvisational material is memorable, and, as a listener, one needed to have little concession for the young age of the creators and performers. In accordance with popular song styles, the chorus has greater urgency in the accompaniment lines and vocal harmony as it moves through the repeated chord sequence. Each improvisation has spontaneity, and players confidently assumed the mantle of soloist, albeit within the limits of their technical expertise. The improvisations did not stray far from chordal notes, but they were free and pleasingly shaped. The Pasifika rhythm feature, played on congas, intensified the mood, and the rest of the band matched this challenge.

The performance of "Where We Belong" reflected the application of successful strategies for creating a variation of mood and instrumentation, and there was a high level of accuracy throughout the song. The best demonstration of this occurred in the picked guitar opening, which set a contemplative mood leading to the more compelling rhythms of the verse.

The performance evaluation suggests that all performers had contributed to the development of "Where We Belong," playing the instrument learned through Heartland, even if it was their second instrument. The improvised sections and the integrity of melodic sections in shape and completeness all reflected the confidence of these performers, thinking creatively and expressing ideas through limited instrumental experience. This is of significance because, at the time of composition, the children had had fewer than 40 hours of instrumental coaching, spread over a period of one to three years, depending on when they were selected for the Music Heartland project.

Learner independence, noted through their interpersonal and individual strengths, was most evident as the children adjusted to variations in the song and adopted different roles. Their commitment in the live performance reflected children who think musically and enjoy their personal creative nature. The final harmony of an E-minor chord at the end of "Where We Belong" provided a poignant, musical affirmation of the children's view about where they belong.

Perceptions About the Effect of Creative Work in Music Heartland

Specific, creative music-making, led by specialist tutors with performance goals, was, almost certainly, new to most of the individuals involved, children, parents, and teachers, alike. Feedback on "Journeys," in particular, generated anecdotal responses that attested to the significance of this creative element in the project. Students commented on the fun of "[finding] out about making all the music…[and] getting the chance to make your own music" (Year-2 child participant, 2004). By early 2004, children realized that to have something creative to share was special. When asked what they would show off to a visitor, most children indicated it would be something group-based and creative.

Parents recognized the struggle involved in generating a creative product of quality and the fickleness of children's confidence, supported by comments such as "I don't think that they had a sense of how good it was, until they actually performed it" (parent of a Year-2 child participant, 2004). Those fulfilling the role of school-liaison teachers issued similar messages about the importance of creative activity in Music Heartland, and classroom teachers realized that creative activity was possibly a curriculum gap in their schools. They also agreed that the creative element set Heartland apart in terms of meeting the needs of gifted and talented children, that it emphasized "…the creative end and the application end rather than more of the same, which…is the danger with some of the things people call gifted and talented programs….This isn't blowing harder on the trumpet, this is actually totally different" (liaison teacher, 2004). The specialist tutors saw creative projects not only

as demanding and intense but also as providing an avenue for expressing commitment and independence in individual children. Unprompted, tutors recognized that the Heartland philosophy had brought a shift in their approaches to teaching in other contexts, saying that "I'm trying to get them [the children] to do more creative work in their individual lessons now...[I]t wasn't [part of] my learning experience, so it's taking me a while to get to that way…of teaching…" (tutor, 2004).

Conclusion: The Implications of Creative Work in Music Heartland

Much can be said about the effectiveness and implications of this creative musical activity. At the end of the first year, the creative projects were somewhat of a revelation, and there was a genuine resolve to continue the investment in the creative development that had blossomed among all of the participants.

Certainly, in relation to knowledge and practices in the music field, the work cannot be claimed as original; however, looking at the creativity of the project, relative to the knowledge and experience of the child participants, some extraordinary products emerged. These products demonstrated a response to a diversity of style, a high quality of understanding about melody, and the subtle use of tone color and texture. To a lesser degree, yet, with some depth, there was an active appreciation of simple harmonic effects and application of devices, which provided cohesive structure and clear development.

Socially, a genuine bonding and involvement was apparent among the groups of children from multiple schools and various grade levels. Numerous groups worked on sub-themes simultaneously, which the tutor and children eventually coalesced. With a long-term cooperation, by the end of 2005, the rather shy group of 2003 showed pride and a sense of belonging as they shared their work and responded to the work of others.

Placed gently into the context of schools wanting to foster musical talent, the Music Heartland model gives clear indicators of social and musical investment and suggests the level of challenge required to excite and engage musically gifted learners. Given an opportunity to create, the musically gifted child will desire to

- explore sounds and their qualities and look for sound potential in their surroundings;
- investigate how sound can be manipulated;
- think and talk about the effect of sounds, character and combinations of sounds, and enjoy their manipulation in order to hear and appreciate their effects;
- respond to the demands of different forms of musical patterns, involving tone color, texture, dynamics, rhythm, melody, and harmony;
- understand and apply elements of repetition, contrast, and unification, as well as "surprise" elements;
- record and perform their created music, experimenting with different technologies;
- create a portfolio of improvised pieces reflecting home-life, various cultural themes, specific knowledge of music, school-subject matter, and personal expression;
- investigate how others use sounds in different contexts (community, cultural, ceremony, genre) and, evaluate their own work and that of others;
- resist the pressure to truncate the development of his or her music to suit the teacher or program; and
- have the classroom teacher and the school value his or her creative outputs.

Products, such as "Journeys" and "Where We Belong," are more sophisticated than what one would typically expect of creative work in a generalist, or even a specialist, classroom for this age level in New Zealand. Furthermore, the children developed curiosity and a belief in their potential to create, attributable, in part, to the kind of self-evaluation processes recommended by Jane Piirto (2003), as well as to favorable conditions for promoting creative activity,[3] as described by George Parkyn (1984, p. 57). This perspective on creativity also aligns with VanTassel-Baska's (2009, p. 4) contention that "[t]he idea of creativity is more exotic than its reality which requires a harmonious confluence of variables in order to support its development."

[3] These conditions included wait time, incubation, and a learning frame in which the ideas of children did not have to be cemented quickly.

The Music Heartland project provides the evidence that the development of meaningful, applicable musical skills and understandings in children requires, of necessity, tutor expertise, the opportunity for deep, creative activity, patience with children as they create their products, and school commitment.

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Appendix 1: Evaluation of Performance and Creative Product

Element	Playing	Creative
Involvement of the child Intensity of concentration Interaction, wanting to participate	• Interest • Enjoyment • Acceptance of a wide range of music • Involvement and participation • Inspiration and aspiration • Collaboration and willingness to debate and contribute	
Response of the child to **musical style**	Control, given the instrument(s) being played, and the level of technical expertise	Composing appropriate to mood, purpose, and musical style
Response to **ensemble**	Tempo, playing in time, nuance, feeling changes, and responding to each	
Growth of **technical expertise**	Made evident on respective instrument or voice, encapsulating rhythm, melody, range, articulation, and fluency indicators	Application of instrument or voice, knowledge, and skills
Accuracy	Attention to correct melody, rhythm, and harmony parts, learned or improvised	Utilization and integration of music elements, in particular, melody, rhythm, harmony, dynamics, texture, and tone color; consideration of these within performance
Challenge	Considered against the time to learn the music, the nature of performance and group size, other Heartland activities influencing the performance	Level of, inventiveness, meaningfulness of contrasts and repetition, evidence of layering and of balance of parts, ability to utilize an element structure, such as blues or verse and chorus
Cohesion	Being aware of the musical structure, adapting to the music, responding to the other's lead, observing stopping and starting devices, providing leadership, responding to the group	Attention to structural elements of the music, including balance, blend of sections, musical consistency, and diversity
Reading and recording	Means used to learn the music, use of graphic or conventional notation and information technology, memorization	Utilization of learned and improvisational processes
Independence	Becoming increasingly autonomous and self-directed and depending less on teacher direction and support	Evidence of self determination in the sounds created, as specific elements or as an accumulated effect; evidence of ongoing action, reflection, and rehearsal, and variation of ideas among participants; evidence of pure originality in the music

3. Extra-Curricular Science Labs for Gifted Students

Dieter Hausamann

Abstract

In the past couple of years, numerous extra-curricular science laboratories (school labs) have been established in Germany, whose main objective is to attract students to science and technology. The German Aerospace Centre (Deutsches Zentrum für Luft-und Raumfahrt, DLR) School Lab Oberpfaffenhofen, operated by Germany's national research center for aeronautics and space, is a typical example of such a science lab. Apart from a variety of hands-on experiments offered for students, its key mandate is teacher education. In this paper, the basic concept behind extra-curricular science labs is presented, as illustrated by the DLR School Lab and its strong ties to state-of-the-art aerospace research and technology. The lab's expertise is described, based on numerous, high-level enrichment projects for highly talented secondary-school students. Furthermore, the model of teacher education with respect to giftedness is demonstrated. Finally, results are presented from both internal and external anecdotal evaluations, which support the success of the extra-curricular science labs.

Currently, in Germany, there is a serious lack of engineers and information technology specialists. This situation is 10 times more critical for Europe. Attracting talented young people to science and technology is, therefore, a national priority (Heller 2007, 2008; Heller & Ziegler, 2007).

The existing educational system cannot meet the demand. The regular science and technology curricula in secondary schools provide neither sufficient instruction nor student motivation for students to pursue this field. Because of this lack of exposure, many secondary-school students—even upon graduation—are undecided about their future studies. Options are even more limited for gifted students because the opportunity to use their talents is not made available to them, and their potential is lost. Since gifted students are often under-challenged by regular school lessons, they soon lose interest. It is important for them to experience real-life applications typically faced by engineers and scientists and assume the role of researcher working within the framework of an authentic science project within institutions involved in research and development.

In the last decade, in order to attract youth to Science, Technology, Engineering, and Mathematics (STEM), numerous extra-curricular science laboratories have been established by research centers and universities all over Europe. More than two hundred such labs exist in Germany, alone (LeLa, n.d.). In a typical school lab, students are able to perform high-tech experiments independently through what is called Inquiry-Based Science Education (IBSE), a technique recently recommended by the European Commission (2007). This technique was developed by Martin Wagenschein (1962, 1980).

In order to achieve a sustainable impact, the typical one-day visit to a school lab must be complemented by the teachers' regular mathematics and science lessons by linking the high-tech experiments and research to the standard curriculum. This requires advanced teacher training and enhanced skill development. Another important element of the extra-curricular science labs is ensuring the sustainability of its impact for both teachers and students.

In this paper, the DLR School Lab Oberpfaffenhofen is presented as an example of an

extra-curricular science lab, including its regular offerings for school classes. The school lab's methods of talent development are described, including several practical examples of enrichment projects, as well as the concept and practical experience of teacher training, especially with respect to gifted education. Additionally, student and teacher feedback on their experiences are presented, as well as the results of evaluation studies.

The DLR School Lab Oberpfaffenhofen – an Extra-Curricular Science Lab

The German Aerospace Center DLR

DLR (n.d.) is Germany's National Research Center for Aeronautics and Space. Its extensive research and development work in aeronautics, space, transportation, and energy has resulted in numerous national and international cooperative ventures. As Germany's space agency, the federal government has given DLR responsibility for the planning and implementation of the German space program, as well as representing its interests internationally.

Approximately 5,700 people work for DLR; the center has 29 institutes and facilities across 13 locations in Germany. The DLR site at Oberpfaffenhofen, near Munich, which employs approximately 1,500 people, is one of Germany's largest research centers. The main activities of the five institutes in Oberpfaffenhofen are devoted to space missions, climate research, development of earth observation systems and technologies, robotics and mechatronics, and the European space-based navigation system, Galileo. These activities are complemented by two space-operation centers: research flight operations and the remote-sensing data center.

The DLR School Lab Oberpfaffenhofen

Since 2000, the DLR has operated six extra-curricular science labs, one of which is the DLR School Lab Oberpfaffenhofen (n.d.). This science lab offers students high-tech experiments within the authentic research atmosphere of a large-scale research center (Hausamann et al., 2008). Students experience the fascination of aerospace research and become acquainted with methods of high-technology research. At present, the DLR School Lab offers eleven experiments: environmental spectroscopy, meteorology, analysis of satellite-based earth observation data, satellite navigation, robotics, virtual mechanics, flight-team simulation, mobile rocket research, and infrared, laser, and radar technology.

On a typical, one-day visit to the DLR School Lab, each student may perform two of these experiments, based on his or her personal interests. Each experiment involves two hours of intense activities and experimentation in the respective field of technology. By the end of the day, students have gained insight into two research areas and the respective experimental methods.

Students are supervised and supported by DLR scientists, as well as by university students, employed for this purpose. In principle, however, they are encouraged to work independently, to generate new knowledge and expertise about the interrelationships among the physical, technical, and geoscientific fields and their applications. Students work in small groups of four or five, generating a stimulating working atmosphere and bonding as a team.

The key success factor of this extra-curricular science lab is the use of state-of-the-art, high-tech equipment, which is unavailable in the school system; for example, students are allowed to operate a surface spectrometer, an infrared camera, mobile laser and radar systems, and sophisticated simulation programs.

Students' visits to the DLR School Lab Oberpfaffenhofen are complemented by and concluded with a visit to the German Space Operation Center (GSOC) and to the recently opened Galileo Control Centre. The latter provides insight into the control of satellites and the research activities of the International Space Station (ISS), as well as the operation of Europe's future satellite navigation system.

Since its opening in 2003, more than 7,500 students have conducted experiments in the DLR School Lab Oberpfaffenhofen.

Assessment by students. Both internal and external evaluations are conducted to investigate the sustainable effect of extra-curricular science labs. The DLR School Labs' standard, internal evaluation tools are anonymous ques-

tionnaires and oral testimonies. At the end of a visiting day, both types of feedback are requested from each participating student. In general, based on a preliminary analysis of several thousand questionnaires and oral statements, over two-thirds of the students indicated that they would like to visit the lab again.

An external evaluation, conducted by the Leibniz Institute for Science Education at the University of Kiel, Germany (Pawek 2009), confirmed these results. A different questionnaire addressing students who left secondary school in 2008 (and who had visited the DLR School Labs in past years) shows strong evidence that the future career decisions of numerous former students (up to 50%, depending on the individual school) have been influenced positively by their DLR School Lab experience.

Programming for Gifted Students

Acceleration and enrichment are proven programmatic measures designed for gifted students. Recognizing the limits of school curricula, Renzulli and Reis (2002) developed the Schoolwide Enrichment Model (SEM), whose goal is to overcome the limits of school curricula and promote the fascination for science and research beyond the regular instructional program. This, however, requires the cooperation between schools and experienced research partners who are able to communicate the enthusiasm for their respective discipline.

One of the key objectives of the DLR School Lab Oberpfaffenhofen is the promotion of gifted youth (Hausamann, 2005). The lab experiments, derived from current research activities at the DLR institutes, are adaptable to the potential of highly talented and motivated students. The labs are not constrained with respect to depth and complexity. The same holds true for the supervising scientists and university students, whose personal expertise far exceeds even the highest school levels. In the past years, the DLR School Lab Oberpfaffenhofen has developed, conducted, and successfully completed about 30 special projects and events for highly talented students. In principle, there are two possibilities for such projects, as detailed below.

1. Regular Visits to the DLR School Lab

School lab experiments can be used to extend the regular curriculum. Activities of the DLR School Lab can be adapted to the special conditions and requests of talented students either by acceleration or extension.

Acceleration. Gifted students are able to perform complex experiments at a much younger age than regular students. A typical example is the mechatronics experiment ASURO (n.d.) which involves assembling and programming a complete robot rover—a task suitable only for secondary-school students aged 16 years and over. Many highly gifted students, as young as 12 years of age, have successfully assembled the robot at the DLR School Lab (c.f. Hausamann, 2005).

Extension (depth). When performing an experiment, students have the chance to move to very complex levels of the physical theories involved; they can develop and perform new and sophisticated experimental techniques, and they can design complex programs and analytical methods beyond what is expected by the standard curriculum. Gifted students take advantage of these opportunities. The DLR School Lab has worked primarily with gifted students from the Maria-Theresia-Gymnasiums in Munich (n.d.). About 10 special classes for gifted students have visited the school lab in the past six years.

Pilot evaluation: Highly gifted versus regular students in the DLR School Lab Oberpfaffenhofen. The effect of the visits to the DLR School Lab Oberpfaffenhofen on gifted students has been investigated by the University of Würzburg (Stumpf et al., 2008) in a pilot study. Summary responses of gifted students were compared to those of students in regular classes. Results show that the visits to the School Lab are clearly positive for all students. More than half confirmed that their interest in natural sciences has been enhanced by the visit; nearly every second student plans to pursue a technical or scientific profession.

There were no significant gender differences in the feedback with respect to factors such as personal interest, comprehension, and selection of experiments.

There were significant differences between regular and gifted student groups; 85% of the gifted, but only 66% of the regular students, expressed an interest in making an additional visit to the school lab. The ranking of the individual experiments by the two groups also differed, with the more difficult experiments ranking higher (more positively) for gifted students. Overall, the feedback from the gifted participants was more positive than that from students in the regular classes.

The sustainability of the effect of visiting the school lab, however, could not be investigated in this pilot study because measuring the effect requires a significant lapse of time. A further extended study is being designed by the author to examine the long-term effects of the DLR experience, utilizing a control group of students who will not have the opportunity to visit this type of lab.

2. Type III Enrichment Projects

Renzulli's Schoolwide Enrichment Model (Renzulli & Reis, 2002) provides a practical basis for school programs to identify and nurture the talents of students with exceptional abilities. Renzulli introduces three types of enrichment activities of increasing complexity and demands:

- Type I enrichment moves students beyond the regular curriculum to consider potentially exciting new areas of interest;
- Type II enrichment targets the development of higher-level thinking (problem-solving, critical thinking, inquiry training) and specific learning skills, allowing students to undertake more advanced and differentiated topics; and
- Type III enrichment, the most advanced stage, "involves students who become interested in pursuing a self-selected area and are willing to commit the time necessary for advanced content acquisition and process training in which they assume the role of a first-hand inquirer" (Renzulli & Reis, 2000, pp. 370–371).

Enrichment activities provide opportunities for students to work independently on an applied subject, to develop authentic products, and to achieve an intended impact on a defined target audience. These students assume the role of researchers.

In the past couple of years, several Type III enrichment projects have been completed by gifted student groups from across Germany in collaboration with the DLR School Lab Oberpfaffenhofen. The following two examples show the distinctiveness and complexity of Type III enrichment projects, the extent to which talented student teams can generate highly interesting questions for current research, and the process by which students evolve from "learners" to "researchers."

The GPS-Einstein Project. Satellite navigation is one of the rare technical applications which is strongly influenced by both Einstein's special and general theories of relativity. It requires a change to the frequencies of atomic clocks on the board of GPS satellites in order to synchronize them with the clocks on the ground. The intention of the GPS-Einstein Project (Hausamann & Schmitz, 2007) was to investigate quantitatively how much adjustment the satellite clocks require. It was initiated by the DLR School Lab Oberpfaffenhofen, based on its expertise in the technical field of satellite navigation.

The half-year Project took place in 2005, during the Year of Physics, in a Grade 12 Physics course at the Christophorusschule Königswinter (CJD) in Germany. The gifted education model at this school follows the three-trimester system. By accelerating and compacting the curriculum, one of the trimesters is available for special enrichment projects. The Grade 12 Physics course (11 students) in the 2004 - 2005 school year was an ideal group for the GPS-Einstein Project.

In phase one, students were introduced to Einstein's theory of relativity, as well as to satellite-based navigation, in the context of a Type II enrichment activity, and the technology of GPS receivers. Each of the students had to work on a specific sub-area, such as the determination of the speed of light, astronomical methods for navigation, principles of satellite navigation, error analysis and correction, and economic and technological requirements for satellite navigation systems. Subsequently, students produced reports on their topics and presented their results to the class. These individual activities were all supported by the teacher at the students' secondary school.

Phase two of the Project consisted of a three-day excursion to the DLR School Lab

Oberpfaffenhofen. The school lab program was tailored to the requirements and abilities of exceptionally gifted students. One important didactical feature was a continuous alternation between independent experimentation and university-level scientific lectures. The main focus was an in-depth examination of satellite-navigation science and technology, time standards, atomic clocks and time measurement, and the consequences of Einstein's theories of relativity for navigation satellites. Finally, there were several opportunities for the students to discuss their respective subjects with members of the group, with the navigation experts, and with the supervising university students, who are studying electrical engineering, physics, mathematics, geosciences, biotechnology, food technology, and chemistry, and are employed by the science lab exclusively for advising and career-modeling purposes. The school-lab program helped define the next step of the Project.

In the third and final phase of the Project, four of the 11 students, upon returning home from Oberpfaffenhofen, took responsibility for empirically investigating the problem, synthesizing quantitative information, and generating answers to key questions; for example, they derived the frequency shift of the GPS satellite clocks and the subsequent consequences. According to all the supervisors, these students constituted the top group in the Physics course.

These four students demonstrated their final results, including a detailed poster presentation and an experimental demonstration of GPS receivers, at a festival at their school. As a further highlight, the group was invited to the Students' Congress in Munich, in December 2005, to present their final results. This national congress, which took place at the end of the Einstein Year of Physics in 2005, was devoted to Albert Einstein's life and research.

The project: Geophysics—Remote Sensing from Satellites. One of the most important methods to identify changes of the environment is "change detection." Satellite data acquired at different times are compared in order to analyze quantitative changes caused by natural or human impact, such as the sealing of the earth's surface by settling activities (e.g., dust from volcanic eruptions), environmental damage, or natural catastrophes. At school, this complex method has, so far, been applied only in special geography courses in high-level, secondary-school classes.

The goal of the enrichment project, Geophysics—Remote Sensing from Satellites, was to investigate the changes in the participants' home environment by studying the properties of the solar radiation spectrum and its influence on the geosystem and by analyzing remote sensing data from satellites (Hausamann et al., 2007).

The project was initiated jointly by the Hector-Seminar[1] and the DLR School Lab Oberpfaffenhofen. In early 2006, this external, talent-support program was officially announced on the website of the Hector-Seminar (n.d.). The focus groups, typically consisting of 10 students, were highly-talented students from Grade 9 and 10. Students from 10 different secondary schools applied for the project, and each seminar group was supervised by a team of two teachers.

The preparation phase began with a one-day workshop in April 2006, in Heidelberg, where the students were introduced to the scientific background, methodologies, and technologies of satellite-based remote sensing of the earth's environment. Hardware and software details of the respective School Lab experiments were presented, and the project goals were discussed and decided.

[1] The Hector-Seminar project (Heller, 2008a) is a program to foster highly gifted secondary-school students by providing enrichment activities in the areas of mathematics, informatics, natural sciences, and technology. It is financed and supported by the Hector Foundation. In the Hector-Seminar, especially gifted secondary-school students are supervised on a long-term basis throughout their school career. The seminar program supplements the regular school activities, from Grades 6 to 13. The projects are interdisciplinary, whose main objective is to facilitate a holistic development of personality, the fostering of cognitive, logical, personal, and social potential, and corresponding competencies. Each seminar course involves 60 students, who are chosen in a two-stage selection process from all 7,500 Grade 6 students of the secondary schools in north-western Baden-Württemberg. The first stage consists of a screening process, whereas the second stage utilizes the Munich High Ability Test Battery, developed by Heller and Perleth (2005), for selecting students. The cognitive, creative, and social capabilities of the selected students are far beyond the secondary-school average. The seminars are located in three cities—Heidelberg, Mannheim, and Karlsruhe. The project at each site is headed by two teachers and takes place in the afternoon, two hours per week. At present, approximately 400 students in eight courses participate in the Hector-Seminar.

The second phase of the project consisted of a visit to the DLR School Lab Oberpfaffenhofen. In May 2006, the Hector-Seminar students spent three days in Oberpfaffenhofen. Supervised by the DLR Lab's university students, all of them conducted the experiments involving the environmental spectroscopy and satellite data. Special attention was given to the operation of DLR's imaging hyperspectral ground spectrometer. Extended practical sessions focused on the application of two different software programs used to access, process, and analyze satellite data. Additional subjects of study included a theoretical course on infrared measurement technology and remote sensing. Project tasks were defined in detail, the most important being the analysis of changes, based on a comparison of satellite images from 1989 and 1999. The visit also included a guided tour of DLR's Crisis Intervention Center and the robot-operated data archive.

The third phase of the Hector-Seminar was initiated two weeks after the visit to Oberpfaffenhofen. The DLR School Lab supervising team went to Heidelberg for a measurement campaign[2] involving all instruments (spectrometers and infrared devices). Further investigation with these instruments provided students with deeper insights and more complex explorations in the field. Based on the information and results gained from this measurement session, the students performed the final task of the project. They classified satellite images and analyzed changes in their respective home environments and, finally, produced reports on the results.

At the end of September 2006, the students presented their Geophysics project at the 2006 Hector-Seminar project workshop in Mannheim. Results were shared, orally and visually, through posters, with teachers, students, and invited guests.

The exceptional work of this group was recently honored with the DLR School Lab Prize of 2008. This prize is awarded annually by the Society of Friends of DLR, on the recommendation of the DLR's Executive Board.

[2] The term "measurement campaign" means that equipment is shipped to another location to which a group of scientists relocates in order to make local validation measurements for the purpose of verifying analyzed data.

Students' assessment of the Type III enrichment projects. The feedback from each group involved in the DLR School Lab's Type III enrichment projects was extremely positive—even though there were distinct points of criticism and substantial recommendations for improvement. On a visit to the Christophorusschule Königswinter in May 2006 (half a year after the termination of the GPS-Einstein Project), four students of the GPS-Einstein Project reported that although preparing their final report and presenting the results was quite exhausting, it left a deep and very positive impression upon them. According to all four students, the project had strongly influenced their career decisions in the fields of physics, chemistry, information technology, and mechanical engineering.

Teacher Education at the DLR School Lab Oberpfaffenhofen

The DLR School Lab Oberpfaffenhofen offers advanced training courses for school teachers in order to prepare them for their class visits to the lab. The main objective of the teacher-education component at the DLR Lab is to help the teachers integrate the extra-curricular activities within their standard curricula and apply concepts to real-world examples. The DLR School Lab offers special courses for groups of teachers from individual schools or regions. They also offer advanced in-service training seminars for the Bavarian teachers, who will serve as the instructors of future teachers.

The key elements of teacher training offered at the DLR School Lab include both self-contained experiments, as well as lectures. In the former, teachers assume the role of their students, experiencing the same feelings of success upon completion of an experiment as their students do. Lectures are the vehicle by which background information about teachers' respective experiments and scientific research areas are disseminated.

Since 2003, more than 1,000 regular teachers have attended advanced teacher-training courses offered by the DLR School Lab Oberpfaffenhofen. The general feedback of teachers has been highly positive, especially with respect to successfully conducting high-tech experiments independently, developing advanced technical skills, and generating ideas for practical classroom teaching. Many

Table 1: *Teacher Participant Feedback on the Advanced Teacher Course on Robotics*

Teacher Participant Feedback on the Advanced Teacher Course on Robotics	Excellent	Very good	Good	Passing	Fail
Fulfillment of expectations	14	5			
Practical usability of results	6	9	3	1	
Quality of presentation	12	7			
Organization, venue, atmosphere	14	5			

of the teachers have been motivated to bring their students to visit the DLR School Lab Oberpfaffenhofen.

An example of advanced training offered to teachers at the DLR School Lab is a one-day regional session on robotics, which took place in Regensburg, Bavaria, in October 2007. Together, the 19 participating teachers built and programmed six ASURO (n.d.) robots. The feedback presented in Table 1 was officially requested by the organizing school administration.

Education of Teachers of the Gifted

Teachers play a key role in gifted education. Key teacher characteristics and competencies have long ago been summarized by authors such as Seeley (1985). Especially, in Type III enrichment activities, the teacher's role changes from that of an educational instructor to that of an initiator, mentor, supervisor, coach, consultant, and assessor of achievement. The teacher's most important function is to support the independence, motivation, and creativity of gifted students (Cropley & Urban, 2002). Pedagogical approaches such as open learning (Peschel, 2002) or self-regulated learning (Fischer, 2004) are ideally suited for Type III enrichment projects.

The teacher-education model developed at the DLR School Lab Oberpfaffenhofen (Hausamann, 2008a, 2008b) is especially suitable for teachers of gifted learners because it links the science labs to the standard school curriculum, includes teacher-run experiments, promotes the acquisition of the requisite background science knowledge, and uses the lecture as a method of instruction. In addition, the scientific fundamentals required in individual experiments inspire talented participants who want to tackle more complex problems and questions. Teachers are exposed to different combinations of various experiments and technologies, and they receive relevant, essential information for making experiments more feasible for and interesting to younger students.

A one-day workshop for a group of Hector-Seminar supervisors at the DLR School Lab Oberpfaffenhofen, conducted in December 2004, is a typical example for such an advanced-level training course, specially designed for teachers of the gifted. The goal of the workshop was to create new ideas for the Hector-Seminar projects and became the nucleus, so far, of two successfully completed Type III enrichment projects: Geophysics in 2006 (see above) and Satellite Navigation in 2008. The feedback on the workshop, the first of four since 2004, was enthusiastic and evaluated as "excellent" by the seven participating teachers.

The DLR School Lab's extra-curricular, gifted education model is also integrated in The European Council for High Ability (ECHA) Diploma teacher-education courses of the International Center for Giftedness at the University of Münster, Germany (ICBF, n.d.). Since 2007, the extra-curricular science labs in gifted education, such as the DLR School Lab Oberpfaffenhofen, have been presented as an option in the education practicum, with the main focus on Type III enrichment projects. Additionally, the DLR School Lab has been designated as an official observation site for students in gifted courses. Two such observations are mandatory for each ECHA Diploma applicant.

Conclusion

This paper explores the basic concept behind extra-curricular science labs, exemplified by the DLR School Lab, with its strong links to state-of-the-art-aerospace research and technology. The described enrichment model for gifted students has been developed and successfully implemented through numerous projects at the DLR School Lab Oberpfaffenhofen. The associated gifted-education, teacher-training model, developed at the DLR Lab, has formed the scientific and didactic basis for Type III enrichment projects at a pre-university level for secondary-school students. The success of these projects has been supported by anecdotal evaluations; however, further studies are required to assess the effects of the projects in terms of their long-term impact and sustainability.

The enrichment projects described in this paper have demonstrated how students, by working with scientific subjects far above the regular school level, are transformed from self-regulated learners to self-regulated researchers. This transformation, effected through their DLR Lab experience, has helped students make the transition from school to university with greater ease, enabled them to gain a more profound understanding of their field of study, and assisted them in making more informed career choices in fields such as physics, chemistry, information technology, and mechanical engineering.

The DLR Lab is one approach by which gifted learners become gifted researchers. Alternative approaches remain the object for further research in the area of giftedness.

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4. The Mexican PAUTA Project: Identifying and Supporting Talented Students in Science and Mathematics in Morelos, Mexico – A Pilot Study

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Abstract

This paper describes the Mexican Programa Adopte Talento A.C.[1] (PAUTA) or Adopt a Talent Program,[2] and the specific development and initial evaluation of PAUTAmor, the PAUTA branch in the state of Morelos. PAUTA was created by Mexican scientists and educators for the identification and support of primary- and secondary-school students with talent in science and mathematics. The program began in various parts of the country in primary schools in 2007, while PAUTAmor started in secondary schools in 2008. Workshops were developed and conducted, first with science teachers and then with students nominated by these teachers. The aim of PAUTA is to develop creativity, scientific abilities, and attitudes indicated as essential by PAUTA. Multiple assessment instruments were selected, adapted, or designed to create a broad database, both quantitative and qualitative, to evaluate the pilot program. Nominated students continue with the workshops for two years, and from this group, a select core continues to a third year of the program, working with scientific mentors in their areas of interest.

The Adopt a Talent Program[3] (PAUTA) began in 2006, coordinated by the Mexican Academy of Sciences[4] (AMC, Academia Mexicana de Ciencias), with the mandate of infusing two fundamental principles of education: excellence and equity. The main focus of this mandate is to identify and develop the scientific and mathematical talents of students at the primary- and secondary-school levels and to offer continuous academic support throughout their schooling, up to university. The vision of the program is to establish direct links between the teachers of basic education and the scientific community in Mexico, and, through them, to identify talented students, as well as to involve the community, private enterprise, and governmental and non-governmental organizations. The ultimate aim is to improve the quality of science education in Mexico and to achieve a greater awareness of the importance of science nationally.

[1] A.C. Means civil association and is part of the name.
[2] http://www.pauta.org.mx/home/
[3] http://www.pauta.org.mx/home/
[4] http://www.amc.unam.mx/

In Mexico, various indicators reflect serious problems regarding the inequity in education, particularly in scientific areas. In 2005, 77.6% of the eligible population, nationwide, had completed secondary education (Bracho, 2007). Graduation rates varied widely in different regions of the country; for example, in Mexico City, the rate was 102.6%[5], while in Chiapas, one of the poorest states in the nation, the graduation rate was only 60.4%. Nationally, only 60% of people between 15 and 29 years of age had finished secondary education, while in the 25- to 45-year-old group, only 24% had completed such education. This is by far the lowest among the countries belonging to the Organization for Economic Cooperation and Development (OECD, 2007). Even worse, all of the corresponding statistics for indigenous populations are much lower than the national averages (Bracho, 2007). Further OECD statistics show that only 26.2% of Mexican 19- to 23-year-olds reach higher post-secondary education (Brunner, Santiago, García, Gerlach, & Velho, 2008), and, of these, only 11% pursue science careers (OECD, 2007). In the Mexican 25- to 34-year-old age group, there are only 984 per 100,000 with a tertiary science degree, compared with an OECD average of 1,675. Only 0.2% of young Mexicans enter advanced research programs at the tertiary level (OECD, 2007). An additional concern is the "brain drain" of university graduate students in science and technology: approximately one out of every five persons studying outside of Mexico does not return (AMC, 2007).

In the state of Morelos, Mexico, the site of PAUTAmor (PAUTA Morelos), 17.8% of the youth between the ages of 12 and 15 years (secondary level) do not attend school, a figure which is below that of the national average of 19.4% (SEP, 2003). Of those who begin secondary school, 20.8% of boys and 18.5% of girls do not graduate. Possible causes may include academic failure, family and economic problems, and lack of relevance of school to daily life, their needs, and their interests (SEP, 2003).

These figures reflect a problem of educational equity at both the national and state level. Additional statistics indicate very low levels of excellence among students still in school. The results of the Excale (grade-school achievement) exams, applied by the Mexican National Institute for Educational Evaluation (INEE)[6] in 2005 (Bracho, 2008), and the exams given by Programme for International Student Assessment (PISA) (OECD, 2006), both applied to 15-year-old students, show a very poor level of scientific literacy, nationally. Results show that approximately one-half of the students are *below* basic levels in reading, mathematics, and science, indicating insufficient competence to continue to more advanced levels of education. Only 3% demonstrate high levels of competency (PISA, 2007).

Research also shows science teaching in Mexico to be very traditional, with large classes and little student interaction, homogeneous treatment of content and teaching-learning strategies, characterized by transmission of scientific "facts," fixed algorithms for solving problems, and evaluation promoting simple memorization of content (Paul de Verjovsky, 2005; Quiroz, 2000). This teaching model does little to develop abilities and attitudes, such as divergent and critical thinking and creativity, required in scientific professions. Of equal concern is the loss of talented students due to the lack of identification and support of potential talent in these areas.

The PAUTAmor Project

PAUTA[7] was created through the efforts of high-profile Mexican scientists and science educators to promote the scientific development of talented children and youth and to cultivate a solid, scientific culture in Mexico. PAUTA believes that talents flourish under different circumstances and proposes to create favorable conditions to foster creativity and develop abilities in science among talented children and youth. By providing appropriate tools, motivation, and support and by helping teachers develop different instructional strategies in the scientific areas, PAUTA aims to improve scientific literacy and generate interest among *all* students. Close links with families, schools, and the scientific community, such as the committees of the Scien-

[5] Graduation rate is defined as the ratio of graduates to the population at typical age of graduation.

[6] Instituto Nacional para la Evaluación de la Educación

[7] PAUTA is supported by the SEP (Secretary of Public Education), CONACyt (National Council of Science and Technology), and UNAM (National Autonomous University of Mexico).

tific Olympics (internal document of PAUTA[8]), are essential.

PAUTA targets certain abilities and attitudes that the Mexican scientific community has deemed essential for any scientist. The abilities related to working in the scientific field include the key categories of intellectual, communicative, and creative potential, while attitudes encompass motivation, persistence, and respect. Each of these categories is further divided into numerous subcategories of more specific traits, as outlined in the next section. The provided list, neither exclusive nor definitive, is an initial guide to fostering the development of scientific literacy among students. It, basically, proposes guidelines for observing, evaluating, and further developing the requisite skills. The activities designed for the PAUTA workshops vary in complexity and content and are adapted for their geographic area within Mexico, as well as for the developmental and curricular context of each age group.

In 2007, the PAUTA project was initiated in primary schools in Mexico City and in the states of Michoacán and Chiapas. In 2008 and 2009, the programs were introduced in secondary schools in the state of Morelos (PAUTAmor[9]). In the latter case, the Morelos Academy of Sciences (ACMor[10]), an organization of scientists from over 40 research centers in the state, supported the project.[11] Professional training workshops were offered to science and mathematics teachers for students at the secondary level (ages 12 to 15 years). In 2008, the first year of the workshops, 24 teachers, from 20 different secondary schools in the state of Morelos, were involved. The workshops presented the PAUTA model, which offers alternative pedagogical strategies to teach science and mathematics. The teachers participated as "students" in seven different PAUTA activities and, in the last session, were provided with information and nomination forms for identifying their own talented secondary students in the sciences in preparation for the first student workshop in the spring of 2009.

The workshop leaders, primarily undergraduate and graduate students who participated in the design of the activities, were assigned responsibilities within the project (e.g., database maintenance, finances, evaluation) and also worked directly with teams of teachers in the workshops. They facilitated the teachers' collaborative work during the activities and observed their specific scientific abilities and attitudes. They worked 10 hours per week. In the first stage, the teachers merely "experienced" the activities in the workshop as "students," so that they would understand the design of the activities. At a later stage, the teachers will replicate these in their own classrooms, and then, in the final year, the teachers will participate in the design of the activities.

Evaluation of Year 1 of the PAUTAmor Project

Each state modified the program, based on the socio-cultural context and developmental levels of its students.[12] PAUTAmor is an adaptation of Renzulli and Reis' (n.d.) triadic Schoolwide Enrichment Model and Renzulli's (2004) Revolving-door Identification Model. The program is designed to facilitate the identification and support of talented students in science and mathematics and to promote higher-level scientific abilities and attitudes. Renzulli's triadic model is used to describe an expanded conception of scientific talent, with a broad-based student-selection process. Multiple criteria and a wide variety of assessment methods are used in the student-identification process.

PAUTAmor was designed as a three-year pilot project, with an ethnographic emphasis, employing multiple instruments in the collec-

[8] Published by the Academia Mexicana de Ciencias (no author and date)

[9] Financial support from PAUTA Nacional and FOMIX (Fondo Mixto – Morelos: Project MOR-2008-C01-93345, "*Implementación y desarrollo del Programa Adopte un Talento (PAUTA) para fomentar la vocación científica en los jóvenes del Estado de Morelos*"

[10] http://www.acmor.org.mx/

[11] ACmor has a tradition of promoting scientific activities and offering support for students through a number of initiatives: developing a student congress for secondary schools, drawing from numerous states in the country, to present research results; establishing a summer research program for students in Morelos; supporting the scientific Olympics; and sponsoring teacher-development programs, principally through "Scientific Thought in the Classroom," a diploma course for secondary- and high-school science teachers.

[12] In the state of Chiapas, for example, the program works with indigenous, primary-school children living in extreme poverty, who speak Spanish as a second language.

Table 1. *Three-Year Program PAUTAmor*

Year of Secondary School	Year of PAUTAmor Program		
	2008 – 2009 Pilot Stage	2009 – 2010 Development Stage	2010 – 2011 Consolidation Stage
First	Workshops* (focus on biology[13])	Workshops* (focus on biology)	Workshops* (focus on biology)
Second		Workshops* (focus on chemistry and physics)	Workshops* (focus on chemistry and physics)
Third		Selection	Research projects with mentors

* All workshops address mathematics, as well as the application of mathematical strategies in other scientific areas.

tion and analysis of qualitative and quantitative data, in order to evaluate the success of the program. It uses questionnaires, checklists, Likert scales, observations, field notes, videos, interviews (Adler & Adler, 1998), and participant portfolios (Johnsen, 2008). The quantitative data are evaluated with the SPSS (version 13) and the qualitative data with discourse analysis, using emergent categories (Clandinin & Connelly, 2000; Lemke, 1997; Lenoir, 2006). The descriptive analysis of the data is designed to provide a broad-based view of the development of each participant at each stage. The constant comparative method, over time, permits the identification of key issues and recurrent events as they relate to each student's observed creative and scientific abilities and attitudes. Despite the small sample size, the collection of data with multiple instruments serves to increase the reliability of the observations, the authenticity of the data, and the validity of the conclusions (Adler & Adler, 1998; Taylor & Bodgan, 1990).

The program consists of three stages: Pilot (2008 - 2009), Development (2009 - 2010) and Consolidation (2010 - 2011). The first year of the program is devoted to training teachers. The second year will involve secondary-school students, with the aim of developing specific scientific abilities. In the third year, a selected subsample of students, based on their successful performance in the PAUTAmor workshops, will continue in the program, working with scientist-mentors on various, advanced research projects of interest (Table 1).

Pilot Stage 2008 – 2009

Workshops

The first steps in the pilot stage included selecting six leaders[14] to develop workshops on different science topics, four in biology (the science taught in the first year of secondary school), two in mathematics, and one in physics (see Table 2). As well as being workshop leaders in their own discipline, each leader served as facilitator for a group of five "students" in other workshops.

Each workshop was developed according to a pre-established format of PAUTA National[15] (see Table 3). The purpose of each workshop was to present intellectually stimulating problems, to re-examine previous scientific concepts covered in the basic curriculum, to generate questions, to promote curiosity, and to conduct research relevant to the specific challenges raised, but not to introduce new concepts, per se. Each workshop was designed with the use of the simplest and least expensive materials possible in order to make

[13] The scientific focus of the workshops is related to the national curriculum of the SEP.

[14] Workshop leaders were chosen on the basis of a series of exams and interviews by members of PAUTA National and the general coordinator for PAUTAmor. Four are postgraduate students in biotechnology, one an undergraduate biology student, and one a psychology undergraduate.

[15] PAUTA National is an association with a national perspective although it currently involves only four states.

Table 2. *PAUTAmor Workshops, 2008 – 2009*

Science Area	Title	Content
1. Biology: Classification	"Look Lively!"	Identification of living organisms, determination of their characteristics and different bases for classification, and development of food chains
2. Biology: Respiration	"Sweet Energy"	Yeast cultures with different carbohydrates to determine which is most effective in producing carbon dioxide
3. Biology: Asexual Reproduction	"1 + 1 → 4"	Model of exponential growth of bacteria and effects of different variables on growth
4. Biology: Evolution	"Butterflies Through Time"	A simulation of natural selection of differently colored butterflies against different backgrounds, and relevance of genetic variation
5. Mathematics: Logic	"I Bet you Can!"	Solving two games of logic using concrete objects to represent the problems to be resolved
6. Mathematics: Logic	"Sure you Can!"	Proposing a method to determine which of 21 identically sized balls weighs most, using a balance, making 3 attempts
7. Physics: Optics	"Mirror Vision"	Geometry of the formation of images in a mirror

workshops easier for teachers to duplicate in their own schools. Each workshop leader was also given a specific administrative responsibility within PAUTAmor. Progress in workshop development was reviewed during weekly meetings with the project coordinators and all workshop leaders. The groups who developed the respective workshops were each responsible for the piloting process.

During the first semester, multiple instruments were selected, adapted, or designed to obtain feedback on the workshop content, delivery processes, and projects throughout the program from all the participants. This same model will continue to be used each year with new topics and new workshop leaders.

In September 2008, the first three workshops were piloted with teachers from two different schools, (delivered on Saturdays), and adjusted accordingly, based on the experiences of the workshop leaders.

Checklists of student abilities and attitudes

In October 2008, a group of secondary science and mathematics teachers[16] were invited to participate in the workshops on a weekly basis, two hours each Saturday, from October to December. A total of 24 teachers accepted the invitation,[17] first attending a presentation of PAUTAmor, then participating in the seven workshops, as "students." The workshop leaders served as presenters of their own work and as facilitators of the subgroups of five "students." During these sessions, the facilitators piloted the use of the observation checklists of scientific abilities and attitudes, an instrument to be used later with students in the PAUTA workshops. The items on the checklists include the ability to

- organize and plan (e.g., express ideas, formulate problems, identify variables, generate original questions, elaborate on predictions or hypotheses, and devise feasible action plans),
- engage in scientific activity (e.g., manipulate materials precisely; adapt materials or methods; select, organize, and classify relevant information; control variables; conduct orderly work; develop observation skills),
- interpret (e.g., engage in abstract thought, process and analyze information, identify patterns and relationships, show originality, explain or justify conclusions, establish causal inferences, evaluate strengths and weaknesses of processes, identify limitations, and develop new research questions), and

[16] The teachers were taking the diploma course, "Scientific thought in the classroom," offered by ACmor.

[17] Each teacher is registered in the SEP, and, at the end of the workshops, receives a letter of recognition for his or her participation if he or she has attended at least 50% of the sessions.

Table 3. *General Format for Workshops*

Workshop Stage and Length (min.)	Procedure	Questions
1. Presentation (20 min)	Presentation of the topic, problem to be studied, and general procedures (maximum: 30 per group)	Specific questions on basic comprehension and predictions with rationales, related to each theme Examples: What do you know about …? Can you suggest a way to …? What do you think will happen when …? etc.
2. Development / Construction (60 min)	Subgroups are assigned a workshop leader and facilitator (maximum: 5 students per group) Activities: exploration of the problem; constant reflection of processes; testing of ideas and predictions; collecting, analyzing, and evaluating data; interpreting patterns and relationships; and drawing conclusions Observation and evaluation of student participation by workshop leader	Questions related to specific observations, strategies, explanations, interpretations, and analyses of original predictions Examples: What are your results? Are your results the same each time? What are the differences? Why? How did you determine that? How do your results compare with your prediction? If you change …, what would happen? etc.
3. Plenary (20 min)	The whole group reunites to exchange experiences, observations, conclusions, and relationships to common activities.	Questions contrasting the results of each group of students Examples: What did your group observe? Why are there different results? How did you organize your work? What would you change? How did your group work together? How does this work relate to….?
4. Closure (20 min)	Students reflect on the workshop. Additional challenges are presented. (Optional challenges are assigned in preparation for the next session.)	Questions to promote individual reflection Examples: What did I learn? How did I learn it? What have I discovered? What could I still investigate?

- communicate (e.g., use correct scientific terminology, argue effectively, discuss and verify predictions, establish relationships, reflect on work, and write clearly).

In addition, an observation checklist assessing student attitudes was designed with a double entry of quality (four levels from "regular" to "exceptional") and frequency (four levels from "almost never" to "almost always"). The resulting matrix identifies students' dispositions relating to

- collaboration (e.g., engaging in group work and positive interdependence, learning cooperatively, negotiating, reflecting),
- respect (e.g., listening, sharing, supporting others' efforts, keeping an open mind to others' ideas),
- persistence (e.g., showing self-motivation, responsibility, patience, and tenacity),
- initiative and creativity (generating unique ideas, solutions, and procedures),
- flexibility (e.g., viewing ideas, problems, and solutions from different perspectives),
- self-reflection (recognizing one's strengths and weaknesses, aspiring to constant self-improvement), and
- independence (e.g., pursuing intellectual autonomy).

Rating scale for workshop content and teacher participation

At the end of each session, the teachers, as students, also completed an evaluation of the specific workshop. This was in the form of a questionnaire designed with 24 items (12 assessing the workshop and 12 assessing the teachers' participation), all with a 5-point Likert scale ranging from 1 ("insufficient") to 5 ("excellent"). This was followed by nine open-ended questions on various aspects of the workshop, such as level of difficulty, appropriateness for the students' varying abilities, and overall strengths and weaknesses.

Rating scales for use of constructivist principles and approaches in their teaching

During these sessions, the teachers, as students, also completed two additional questionnaires, one on their vision of constructivist learning for their own students and a second one on science teaching. The purpose of these evaluation tools was to provoke reflection on their own teaching practices, as well as to add relevant pedagogical information to the database on each teacher.

The 6-point Likert rating scale on constructivist learning was adapted from Salish I (Salish I, 1997), consisting of 42 items. The items form six categories of analyses of the teachers' perceptions of students' roles in the classroom: (1) ensuring personal relevance of science for their students, (2) nurturing student awareness of scientific uncertainty, (3) encouraging constructive student criticism of teaching and learning activities, (4) fostering student control of the learning environment, (5) promoting student-teacher interactions or negotiations and, (6) engendering student attitudes (validity check).

The five-point Likert rating scale on science teaching was adapted from Martinez et al. (2002), with 59 items, organized into four categories: (1) workshop content, (2) methodology, (3) evaluation, and (4) professionalism. The frequency scale was then organized into three categories: constructivist, intermediate, and traditional, permitting the identification of the perceived teaching and learning model of each teacher.

The responses to the two scales were recorded and analyzed, with results forming part of the initial profile of the teachers in the database.

A final debriefing session was held with the teachers to discuss possible conceptual uncertainties or challenges emerging from each workshop. The teachers were encouraged to use these same workshops and strategies with their own students, thus, generalizing their experiences to their own teaching practices to improve science teaching for all. In this way, the workshops served as professional development for teachers.

Periodic training sessions were given to workshop leaders to establish the norms for interpreting the categories used to design the observation checklists for assessing students' scientific abilities and attitudes. Sessions were also designed to train leaders on the use of the instruments to increase interrater reliability (Renzulli & Callahan, 2008). Video excerpts of collaborative work from all participating pilot groups were observed by all potential workshop leaders, who made individual notations on the instruments. After each training session, the results were compared and discussed, with the process repeated until overall agreement on the interpretation and use of the instruments was reached.

The PAUTAmor workshops, in January 2009, culminated in a special session involving teacher attendees, ACmor diploma-course students, and teachers from other schools. Its purpose was to give teachers the basic tools to identify their own students with notable interests and aptitudes in science and mathematics. This was a prerequisite for inviting their students to participate in the next set of PAUTAmor workshops for students from February to June 2009.[18] At this session, 18 teachers from 13 different secondary schools were present. The instruments and specific procedures for nomination were explained and distributed, with the request that the teachers nominate their students before the end of January 2009.

Results of the Evaluation of the First Pilot Year

Rating scale for workshop content and teacher participation

Of the 24 teachers registered in the workshop, only half had a minimal attendance of 50%.[19] The results of the evaluation of each workshop were highly positive, with virtually all aspects of the materials, design, and their own interaction graded as excellent or close to excellent (averages above 4.5, with 5 as excellent), with the exception of their own par-

[18] IQ tests are rarely used in Mexican schools, so this information is not available.

[19] A teachers' strike in Morelos blocked all public basic education for two months in the fall semester of 2008, affecting the numbers of teachers taking the ACmor diploma course, the point of contact for teachers to participate in the PAUTAmor workshops. The two-hour workshops followed the two-hour diploma course every Saturday, time for which the teachers received no compensation.

Table 4. *Teachers' Perceptions of Their own Constructivist Practices*

Teachers' Scores	Elements of Teachers' Constructivist Practice					
	Ensuring personal relevance of science for their own students	Nurturing student awareness of scientific uncertainty	Encouraging constructive student criticism of teaching and learning activities	Fostering student control of the learning environment	Promoting student–teacher interactions or negotiations	Engendering positive student attitudes
Mean	2.47*	3.16	1.99	3.82	2.73	2.94
Range	1.7 – 3.6	2.9 – 3.6	1.1 – 2.7	2.9 – 5.4	1.6 – 3.6	2.3 – 3.7

* The six-point scale is from 1 (always[20]) to 6 (never).

ticipation in one workshop, which had an average evaluation of 4.0 (good). In the open questions, all answered that the workshops met their expectations and described the work as interesting, fun, motivating, and challenging, with good integration of mathematical skills. All said that they were motivated to renew their own teaching practices and desired to apply the workshops in their own classes, with some indicating a need for further assistance to do so. The noted strengths of the workshops included the knowledge of the workshop leaders, their teaching strategies, the simplicity of the materials, and the size of the small groups. For weaknesses, most recorded "none," but some mentioned problems of punctuality of the participants that resulted in less time to conclude the work properly, inadequate publicity about the program, and limited space for presentation setup.[21] Suggestions for improvement included providing more specific content information on the various topics, time to study the topics beforehand, and, in a few cases, clearer instructions. According to observations made by the workshop leaders during the different sessions, some of the teachers (as students) were frustrated by having their questions answered with more questions, but, generally, agreed that it motivated their own efforts to solve the problems.

Rating scales for use of constructivist principles and approaches in their teaching

Eight teachers completed the rating scale on constructivist learning, and eight completed the scale on science teaching practices, with four teachers overlapping, allowing for a limited comparative analysis.

The data on constructivist learning (Table 4) indicate that these teachers provide the environment for some aspects of constructivist learning in their own science classes, for example, by permitting student criticism of and participation in the teaching-learning activities. The least constructivist practice is the teacher maintaining control of the learning environment, although there was considerable variation in the teachers' perceptions in this respect. These response patterns indicate a somewhat contradictory view and merit further investigation.

The data on science teaching practices (Table 5) indicate that the teachers consider themselves to fall between traditionalism and constructivism in the areas of content, evaluation, and professional perception, but lean towards constructivism in the area of methodology. Of the four teachers who answered both questionnaires, there was an overall consistency in their declared practices as intermediate.

In succeeding years, these questionnaires will be administered to all new teachers participating in PAUTAmor and may also be used again with the original teachers at a later date to see if there are changes in their teaching practices, particularly if they, indeed, apply the new strategies learned in the workshops in their own school classrooms. In future, it

[20] *Always* refers to constructivist practices.

[21] The teachers' workshops were held in a large science laboratory in the Institute of Biotechnology of the UNAM. The student workshops will be held in a new science museum for children, to be opened in Cuernavaca, Morelos in February 2009, which has an appropriate space for workshops.

Table 5. *Teachers' perceptions of their science teaching practices: traditionalist or constructivist?*

Teachers' Scores: (traditional = 1 intermediate = 2 constructivist = 3)	**Categories of Science Teaching**			
	Content	Methodology	Evaluation	Professionalism
Mean	1.98*	2.40	2.14	2.02
Range	1.6 – 2.5	2.1 – 2.6	1.7 – 2.7	1.8 – 2.2

* The five-point frequency scale is reduced to a 3-point scale: 1 (traditional), 2 (intermediate) and 3 (constructivist).

would also be relevant to confirm the declared practices through direct observation of these teachers and to ascertain that the statements are not merely expressions of intention or belief (Paul de Verjovsky, 2005).

Conclusion

This paper describes the Mexican Programa Adopte Talento A.C.[22] (PAUTA), or Adopt a Talent Program,[23] and the specific development and initial evaluation of PAUTAmor, the PAUTA branch in the state of Morelos. The aim of PAUTA is to develop creativity and essential scientific abilities and attitudes among students.

In the PAUTAmor project, all the participants, materials, processes, products, strategies, and instruments were constantly being evaluated in an attempt to assess the success of the pilot project. The first complete evaluation was carried out in the summer of 2009. The impact of the pilot workshops was analyzed from the different perspectives of the participants, in search of constant improvement of the program. Pilot workshops were redesigned where considered necessary, and new ones were developed for the following year, with an emphasis on chemistry and physics, the science classes in the second- and third-year curriculum of secondary school. Early in 2009, an external evaluator, appointed by PAUTA Nacional, made periodic visits, observing workshops and meetings and interviewing different participants. The evaluator's report formed an important complement to the internal evaluation. Ultimately, the success in identifying talented students in Mexico, providing supportive programming to nurture their potential, and finding them flourishing in science careers will provide more definitive validation of the PAUTAmor program.

PAUTAmor also has the intention of supporting students with pressing economic needs in order to continue their attendance in the workshops and projects and, if necessary, to remain in school.[24] The scientific community and the entire social sector have been invited to participate in this innovative Adopt a Talent Program to support the mission to establish excellence and equity in education throughout Morelos.

[22] A.C. means civil association and is part of the name.
[23] http://www.pauta.org.mx/home/

[24] This has occurred mainly in the state of Chiapas where a number of indigenous students have received scholarships that have enabled them to continue their schooling.

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PART 3: ASSESSMENT CONSIDERATIONS

1. Identification of Mathematically Promising Students in a Diverse Society: A Question of Equity

Dorit Neria
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Abstract

How one defines academic talent is influenced by one's culture and socio-economic background. Therefore, ensuring an equitable and unbiased process for identifying promising students in a diverse society is complex. This paper, first, provides a brief review of the available identification methods and their respective limitations for addressing the inclusion of students from diverse backgrounds. It, then, offers an example of a successful strategy used in southern Israel to select talented students from various cultures to participate in the "Kidumatica" mathematics, which aims to promote the abilities of mathematically talented youth.

One of the core aims of education is to develop each student's potential, regardless of his or her ethnic and religious affiliation, socio-economic status (SES), or gender. Therefore, it is troubling to learn that, in many cases, there is a link between placement in educational programs and these factors. Disadvantaged groups are overrepresented in low-track classes and underrepresented in programs for the gifted and talented (Borland & Wright, 2000; Donovan & Cross, 2002).

This under-representation has wide-scale implications for involving students in programs for those gifted in mathematics. Mathematics is considered an academic gatekeeper (Galbraith, 1993) for advanced education in the fields of science and technology. Participation in programs for the academically gifted and talented in mathematics has unmistakable consequences for an individual's further academic growth. The challenge of mathematical problem solving contributes to the development of students' cognitive abilities and promotes changes in non-cognitive aspects of learning, such as self-confidence and increased interest in and enthusiasm in the discipline (Olszewski-Kubilius & Yasumoto, 1995; Wieczerkowski, Cropley, & Prado, 2000). This may also lead to students' improved social and economic status (Moses & Cobb, 2001).

Educators and researchers have not agreed on the exact definition of academic giftedness and talent (Feldhusen & Jarwan, 2000; Gagne, 2004). The vagueness of the general definition of giftedness also extends to mathematical talent and, consequently, influences the selection of candidates for advanced mathematical programs (Wieczerkowski et al., 2000).

The definition of mathematical talent is influenced by the perception of academic talent, as well as the essence of mathematics. The different definitions are conceived as a continuum, the two ends of which can best be described as *quantitative* versus *qualitative* (Wieczerkowski et al., 2000). Mathematical talent as a quantitative trait pertains to students who are capable of solving conventional mathematical problems well and quickly; as a qualitative trait, it describes students whose

talent is solving more challenging and non-conventional problems using original and elegant strategies.

Krutetskii (1976) argues that mathematical giftedness consists of several abilities, such as logical thought, effective organization and processing of information, pattern recognition, generalization, reasoning, flexibility of mental processes, and clarity and simplicity in generating solutions. The prominence of these traits has been confirmed by several researchers (e.g., Dahl, 2004; Diezmann, & Watters, 2001; Koichu & Berman, 2005; Sriraman, 2003). Affective traits, such as motivation, interest, and persistence, also distinguish academically talented students from their non-gifted peers (Wieczerkowski et al., 2000).

Approaches to Identifying Mathematically Talented Students

There are a number of methods for identifying mathematically talented students. The most frequently used approaches are reviewed below.

IQ tests. Traditionally, the identification of giftedness has been rooted in psychometric evaluations of intelligence quotients. IQ tests are easy to administer to a large number of students. They, however, do not take into account domain-specific talent, such as mathematics, and do not assess non-intellectual factors, such as motivation and task commitment. There is a continuing debate regarding cultural sensitivity in IQ tests, and research has found IQ tests to be biased against minority students, since intelligence tests are largely constructed to meet the norms of a dominant white, middle-class population (Barber, 2005; Ford, Baytops, & Harmon, 1997; Katzman, 2003; Suzuki & Valencia, 1997).

Standardized tests. The use of standardized tests, a common method, has the advantage of being content specific. As the test is simple to administer, identifying promising students in mathematics is relatively easy. Standardized tests are criticized mainly because of their inability to reveal specific *qualitative* mathematical traits. They may test students' memory and ability to repeat a learned procedure rather than original mathematical thinking. The emphasis on right or wrong answers may obscure insight into students' thinking processes. An analysis of solution paths can provide important information beyond the correctness of the solution and reveal mathematical promise (Neria & Amit, 2006; Niederer & Irwin, 2001), as well as other traits, such as motivation, perseverance, and creativity (Wertheimer, 1999). Like IQ tests, however, some standardized tests have been found to be culturally insensitive (Ford, 1998).

School and teacher nomination. Another means of identifying students is through teacher nomination since teachers can provide much information about their students' abilities. Not all teachers, though, have a sufficient knowledge of giftedness. Teachers often associate assertive students or high grades with academic talent, even though poor academic achievement does not necessarily indicate a lack of giftedness (Maitra, 2000; Wilson & Briggs, 2002). Lack of performance may be a result of boredom (Reis, 2003). In addition, some teachers may have biases with respect to gender or ethnicity (Elhoweris, Mutua, Alsheikh, & Holloway, 2005; Maitra, 2000).

Mathematical problem-solving test. A teacher-designed test comprised of tasks used to identify various aspects of mathematical ability is an alternative method for identifying mathematically gifted students. Such tests are content specific; however, they are time consuming and administratively demanding. The testing, typically, involves a large number of students, and the checking and grading process is performed by the teacher (Wertheimer, 1999). In identifying students, one must ensure equal opportunity for all.

An unbiased process must consider that excellence is not defined by similar values in all cultures and that not all students receive the same degree and kind of schooling (Borland & Wright, 1994; Peterson, 1999). Therefore, the purpose of the identification process should be not only to find students who can demonstrate their talents but also to find those who have potential (Ford et al., 1997).

The "Kidumatica" Mathematics Club

This paper describes the selection process for participation in a mathematics club—the "Kidumatica" club—designed for developing

and nurturing mathematically promising students in the southern region of Israel.

Kidumatica was first established in 1998 to provide a framework for the cultivation and promotion of youth (aged 10 to 17 years) with high mathematical abilities. Kidumatica activities expose students to a variety of mathematical subjects, varying in content and strategy. These subjects provide enrichment and enable students to develop sophisticated and creative mathematical thinking. Since its founding, Kidumatica has attracted a multitude of applicants. With a limited number of spaces available in the club, some selection of students is required to ensure that a challenging, high-level mathematical environment is maintained.

Due to Israel's diverse population, with representation from a variety of ethnic, religious, cultural, and social backgrounds, the process of identifying and selecting students for the mathematics club is complex. To create equal opportunities in a diverse society, one must adopt different approaches in both curriculum and assessment (Amit, 2000; Amit, Fried, & Abu-Naja, 2007). One of the main concerns of the Kidumatica leaders is not to overlook promising students who study in schools that do not provide high-level mathematics studies.

A Two-Stage Identification Process

A single identification method is insufficient to determine eligibility for gifted and talented programs; both quantitative and qualitative information about the students' abilities is needed (Ford et al., 1997). Therefore, the screening process is multidimensional, and special consideration is given both to the students' problem-solving processes and their absolute and relative ranking, as described below.

Stage 1: Teacher- or self-nomination. Letters are first sent to all the schools in the region, asking mathematics teachers to recommend the top students in their classes. This initial recruiting method has the advantage of providing an opportunity for all students in the region. It also has its disadvantages; for instance, some teachers tend to view the more assertive pupils as talented and ignore the quiet ones. Also, bias might prevent teachers from recommending some of the students, especially members of minority groups (Elhoweris et al., 2005; Maitra, 2000; Wilson & Briggs, 2002).

Therefore, students are also invited to nominate themselves. The self-nomination provision is based on the assumption that motivated students who are overlooked by their teachers but consider themselves eligible deserve the same opportunity as their peers.

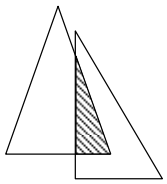
Stage 2: Entrance exam. The students are asked to take an exam that is designed to reveal the abilities that the mathematically gifted are assumed to have, including, among others, a capacity for generalization, abstraction, data organization, as well as other important traits, such as persistence and motivation. The latter are important in assessing a student's intellectual stamina and will to succeed, even in the face of frustration and lack of knowledge. The test consists of routine and non-routine tasks. Tasks are based on the school's curriculum because schools with low-income students or with large minority populations may have less-experienced and less-qualified teachers (Burney & Belke, 2008). Rather than aiming at evaluating students' command of schoolbook problems, the tasks are aimed at revealing mathematical potential. This is achieved by qualitative analyses of the applicant's solution strategies to tasks that demand such mathematical traits as organization and processing of mathematical information, reasoning, use of number sense, and logical thought (See Figures 1 and 2).

During the exams, the Kidumatica teachers are present to assist the examinees. Students may lack the appropriate terminology (such as "natural numbers" or "pentagon"), and having such terms clarified does not harm the validity of the exam, whose aim is to reveal mathematical promise rather than the command of mathematical terms or reading comprehension. In addition, new immigrants are given assistance with the language, and tests for students from the Bedouin minority are translated into Arabic.

Selecting Students

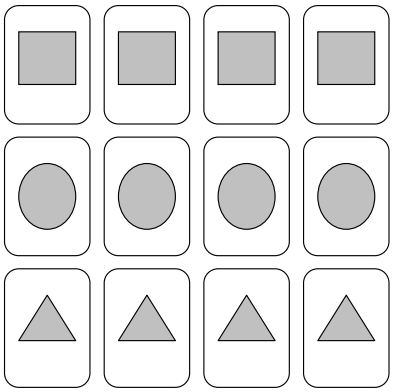
Grading process. Correct answers are allotted maximum points, but there is also an emphasis on the solution paths and their justifications, so as not to overlook students' cognitive abilities, such as solution strategies, reasoning, or elegance. When one looks only for correct answers, crucial information about

The following drawing consists of two triangles. Their overlapping area is also a triangle.



Draw two triangles with an overlapping area that forms a pentagon.

The following drawing consists of 12 cards.



A boy shuffles the cards and puts them facing down on a table. He picks up one card at a time.

The game ends when one of the two possibilities occurs:
* He holds three identical cards.
* He holds three different cards.

How many cards does he have to pick up in order to be sure that the game has ended?

Explain your answer.

Figures 1 & 2. Examples of Problems from the "Kidumatica" Entrance Exam

students' cognitive abilities may be bypassed, whereas their answers to non-routine tasks reveal mathematical promise, regardless of their correctness (Neria & Amit, 2006; Niederer & Irwin, 2001).

Selection. Acceptance to the "Kidumatica" mathematics club is based mainly on the exam scores. The students who achieve the highest scores, overall, are accepted, but special care is taken to ensure that some candidates from every nominating school are accepted. The students with the highest grade from each school are automatically accepted, even if they did not score highly, overall, since they are best in relation to the standards of their school. This approach provides an equal opportunity for all students, regardless of their comparative mathematical ability and level of schooling.

Conclusions

The process of identifying promising students in mathematics is complex, and several aspects should be considered in such a process. Both cognitive traits (such as mathematical logic and reasoning) and affective traits (such as motivation and persistence) must be taken into account. In addition, an effective method must be found to identify students of diverse cultural and social backgrounds. In order to ensure equity in the acceptance of students, regardless of their social background and previous schooling experience, the identification process must be two-staged and include testing of material not solely based on the school curriculum. The selection of students should not be based on the rank ordering of entrance-exam grades, alone, but must be multi-dimensional and based also on affective traits, such as motivation and the will to participate in the program.

The process described above has proven successful. Kidumatica students have won countless national and international contests, participate in university courses at a young age, and, most importantly, acquire the tools that will equip them to be the potential future technological and scientific leaders of Israel.

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2. Engaging the Minds of our Youth: The High Performing Student Program at ACS Athens

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Abstract

ACS Athens is an accredited Kindergarten to Grade 12 International Baccalaureate school, which offers students enriched programming across all subjects. The newly implemented High Performing Student (HPS) Program, unique in Greece, is part of the school's Optimal Match program in which the curriculum is matched to the students' needs and abilities through differentiation and extended learning. The authors developed a survey (adapted from Williams' Performance Levels of a School Program Survey, 1979) to review the HPS Program initiated at ACS Athens in the fall of 2008. Sixty-two teachers, administrators, and counselors (across all grade levels) completed the survey in May 2009, reflecting a 78% response rate. The survey addressed students' abilities in domains such as intellectual, leadership, creative-thinking, visual and performing arts, and affective abilities, which were assessed with respect to teacher training and professional development, community involvement, student-centered programming, and independent student learning. Results from this initial survey identify the program's multiple strengths and set the foundation for further development and consolidation of the school's HPS Program.

> *The world can be a wondrous playground of energy, curiosity, enthusiasm, like a ball of fire bouncing off of a court, twisting, turning, changing directions, angles, height and depth, seeing, observing, evaluating, contemplating, seeking meaning and understanding. It is through the process of reflecting that a simple isolated idea or concept can be transformed into a realm of infinite possibilities.* (Eleni Froustis-Vriniotis, Educator and Counselor, ACS Athens School, 2008)

In 2006, the University of Winnipeg (UW) in Canada and the American Community School (ACS) of Athens, an accredited Kindergarten to Grade 12 International Baccalaureate (IB)[1] school in Greece, signed a memorandum of understanding inviting UW senior education students in the final year of their degree program to complete their five-week practice-teaching block, as interns, at ACS Athens.

In 2008, the first two authors visited ACS Athens as representatives of The World Council for Gifted and Talented Children. Dr. Stefanos Gialamas, President of ACS Athens, expressed an interest in initiating a gifted program at his school and asked us to evaluate the program at the end of its first year of op-

[1] The ACS Athens high-school diploma is recognized by the Ministry of Education and Religious Affairs.#

eration. We accepted his invitation and undertook the evaluation in May 2009. The goal of this article is to report on the results of this evaluation, identify the strengths of the gifted program, and recommend areas for further development. A secondary objective of this study is to assess the usefulness of the evaluation instrument, a teacher survey for evaluating gifted programs in schools, adapted from Williams' Performance Levels of a School Program Survey (PLSPS).

The Context

ACS Athens School

ACS Athens is an international school that was founded in 1948 to serve the families of the newly established American military base in Greece. Currently, there are almost 800 students enrolled, representing over 45 countries. Approximately half of the students are American citizens of Greek origin; the remaining students are from the Middle East, Canada, Africa, Europe, and the People's Republic of China. Students are typically children of diplomats, chief executive officers, academics, government officials, and businessmen. Accredited by the Middle States Association of Schools and Colleges, as well as by the International Baccalaureate Organization, ACS Athens is located in the Halandri suburb of Athens, Greece.

As a state-of-the-art facility, ACS Athens is a full-capacity, wireless campus with interactive boards in most classrooms and laboratories. It has an extensive library containing the largest collection of English language books in Greece, numerous fully equipped science laboratories, a large professional-quality theatre, a fine-arts classroom suite, and a music room. The school also has outdoor basketball, volleyball, and tennis courts, as well as a large gymnasium, a weight-training room, and an Olympic-size swimming pool.

Staff includes 96 teachers, 64 of whom have Master's degrees and four of whom have doctorates. Teacher-student classroom ratios range from 1:8 to 1:25. Several teachers are accomplished authors in their own right, having published books in the fields of mathematics, history, poetry, counseling, leadership, and linguistics. The physics teacher is the author of the IB text in Physics used by IB schools throughout the world.

ACS Athens has an outstanding record of student placement following graduation, with over 95% of graduates placing in top universities around the world, including Cambridge, Harvard, Princeton, Yale, Duke, UCLA, Cornell, and Tufts.

The school is developing a Stavros Niarchos Foundation grant proposal to establish a Research and Development Centre and an In-Service Training Institute for teachers around the world.

Enrichment Opportunities

ACS Athens, as a premier school in Greece, is known for its numerous program initiatives that promote innovative teaching and learning, including a Summer Leadership Institute, a major Newscoop student journalism project, and its award-winning Institute for Creative and Critical Thinking.

Summer Institute on Academic Leadership. In 2009, ACS Athens initiated a summer leadership institute, in partnership with the University of Richmond, Virginia (Jepson School of Leadership Studies). ACS Athens students from Grades 11 and 12 first attended a three-day workshop at their home school, designed to challenge their personal concept of leadership as they explored its theoretical links with democracy, ethics, and community service, even as they explored the leadership potential within themselves. This was followed by a week-long series of workshops at the University of Richmond, focusing on the philosophical, historical, ethical, and social science foundations of leadership, the Jeffersonian ideal of democracy, and leadership in the field of science and environmental issues. As a follow-up to their academic studies, students had an opportunity to observe leadership in action in Washington, DC to learn, personally, from leaders in politics, business, law, government service, the military, medicine, journalism, and public-interest lobbying. Steve Madeiros, the school's academic director, reported that "[s]tudents were engaged in discussion, debate, role-playing, consensus building, negotiating, problem-solving, and project work, supported by a rigorous program of multidisciplinary reading" (Gialamas, Pelonis, & Medeiros, 2009, p. 21).

Newscoop student journalism project. Newscoop, an organization founded by Harvard University's Kennedy School of Government, has developed stellar student journalists who write about world issues from a student's perspective. The Newscoop project at ACS Athens offers students the opportunity to write, edit, and produce news documentaries in collaboration with other students throughout the world. The goal is to create a trusted news source, accessible on the web by students around the globe to inform each other. In 2009, ACS Athens students produced their first piece, a 26-minute documentary on the Israeli-Palestinian conflict that was covered nationally by the Greek television media, with rave reviews (Kelly, 2009).

The village project. Since 2007, when fires ravaged the Greek countryside, ACS Athens has supported the Lepreo Village Elementary School, located in the Zaharo municipality. ACS Athens helped renovate the school, test the local water sources for contaminants, plant 150 trees in the burned forest area, establish a Technology and Education Centre to teach computer skills to students, and raised 5,000 Euros to purchase the school's first computer lab**.**

The world debate tournament. In 2009, ACS Athens hosted eight national teams for the first round of the World Schools Debate Championships, under the auspices of the President of the Hellenic Republic. Countries represented included Germany, Mexico, Netherlands, Indonesia, Romania, Scotland, Israel, and the Philippines. ACS Athens students had a unique opportunity to watch world-class competitors in action.

Institute for Creative and Critical Thinking (ICCT). Successfully launched in the summer of 2006 by ACS Athens, in conjunction with leading universities, worldwide (Williams College, USA; Tufts University, USA; and York University, Canada), the first Athens Summer Institute marked a milestone in the school's history. The Institute established an innovative school and university partnership to promote critical and creative thinking across the disciplines for students enrolled at ACS Athens. It offered a unique, educational experience for young people from all over the globe who aspire to become world leaders in science, technology, business, government, education and community affairs, and the arts. Its Director, Steve Medeiros (2007), elaborates:

> … [In the summer of 2006], over the course of two weeks, our learning community was introduced to an amazing range of artifacts and ideas: the art of Mark Rothko as a meditation on the concept of infinity, a psychological approach to the issue of managing change, the idea of a map as a metaphor for and theory of how we interpret the world, the poetry of Emily Dickinson set to the musical forms of Protestant hymns, knot theory and its relation to the structure of DNA and the science of cloning, a Chandra Sheka meditation on the White Dwarf and the clash of old and new ideas in the field of physics, exploring African changes and rhythms through voice and movements as a means of creating theatre, the elegant and profound simplicity of the movement of a pendulum and what it tells us about the way the universe works, and the paradoxical mathematical concept that there are different sizes of infinity. And, all of this before the students and teachers moved on to the class!...Through collaborative inquiry and problem-solving, presentations, demonstrations, formal debates and discussions, experiments, writing in a range of genres, critical reading, games, improvisations, simulations, performances, field trips to Epidaurus and Delphi, and regular reflections on their learning, Institute participants explored the content of their…courses, honing their academic skills, while expanding their understanding of literature, science, mathematics, theatre, and politics. (Medeiros, 2007, pp. 20–21)

In 2009, the ICCT was awarded the prestigious Nikolai N. Khaladjan International Award by the American Association of University Administrators, the first time in its 40-year history that it had been offered to a Kindergarten to Grade 12 school, rather than to a university.

Virtual science fair. In 2009, ACS Athens middle-school students participated in the first ever virtual science fair, which involved hundreds of students, mentors, judges, and teachers from schools from around the globe. NVSF[2] Project Director, Stuart Fleischer of Israel, noted that "[w]hat was once considered

[2] NVSF stands for NESA Virtual Science Fair and NESA for Near East South Asia.#

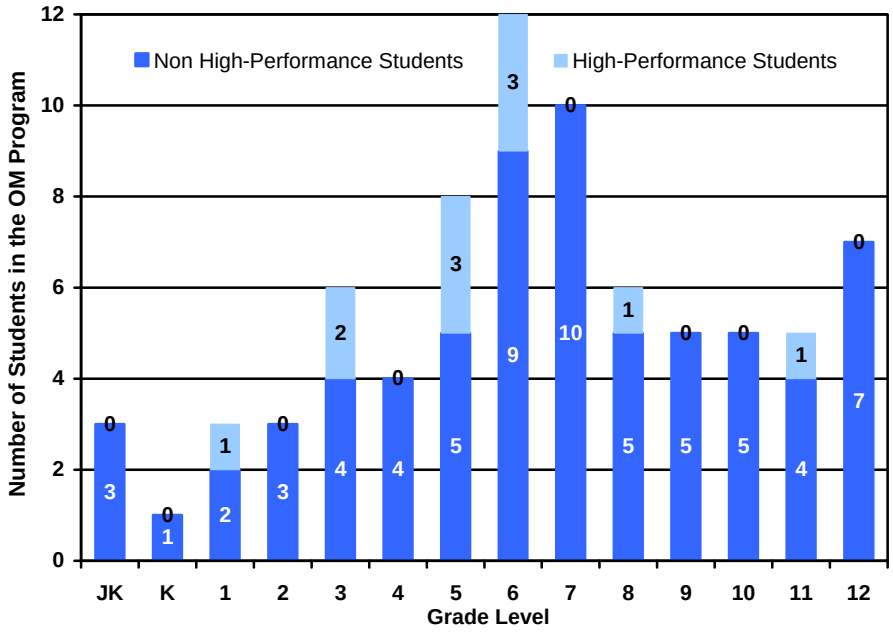


Figure 1. Number of Students in the Optimal Math (OM) Program by Grade Level

impossible is now being accomplished with today's e-learning tools and e-mentoring, i.e., pairing experienced science educators and scientists with middle-school students. In doing so, it helps establish content-related, curriculum-based 'tele-apprenticeships,' or what is referred to as 'e-mentoring'" (Fleischer, 2009, p. 31).

Articulation with American universities. Recently, the school has established an articulation agreement with two American universities in Virginia, namely, the University of Mary Washington and University of Richmond, which allows students to gain credit or course equivalencies for IB and Advanced Placement courses completed at ACS Athens. Discussions are underway with twelve other American universities to develop similar articulation agreements.

In addition to the many enrichment opportunities afforded to all students attending ACS Athens, the school, in 2008, introduced a new program for gifted or (what ACS Athens calls) high-performing students.

The High Performing Student (HPS) Program

Service delivery for the school's high-performing students is provided through its Optimal Match (OM) Program, housed on campus at the Stavros Niarchos Learning Centre. Johns Hopkins University defines optimal match as "the practice that seeks to equate a child's educational experiences to his or her abilities, achievements, interests, and motivations" (Haldiman, 2004). The OM program is innovative in Greece in that it serves students who have various special needs, including learning disabilities, ADHD, Asperger Syndrome, speech and language difficulties, Down Syndrome, vision impairments, oppositional disorders, and dyslexia.

In 2008 – 09 academic year, the OM program served a total of 78 students, of whom 11 were gifted or high-performing (see Figure 1). Most OM students were from Grades 5, 6, or 7, and the majority of HP students attended elementary school.

Teachers who serve high-performing students in their classrooms work closely with OM specialists to help differentiate the curriculum, develop more appropriate learner outcomes, and offer a variety of challenging learning experiences. Specific programming strategies used by ACS Athens include curriculum compacting, acceleration, differentiated instruction, and pull-out enrichment. The approach to enrichment delivery through these strategies is reflective of that advocated by Renzulli in his

Figure 2. Renzulli's Three-ring Conception of Giftedness

Schoolwide Enrichment Model (Renzulli, 2003), as these programming options are integral to his model. Curriculum compacting, for example, is to be offered to any eligible students, that is, to those who have already mastered the curriculum being taught and can benefit from having content compacted and then use the resulting freed-up instructional time on alternative studies of their particular interest. Such students are not necessarily selected from the talent pool, which Renzulli defines as the "10 – 15 percent of above average ability/high potential students…identified through a variety of measures, including achievement tests, teacher nominations, assessment of potential for creativity and task commitment, as well as alternative pathways of entrance (self-examination, parent nomination, etc.)" (Renzulli, p. 187). The percentage of students participating in the OM Program corresponds favorably with the talent-pool recommendation.

Renzulli contends that in order for identified students to reach their potential, diverse educational opportunities have to be provided, ones which are not part of the normal delivery of services in schools. His categorization of the types of enrichment required, as presented in his Enrichment Triad Model, has become popular around the world. In brief, they consist of three types of enrichment activities: Type I, which are intended to expose students, generally, to a broad range of topics of interest in various disciplines; Type II, which consist of group training and instruction in specific areas for the purpose of developing particular skills (e.g. in critical thinking, research, or communication); and Type III, which are self-selected by the students, either in small groups or individually, in their own areas of interest and involve acquiring advanced knowledge and undertaking the development of an authentic product (Renzulli, p. 186). At ACS Athens, the HPS Program specialist works with classroom teachers to ensure that the curricula are differentiated and that learning experiences are designed to meet the individual needs of the students in the program. Such program delivery involves mentorships, guidance in small-group activities, individualized projects, ability grouping, individualized learning plans (ILPs), and offering of internationally recognized, specialized programs. The numerous enrichment activities at the school, as outlined earlier, correspond to the Type I, II, and III activities in the Enrichment Triad Model.

The High Performing Student Program, as part of the OM Program, was designed to provide appropriate educational opportunities for students with exceptional abilities and thereby challenge them suitably in order for them to reach their potential. In order to be eligible for the HP program, students must have above-average ability (an IQ of 130+), display superior talent or giftedness in a given area, and be highly motivated, which is reflective of Renzulli's three-ring conception of giftedness (Renzulli, p. 186) (See Figure 2). The critical aspect of this concept is the interaction among the three qualities.

According to Kalyvas, the school's counseling psychologist and OM teacher specialist, stu-

Table 1. *Sample Student Profiles*

Grade: 3 Israeli Male	Age: 9 years IQ: 150
"Sam is curious, polite, and inquisitive about the world around him. Last September, he came to ACS Athens speaking only Hebrew, but, nine months later, he is fully fluent in English. He provides a positive energy to the class with his uncanny ability to learn. He learns math with ease at the middle-school level. Sam is a teacher's dream. He constantly wants to be challenged."	
Grade: 5 Hungarian Male	Age: 11 years IQ: 140
"Joe is an enthusiastic learner who constantly craves knowledge. This year, he grew out of his shy stage, and his sense of humor really blossomed. Joe gets bored easily if not stimulated in class and is impatient with routine tasks but loves to help his peers understand complex concepts."	
Grade: 6 Mexican American Male	Age: 13 years IQ: 130
"Anthony has made tremendous strides in his studies this year. His effort was lackluster at the beginning of the year until he realized that he can be an "A+" student. He strives to be the best at everything. Anthony is talented in all school subject areas, including music. Last term, he composed and played his own music in front of his classmates. He is a modern-day Renaissance kid."	

dents qualify for the program based on criteria such as superior problem-solving skills; a wide range of interests (is well-read); a creative imagination; keen insight (looks for truth and justice); flexible, original thinking ability; abstract and complex thought capability; and a strong intellectual curiosity. Sample student profiles, provided by the OM teacher, showcase the diversity of talents of students attending ACS Athens.

The Study

The goal of our study is to report on the results of an evaluation of the High Performing Student Program at ACS Athens, to identify its strengths and recommend areas for further program development. A teacher survey, adapted from Williams' PLSPS by the authors, was used to collect the data for the evaluation. A secondary objective of this study is to assess the usefulness of this evaluation instrument.

The Method

Participants

A total of 62 teachers across the three schools participated in the program evaluation, representing a 78% response rate (see Table 2).

Evaluation Instrument

The authors developed a six-page survey, adapted from Williams' (1979) Performance Level of a School Program Survey (PLSPS). The adaptation involved streamlining the diction and dropping the cognitive domain because of its overlap with the intellectual domain. The instrument was piloted, and

Table 2. *Participants in the Evaluation Study*

Participant	Level			
	Elementary School	Middle School	High School	Total
Teacher	13	11	30	54
Specialist Staff[a]	2	1	5	8
Total	15	12	35	62

[a] The staff specialists include the principal, school psychologist, counselor, OM director, and teaching assistant.

thereafter further changes were made, including adding the "have no knowledge" response option and refining the instrument, as a whole.

The instrument assessed six program domains by surveying the teachers' perceptions of the school's performance in addressing the following areas:

- **intellectual**: fostering critical thinking, problem-solving, and informed decision-making;
- **leadership**: enabling the development of leadership qualities to influence, guide, or inspire others;
- **creative thinking**: encouraging the engagement in divergent, fluent, flexible, original, and elaborative thinking, resulting in creative productions;
- **visual and performing arts**: providing opportunities for the showcasing of exceptional talent for developing aesthetic productions in graphic arts, sculpture, music, dance, or drama;
- **psychomotor abilities and talents**: promoting excellence in sports, track and field, gymnastics, and dancing; and
- **affective abilities**: nurturing empathy, compassion, moral sensitivity, and a strong sense of justice.

Across each domain, 10 common questions were asked of teachers: (1) How is this domain measured? (2) Are special enrichment classes available in this area? (3) Are there opportunities, outside of class, to develop this talent further? (4) Are there advanced lessons within the inclusive classroom specifically targeting individual students? (5) Does the school offer any recognition or incentives for those who excel in this area? (6) Are there special opportunities given to students to develop or showcase their talents within the regular curriculum? (7) Are others brought from outside of school to work with students? (8) Is teacher professional development offered in this domain? (9) Do students with this gift or talent work with or serve as mentors for other students in the school? (10) Are students excused from classes to pursue further activities in this domain, in or out of school?

The questions were particularized to the demands of the domain; for example, within the intellectual domain the following questions were asked: How are intellectual abilities measured? Do you offer special enrichment classes? Are students accelerated? Do you individualize student goals? Can students pursue advanced work? Do you offer special options like honors classes, advanced placement, special electives, or self-directed research projects? Do you bring outside specialists to work with students? Is professional development available for teachers in this area? Are high-ability students encouraged to work with or help others in their talent area? Do you excuse students from regular class so that they can pursue independent work away from the school building?

Participants were asked to respond to each question, under each domain, using one of five options: 1 = not being done (this practice is absent at my school); 2 = rare (it hardly ever happens); 3 = usually being done, but we need more of this; and 4 = adequately being done (leave as is). A fifth option was "I have no knowledge of this."

Procedure

The principals of the three school divisions (elementary, middle, and high-school) distributed the hard-copy surveys to all teachers, specialists, and administrative staff during a general faculty meeting. Surveys were completed during the meeting or taken home and returned to the principal the following day. All surveys were then forwarded to the first author three to five days after the general meeting. Data were recorded on spreadsheets by a senior research assistant and analyzed by a statistician, using SPSS.

Results

Results are reported for all teachers, for all domains, including the "I have no knowledge" response.

Teacher Responses: Program Strengths and Weaknesses

The overall composite mean score for all teachers, combining all domains, is 2.80, a score falling between "this practice is rare (it hardly ever happens)" and "it is usually being done, but we need more of this." Such a score is not unexpected since the HPS program has only been in place for one year.

Mean overall scores, broken down by domain, in descending order, are as follows: psychomotor, 3.11: visual and performing arts, 2.91; leadership, 2.84; affective, 2.72; creative 2.63; and intellectual, 2.60. The higher the score, the more adequately ACS Athens is addressing the target domain within its HPS program. These scores reflect the traditionally strong physical education program (highest score) and theatre program (next highest score) that exist at ACS Athens. Leadership, too, is a relatively strong element (third-highest score) that permeates all subject areas at the school. Additionally, there is emerging school support for the intellectual, creative, and affective domains of the school's HPS program.

When the mean scores are examined by domain *and* specific question posed, as shown in Figures 3 to 8, one sees the rich detail that can inform how successful a gifted program is; how it relates to professional development, community involvement, and student-centered programming; how well the program is evolving over time; and what specific areas need greater attention in order to consolidate the program and ensure that it is adequately meeting the needs of its gifted students, as well as of the teachers who deliver the program. In Figures 3 to 8, the horizontal axis represents questions 1 to 10. The vertical axis on the left-hand side represents the teachers' mean response scores, ranging from 1 (not being done) to 4 (adequate, leave as is). The higher the bar, the more adequately the school is addressing that domain in the HPS program; the lower the bar, the less sufficient the school's response.

The alternate vertical axis on the right-hand side of each figure represents the percentage of teachers who responded "I have no knowledge" to a given question. This is visually represented by the line graph superimposed upon the histogram. The higher the line is, the greater the proportion of teachers who know very little or nothing of the HPS program. Thus, the line graph visually depicts how well-informed or knowledgeable teachers are about the HPS program. The figures below show mean response scores for all of the teachers in each of the domains of the survey.

"No Knowledge" Responses

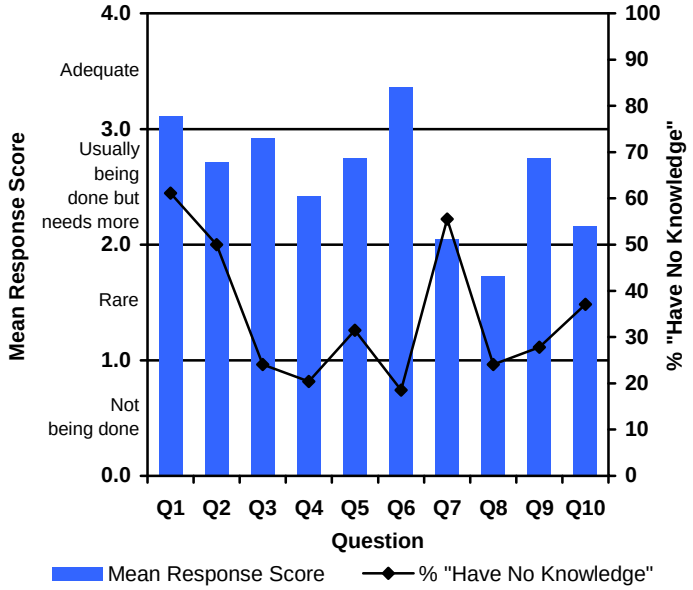
Table 3 shows that a significant number of teachers at ACS Athens have "no knowledge" of selected aspects of the HPS program. For each of the domains—intellectual, leadership, creative thinking, and affective abilities—roughly 30 to 35 % of teachers marked "have no knowledge" on at least 50% of the survey responses. Teachers were considerably less knowledgeable about the domains of visual and performing arts (46.3%) and psychomotor abilities and talents (61.1%).

Teacher Responses by School Level

Overall mean scores, broken down by school level, reveal that scores for elementary-school teachers and middle-school teachers tend to be higher than those for high-school teachers (2.92, 2.88, and 2.73, respectively, out of 4). This is most likely due to the fact that the majority of HP students are currently in the elementary and middle schools where teachers have more experience with and are more informed about the HP program.

Table 3. *Percentage of Respondents Answering "I have no knowledge" on at least 50% and 75% of Questions by Domain: Teachers vs. Specialist Staff*

	Have no Knowledge on at least 50% of Responses		Have no Knowledge on at least 75% of Responses	
Domain	Teachers	Specialist Staff	Teachers	Specialist Staff
Intellectual	35.2	0	9.3	0
Leadership	33.3	0	5.6	0
Creative Thinking	29.6	0	1.9	0
Visual & Performing Arts	46.3	0	18.5	0
Psychomotor Abilities & Talents	61.1	0	40.7	0
Affective Abilities	35.2	0	14.8	0
Mean	34.8	0	15.1	0



Survey Questions

Q1: How are intellectual abilities measured?

Q2: Are there special classes which enrich academic subject areas?

Q3: Are high-ability students accelerated?

Q4: Are they provided with individualized goals to meet their academic needs?

Q5: Are opportunities given to pursue any advanced work?

Q6: Does your school program provide special options (e.g., honors classes, advanced placement, electives, research projects) for those who perform academically above grade level?

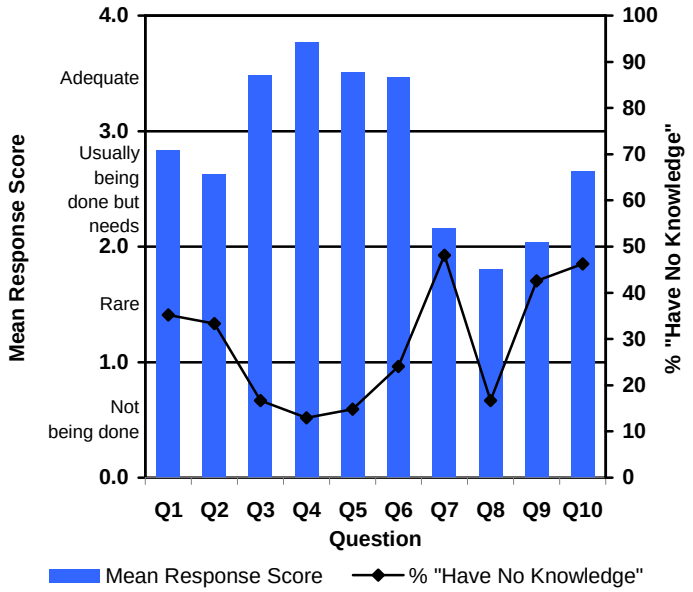
Q7: Do others from outside the school come to work with high-ability students?

Q8: Is professional development provided to teachers for planning special academic programs beyond those offered to regular classroom students?

Q9: Are students who have outstanding knowledge in an academic subject allowed to work with others less knowledgeable?

Q10: Does your school program permit academic achievers to be dismissed from regular classes for independent work away from the building?

Figure 3. Mean Response Scores for all Teachers: Intellectual Abilities



Survey Questions

Q1: How are leadership abilities measured?

Q2: Do you use students' leadership performance to select them for further leadership experiences?

Q3: Are potential class leaders—regardless of age, gender, grade, race, or color—given equal opportunities to perform as school leaders?

Q4: Do students choose their own leaders in your class or school? How?

Q5: Does your school provide recognition for those volunteering in leadership roles?

Q6: Are those who are identified as leaders given special opportunities to assume leadership roles in and out of classroom settings?

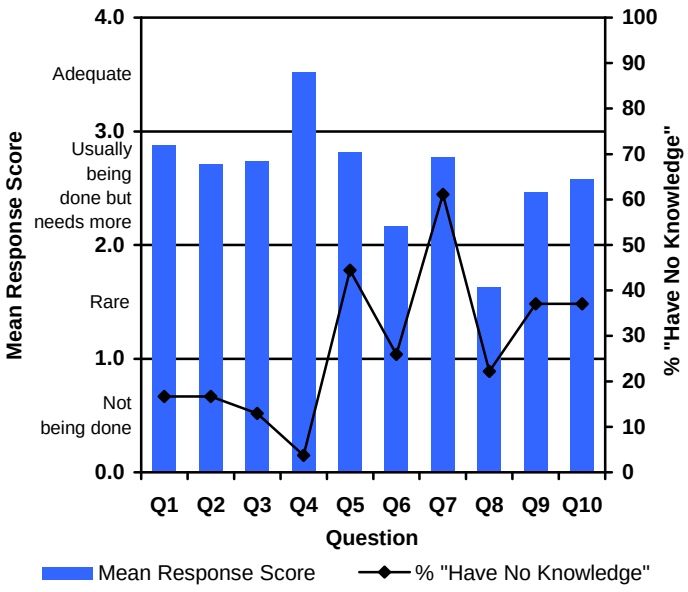
Q7: Do others from outside the school come to work on leadership training with potential student leaders?

Q8: Is professional development offered to teachers for observing, diagnosing, and developing leadership abilities in students?

Q9: Are school student leaders used to offer leadership training for other students?

Q10: Are identified student leaders excused from classes to participate in further leadership activities in or out of school?

Figure 4. Mean Response Scores for all Teachers: Leadership Abilities



Survey Questions

Q1: How do you measure creative thinking?

Q2: Do you use students' performance in creative thinking to select them for further experiences requiring such skills?

Q3: Are students who excel in creative thinking encouraged to work on hobbies, imaginative ideas, inventions, or extracurricular projects in class?

Q4: Do you provide lessons or group activities requiring creative thinking in your classroom?

Q5: Do you provide recognition or incentives for those who think creatively?

Q6: Do you have special activity centers in your class for students to work on their creative ideas?

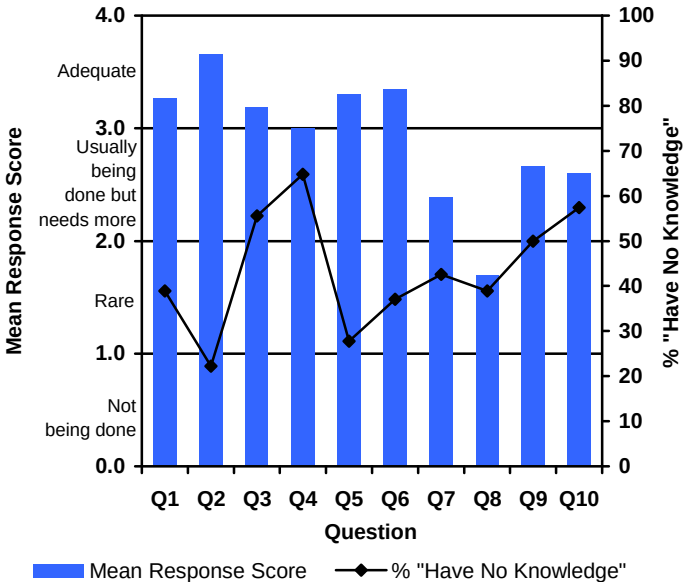
Q7: Do others from outside the school work on creative thinking skills with student groups?

Q8: Is professional development provided on how to teach creative thinking within the curriculum?

Q9: Are students who think divergently used around the school (as mentors or teacher helpers) to work on creative productions with others?

Q10: Does your school allow students to be dismissed from regular classes for independent or group work on creative activities?

Figure 5. Mean Response Scores for all Teachers: Creative Thinking



Survey Questions

Q1: How do you measure students' aesthetic expression in art, sculpture, music, dance, or drama?

Q2: Are talented students of the arts selected and actively involved in displaying, beautifying, decorating, or performing artistic activities in your school?

Q3: Does your class or school attempt to accelerate talented students through advanced work in the visual and performing arts beyond the regular curriculum?

Q4: Are selected students assigned to work with staff music and art teachers on artistic activities beyond those offered all students?

Q5: Does your school offer special recognition, awards, or incentives to those students who perform well in the arts?

Q6: Are there provisions in your school for special visual and performing arts experiences offered to talented students?

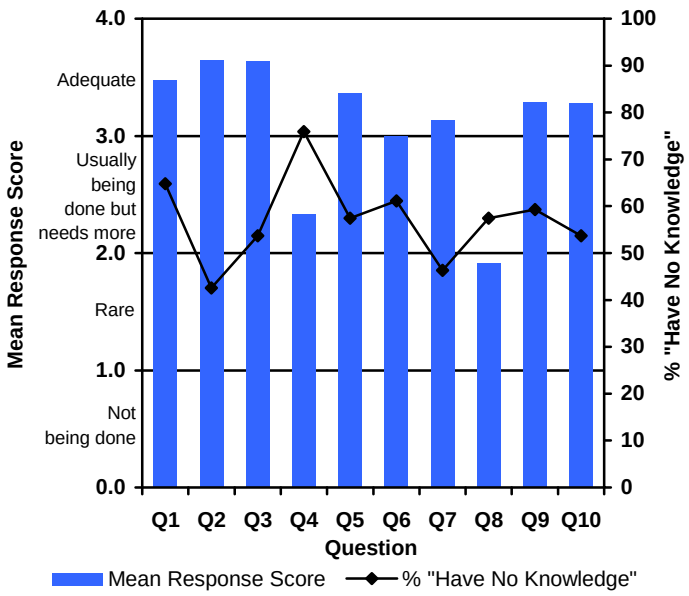
Q7: Are others from within or outside your school brought into the building to work with artistically talented students?

Q8: Is staff professional development provided to help encourage and develop students' visual and performing arts?

Q9: Are those who excel in some artistic endeavor provided opportunities to share their talents as student mentors or teacher helpers with other students?

Q10: Are artistically talented students allowed to leave class to work with mentors or advocates in or out of school?

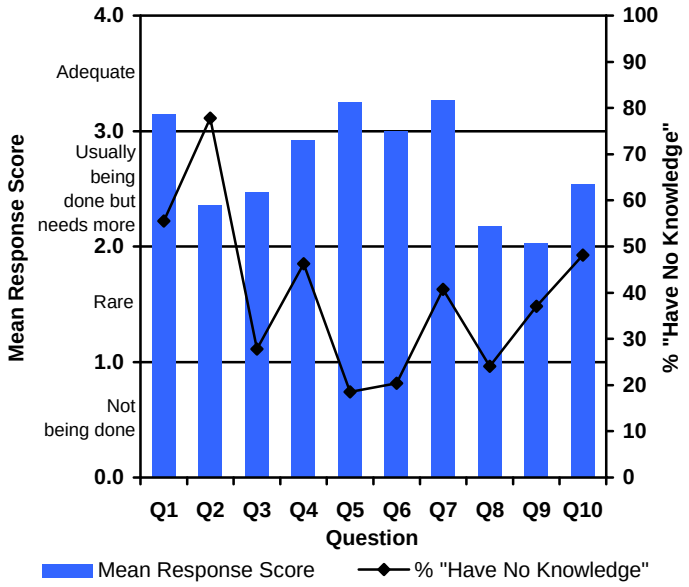
Figure 6. Mean Response Scores for all Teachers: Visual and Performing Arts



Survey Questions

Q1: How do you measure students' psychomotor development in school?
Q2: Are students who excel in movement skills, actively involved in physical activities in your school?
Q3: Are students who are advanced in movement and motor development selected for class or school activities requiring vigorous fine and gross motor skills?
Q4: Are students suspected to be physically or perceptually advanced recommended for observations or tests to further verify physical balance, agility, and endurance?
Q5: Do you offer special recognition or incentives to students who perform well on sensory motor tasks?
Q6: Does your school program integrate physical endurance, muscle tone, body control, and planned physical production activities into the total curriculum?
Q7: Are there provisions for parent and community involvement in physical education and health programs for students?
Q8: Is staff professional development provided on how to measure and nurture students' physical or motor development?
Q9: Are physically gifted students given opportunities to share their talents as mentors with other students not as physically inclined?
Q10: Are physically talented students allowed to work on perfecting their physical expertise during or outside of school time?

Figure 7. Mean Response Scores for all Teachers: Psychomotor Abilities



Survey Questions

Q1: How do you measure students' affective areas and emotional development in school?
Q2: Are students who indicate strong affective development selected for enriched experiences to nurture their emotional maturity further?
Q3: Do you provide time for students who feel good about themselves to continue strengthening their self-concept?
Q4: For students observed being emotionally stable, are records kept of critical incidents, anecdotes, or observed behaviors in an attempt to show positive growth?
Q5: Do you provide recognition or rewards for students who are self-disciplined, independent, and self-sufficient learners?
Q6: Do you provide specific lessons and class activities for students which would purposely integrate their emotional development along with their academic development?
Q7: Do other school staff or people from outside the school work on human development, motivation, or self-esteem programs with students?
Q8: Is professional development provided to teachers to train them on building positive student self concept, cooperative attitudes, motivating students to want to learn, and getting along with others?
Q9: Are students who demonstrate a positive self-concept given opportunities and encouraged to work with disruptive students or those who have behavior or discipline problems?
Q10: Are emotionally developed students allowed to leave class to work with a mentor or advocate on individual projects of interest to them?

Figure 8. Mean Response Scores for all Teachers: Affective Abilities

Table 4. *Means Scores on the Lowest-Scoring Questions 7, 8, and 9*

Domain	Mean Scores (1 to 4)[a]		
	Q7 Outside Expert	Q8 Professional Development	Q9 Students as Mentors to Peers
1. Intellectual	2.1	1.7	2.8
2. Leadership	2.2	1.8	2.0
3. Creative Thinking	2.8	1.6	2.5
4. Visual & Performing Arts	2.4	1.7	2.7
5. Psychomotor Abilities & Talents	3.1	1.9	3.3
6. Affective Abilities	3.3	2.2	2.0
Overall Means	2.6	1.8	2.5

[a] 1 = not being done
2 = rare
3 = usually being done, but needs more
4 = adequate; leave as is

Teachers versus Specialist-Staff Responses

Specialist staff (consisting of principal, psychologist, counselor, Optimal Match director, and teaching assistants who work with HP students) score the HP program more highly (with an overall composite mean score of 3.04) compared to regular classroom teachers (who score 2.80). Specialist teachers tend to be more informed about the HPS program and are more directly involved with various aspects of HPS service delivery, including identification, assessment, and programming. Teachers who have HP students in their classroom have higher overall mean scores (2.89) than those teachers who do not have any HP students (2.74), for similar reasons.

Common Concerns across all Domains

The lowest overall mean scores by *targeted question* across domains was consistently the need for more professional development (1.8), followed by the need to use HP students more often as mentors for other students in the school (2.5), and, finally, the need to bring in more outside experts to work with HP students (2.6). The lower the score, the less fully developed the area at the school (see Table 4). The range of mean scores for these three targeted questions, regardless of domain, fall between 1.7 ("rare") and 3.3 ("usually done, but needs more").

Discussion

This paper reports on the evaluation of the first year of the HPS Program at ACS Athens, an International Baccalaureate school in Greece. Assessment data were gathered through a survey, adapted from Williams (1979), which examined the school's performance in meeting students' needs in the areas of intellectual challenge, leadership, creative-thinking, visual and performing arts, psychomotor development, and affective abilities. These were assessed with respect to a number of areas, including teacher training and professional development, community involvement, and student-centered programming.

Despite its nascent stage of development, the HPS Program at ACS Athens clearly has numerous strengths; for example, the school has an outstanding physical education program (having won many international championships in basketball, track and field, and tennis). It has a vibrant visual- and performing-arts program, with annual theatre productions, like Plato's *The Apology of Socrates*, Moisés Kaufman's *The Laramie Project*, and Thornton Wilder's *Our Town*. It provides numerous leadership opportunities to both its teaching staff and students, including the in-house publication of a first-rate journal of effective teaching, leadership, and innovation, *Ethos*, to which both staff and students contribute. It also has a strong history of academic excellence, integrates community service within the curriculum for all students, and aspires to be

the centre for in-service teacher training for international school teachers, world-wide.

Despite these strengths, however, the survey points to a number of areas that require further development or improvement. These include the need for more frequent professional development for teachers in all areas of gifted education; the need for more outside experts like scientists, artists, engineers, musicians, poets, ecologists, geographers, entrepreneurs, politicians, and medical professionals, to be brought into the school to work with students; and, finally, the need to have HP students serve more frequently as mentors, in their own right, for other students in the school.

A closer examination of the survey results also reveals that there is a significant number of teachers at ACS Athens who have "no knowledge" of selected aspects of the HPS program. This underscores the need for better communication or sharing of information about the program among staff at all three school levels.

The following are recommendations to help consolidate the strengths of the HPS Program, having concluded its first year of implementation: provide extensive professional development or in-service training that reaches teachers throughout the school; establish a community mentorship program for HP students to enhance HPS Program; incorporate a gifted curricular model, such as the Renzulli Schoolwide Enrichment Model, to guide the program-implementation process; introduce an evaluation plan to assess the success of the program and to guide improvement as it evolves; consider a more comprehensive identification system for gifts and talents that is not limited to IQ scores; more fully develop various HPS curricular strategies, such as curriculum compacting, acceleration, differentiated instruction, pull-out enrichment, contracts, independent projects, and mentorships.

The usefulness of the survey, adapted from Williams (1979), also merits some attention. This instrument proved to be effective as an evaluation tool for assessing the HPS Program at ACS Athens. First, it is detailed and allows one to examine a variety of program dimensions simultaneously. Second, as a standard tool, it allows comparability across gifted programs. Third, it identifies specific strengths and gaps in programs under examination. Fourth, it provides direction for program improvement through pre- and post-surveying. Finally, it gauges the extent of change in gifted programs, over time, through annual assessments.

School administrators who may be contemplating the initiation of a gifted program at their school may wish to consider the following additional factors that influence successful implementation. Teachers must feel committed to all aspects of service delivery; they must believe in the program; they must be philosophically on board. There must be supportive school-board policies addressing gifted programs that provide educational, professional, and administrative assistance to staff and students. It is desirable to select a model of gifted education, like Renzulli's Schoolwide Enrichment Model, to provide structure and more efficient delivery of a program. A model of gifted education makes implementation easier, alignment of the curriculum more effective, and the articulation with the regular program more seamless. A director is needed to oversee and monitor the program and to serve as its leader and champion. Professional development is critical; it is the fuel that drives any program. Community mentors play an important role, an option that should be included in any enrichment program. To have a sustainable program, one must also have the funds, ways to support the program financially. Finally, one must have an evaluation plan to assess and monitor the success of the program over time. Once these are in place, the likelihood of success of any gifted program is greater, and the vital task of engaging the minds of youth becomes more meaningful and effortless.

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3. “Frühstudium” – Acceleration and Enrichment for Secondary-School Students at the University of Koblenz-Landau

Martina Endepohls-Ulpe

Abstract

“Frühstudium”[1] is an enrichment and acceleration program option offered at some German universities for students from secondary schools. Students participate in selected university courses while continuing their studies at school, thus saving time in their future studies, while enriching their knowledge in several fields. This paper focuses on an evaluation of “Frühstudium” at the University of Koblenz-Landau, Campus Koblenz, initiated in 2006. The program evaluation, consisting of a questionnaire administered to the student participants in the program, centered on three areas, namely, the benefits of the program, the promotion of the program at the school level, and the degree of support for the program by the secondary-school teachers. Results, based on the response rate of 20 students, indicated a number of strengths of the program, but also some of its limitations. The evaluation of two years of “Frühstudium” at the University of Koblenz reveals that this program is worthwhile as an enrichment measure for students.

Acceleration and enrichment are two basic principles of differentiation frequently applied in gifted education programs, as well as in measures for individualized instruction for gifted students. Paula Olszewski-Kubilius (2003) calls them the “cornerstones” of gifted education. Acceleration is a program intervention consisting of moving designated students through the normal curriculum at a faster pace or at younger ages than other students. Individualized organizational forms of acceleration are grade skipping or early admission to certain levels of schooling, for example, primary school, college, or university. In contrast, enrichment extends, supplements, or sometimes replaces aspects of a school’s existing program, as “[t]he emphasis in enrichment is generally to keep children with their age-peers and to foster the development of higher cognitive and affective processes” (Coleman & Cross, 2005, p. 270). The student works on problems or materials that are not part of the regular curriculum, or subjects in the regular curriculum are extended. Enrichment may happen as a part of the school program in the regular class or during special courses at allocated times in designated settings. There are also many opportunities for enrichment for gifted children outside of school, in activities such as weekend courses or summer camps (Endepohls-Ulpe, 2009, p. 868 – 870). Acceleration and enrichment are complementary measures since saving time by acceleration provides learning time to cater for the individual abilities and interests of the students, which may be accomplished through enrichment.

In spite of the demonstrated effectiveness of these two measures for improving the learning environment of gifted students, acceleration and enrichment both have their limitations, or even disadvantages. Acceleration may be disallowed on account of state regulations or laws. In Germany, for example, it is hardly

[1] “Frühstudium” means going to university early.

possible for a student to skip one of the last two grades of grammar school (Grades 12 and 13) because the performance during these two years, in the form of marks for written or oral exams, is considered for the final certificate—the "Abitur."[2] Grade skipping may also not be an option for students who are high-achieving in a designated area, for example, mathematics or language, but who are not generally gifted and, therefore, cannot skip an entire grade. Additionally, acceleration is not very popular among parents and schools (Rost, 1993, p. 204), despite the fact that the effects of acceleration for achievement and students' self-esteem, as determined by empirical studies, seem to be positive (Heinbokel, 2008, p. 84). There is, obviously, considerable concern about the adverse effects on children's social and emotional adjustment; parents, as well as teachers, also assume that accelerated pupils will have problems later in their schooling.

Enrichment is mostly preferred over acceleration by parents, but if it is to be provided over a longer period of time and to be of high quality, it is a measure that is time-consuming and expensive, especially if the extra courses are taken outside school (Heinbokel, 2008. p. 83). This is true for schools, too, if they organize and offer extra programs.

The Principle of "Frühstudium"

"Frühstudium" is a combination of acceleration and enrichment for secondary-school students taking selected university courses while still in school, circumventing some of the disadvantages associated with the implementation of each measure on its own.

This program was first established in Germany at the University of Karlsruhe in 1998, and in the following years, at the universities of Cologne (2000) and Bonn (2001). In 2004, the conferences of the German Ministries of Education and headmasters of German universities officially decided that students of secondary schools would be permitted to attend universities without formal admission and participate in regular courses. Achievement in university courses studied would be credited towards the student's future studies. By now, there are nearly 50 German universities offering different forms of participation in university courses for younger students (Deutsche Telekom Stiftung, 2008).

The main principle of "Frühstudium" is that students of grammar schools or, in exceptional cases, of modern secondary schools ("Realschulen"), who are highly motivated, interested, and performing very well are offered the opportunity to participate in university courses. The amount of time spent at university is not pre-determined or limited. Since the students miss part of their regular school lessons, schools have to give their permission, one condition for obtaining this permission, usually, being outstanding achievement at school.

The aims of this program are to deepen and enrich students' knowledge and to reduce the overall time spent at university upon completion of secondary school. Students can save time in the educational system without having to skip a grade. As an enrichment measure, "Frühstudium" orients students to possible fields of study and gives them opportunity to determine their interests in certain subjects (Ley, 2002). The courses are normal, high-quality university courses, provided at no additional cost for either the schools or universities.

The programs at different German universities vary with respect to the admission criteria and courses offered. Halbritter (2004) criticizes the common use of high-school grades as the basis for student entry, arguing that this criterion keeps underachievers away, as it is precisely the unmotivated and insufficiently challenged who could profit from the program. Some universities provide mentoring by older students, a support which helps prevent the school participants from dropping out prematurely (Halbritter, 2004).

Students who complete a semester and meet the requirements receive university credit for future studies in the same subject. If they meet all the university-course criteria, students can take the respective oral and written exams and obtain a university degree while still attending secondary school, but this seldom happens.

[2] In Germany, the "Abitur" is the final certificate issued to students, in all federal states, upon their successful completion of secondary school, based on their performance on oral and written exams over the two final years.

"Frühstudium" at the University of Koblenz

"Frühstudium" was established in the winter of 2006 as a mentor-supported acceleration and enrichment program at the University of Koblenz-Landau, Campus Koblenz. The possibility of younger students taking university courses had existed since 2004, but, in Koblenz, not a single student opted to do so, perhaps, due to ineffective communication about the program or various psychological and logistical barriers for the students.

While the university provided the teaching resources, funds were needed to establish the program financially, for example, designing an internet page (uni-koblenz.de/fruehstudium), printing and distributing flyers to recruit students at the various schools, and identifying, training, and paying mentors to work with students. The mentorship component of the program was made possible through the sponsorship of the German Telekom Foundation and a loan program of the Rhineland-Palatinate Ministry of Science.

In the initial year of the program, only courses in mathematics, natural sciences, and computer sciences were offered. In the second year, course options were extended to include other faculties and subjects, such as philosophy and musicology.

Participation of secondary-school students was based on school nomination and parental agreement. Mentors helped students build their individual timetables. Students were also able to communicate with their mentors by e-mail or phone when questions arose. In addition, an e-learning platform (WebCT-Blackboard) was established as a further communication tool for exchanging articles or course notes. Each student had to contact his or her personal mentor at least every two weeks.

Evaluation of the Program

In 2008, an evaluation of the "Frühstudium" program at the University of Koblenz was conducted. This evaluation consisted of a questionnaire administered to the student participants in the program, which centered on three areas, namely, the benefits of the program, the promotion of the program at the school level, and the degree of program support by the secondary-school teachers.

Method

The Questionnaire

After each of the two semesters[3] of study, students were given a questionnaire to gauge their satisfaction with the program. It included 4- to 6-point Likert-scale items and open questions on several aspects of the program, including organizational factors, travel time to university, number of missed lessons at secondary school, attitudes of others (peers, friends, parents, etc.) concerning the program; perceptions of success, support at school, problems encountered and possible solutions, and suggestions for program improvement. First-time students answered a longer version of the questionnaire, which requested information about how they got into the program, and their parents responded to a parallel questionnaire. The questionnaires were adapted from that used in Solzbacher's study (Deutsche Telekom Stiftung, 2008)—a tool created to evaluate all German "Frühstudium"-programs in the winter of 2006 - 2007. All data were analyzed using descriptive statistics.

Participants

A total of 31 individual students participated in the program between 2006 and 2008, some of whom took part in more than one semester. After the completion of the first semester, 20 of these returned their questionnaires. A total of 42 questionnaires were collected, representing, in some cases, multiple completions of the questionnaires by returning students; however, the data analysis is based on the discrete responses of the original 20 students (See Table 1).

In the winter of 2006, the program started with 12 students. In the summer of 2007, there were 14; in the winter of 2007, there were 9; and in the summer of 2008, there were 7. These participating students all came from grammar schools.

Eight of the 20 students who completed the questionnaire after their first semester were in Grade 11 when they started, 9 were in Grade 12, and 3 were in Grade 13. The ratio of male

[3] German universities run two semesters. The winter semester, during which most students start university, begins on October 1st and ends on March 31st. The summer semester begins on April 1st and ends on September 30th.

Table 1. *Number of Participants and Semesters Studied*

	Number of semesters				Total
	1*	2	3	4	
WS 2006/07 Winter semester	7	0	0	0	7 (12)
SS 2007 Summer semester	7	5	0	0	12 (14)
WS 2007/08 Winter semester	5	0	2	0	7 (9)
SS 2008 Summer semester	1	2	0	2	5 (7)
Total	20	7	2	2	31 (42)

*Only data for the group of students in the first semester were analyzed for the purpose of this study.

to female students was approximately 2:1 (13 male, seven female), which may have been due to the program's initial focus on mathematics and on natural and computer sciences, courses mostly selected by the male students. Four of the seven female students chose subjects like philosophy, musicology, or psychology. Table 2 shows that most of the students were between 16 and 18 years of age; one student was 15, and two were 19 years old when they started the program.

Twelve of the 20 students acquired certificates of performance (which now constitutes university-credit points) in one or more courses after their first semester. Of the seven students who continued their university studies in the second semester, four acquired certificates upon completion, and the two students who continued in the program for the third and fourth semester acquired certificates in each of these semesters. Students who attended the courses but did not write a final test or prepare a presentation did not acquire certificates or credits.

Most of the participants were high achievers, obtaining a mark of 1 or 2 (the best marks in the German school system) in the main subjects: mathematics, German, foreign languages, or natural sciences. Four students had skipped a grade, two of them in primary school and two of them in secondary school.

A disproportionate percentage of students came from families with higher-level education. Nine fathers had studied at a university, and only two fathers worked in non-middle-class jobs. Five of the mothers had had an academic apprenticeship (technical-vocational stream). These numbers are not representative of the general population. The Koblenz sample is not as academically distinguished as the total sample of students participating in similar programs elsewhere in Germany, as analyzed by Solzbacher (Deutsche Telekom Stiftung, 2008). In that study, 71% of the students had at least one parent with a university background, and 58% of these students had both parents with a university degree.

Table 2. *Age of Students at the Start of the Program*

Age	N	%
15	1	5
16	7	35
17	5	25
18	5	25
19	2	10
Total	20	100

Table 3. *Students' Source of Information on the Program*

	N	%
Secondary-school administration	1	5
Secondary-school subject teacher	6	30
Secondary-school guidance counsellor for gifted students	1	5
Media (newspaper / radio)	5	25
Parents	1	5
Friends	3	15
Other sources	3	15
Total	20	100

Results

Starting Conditions: Student Interest in the Program, Recruitment, and Expectations

Students obtained initial information about the "Frühstudium" program from varying sources: 40% were informed about the program by their schools, which, in turn, received their information from the university program administration twice a year, and 55% of the students received their initial information from the media, friends or parents, or other sources (universities, former teachers) (See Table 3).

Students rated their personal interest in the subject of study as the most important reason for participating in the program (See Table 4). An equally important reason was gaining an understanding for career options, that is, insight into the subject of study to determine their degree of interest in it.

Escaping uninteresting instruction at school was also a motivational factor. Factors not very important to the students were the study time redeemed or the money saved. Neither did the advice of teachers or parents play an important role in the students' decision to participate.

The reasons for participation matched students' expected program outcomes. Escaping from boredom at school was rated the most important outcome (M = 3.5), followed by securing information for a choice of career (M = 3.3), attending the courses regularly (M = 3.0), adding the program to their curriculum vitae (M = 2.9), and acquiring a certificate of performance (M = 2). The distances from secondary school or home to university differed for the participants: for 35%, it was 5 to 10 kilometers; for 30%, it was between 10 and 40 kilometers; and for 20%, it was more than 50 kilometers. The average amount of travel time between school and university was over 40 minutes. One student needed 90 minutes to reach the university.

Table 4. *Student Participation Factors*

	*M**
Interest in the subject of study	3.9
University experience	3.1
Subject-interest confirmation for career choice	3.0
A change from everyday school life	2.7
Boredom at school	2.6
Prospect of finishing university studies earlier	2.0
Parental encouragement	1.6
Saving university-tuition fees	1.6
Teacher or school encouragement	1.4

*Note: 1 = not important; 4 = very important

Table 5. *Reactions of Others to Students' Participation in the "Frühstudium" Program*

	*M**	Negative Reactions *N*
Parents	4.65	1
Friends	4.50	0
Teachers	3.65	4
Regular students at the university	3.65	0
Teachers at the university	3.45	0
Peers at school	3.20	6

*Note: 1 = negative; 3 = neutral; 5 = positive

The time that the students spent at the university each week ranged from 2 to 14 hours (*M* = 4); 75% spent 2 to 5 hours, 20% spent 6 to 8 hours, and one student spent 14 hours. The number of lessons missed at their school each week corresponded closely to the hours the students spent at university (1 to 14 hours): 75% of these students missed 1 to 5 hours, 20% missed 6 hours, and one student missed 14 school lessons.

Experiences During the Program: Supportive Conditions and Obstacles

Reactions of others (parents, friends, teachers, university students, university faculty, school peers) to their participation in the "Frühstudium" program were mostly positive, according to item means (See Table 5). School peers were the most discouraging group. Six students reported negative or slightly negative peer reactions. Overall, friends and parents were the most supportive. Four students reported negative reactions from their teachers at school. University students and faculty were mostly neutral, often not even noticing that the participants were not regular university students.

Students frequently indicated that they had established ties to regular university students or to fellow participants in the program. Four students commented on establishing close contact with university faculty, who were mostly very interested and supportive when they recognized the special status of the students.

Support at the secondary school for the participating students was mediocre. Only eight students reported getting any support in completing their missed work at school. Eight students reported getting information on missed subject matter, one student got support for post-processing the missed lessons, and one was given the opportunity to compensate for missed presentations with written or oral contributions. Four students were supported by teachers who taught the same subjects that the students were studying at university. Eight students obtained assistance from teachers whose lessons they had missed, and five students were supported by friends, peers, tutors, or the headmaster of the school. Most of the students were highly satisfied with the support of the university, for example, with being mentored by older students. Only two students reported that they were not completely satisfied with the university mentoring.

Table 6. *Satisfaction with the Program*

	N	%
Completely satisfied	8	40
Satisfied	7	35
Somewhat satisfied	3	15
Somewhat not satisfied	1	5
No response	1	5
Total	20	100

Success of the Program: Costs and Benefits

Most of the participating students were satisfied with the program. Only one student indicated being "somewhat not satisfied" (See Table 6).

Of the 20 students who completed the questionnaire, 17 students (85%) attended their courses until the end of the semester and three (15%) dropped out for a variety of reasons—the extensive distance from school to university, missing tests at their school, illness for several weeks, missing too many lessons in one subject at school, and teacher and headmaster concerns with regard to missed lessons. The total number of dropouts is likely higher than three, as it can be assumed that some of the students who did not fill out the questionnaire had dropped out.

Nine students reported that their marks at secondary school in their university-studied subject improved during the program. Nine students did not experience any change in marks, and two students reported a deteriorated performance at school. With respect to other subjects, 14 students (70%) reported no change, three reported a positive change, and three reported a negative effect on their school marks. Reasons given for a decline in school performance were negative attitudes and bullying by teachers of the studied subject, poorer marks for oral participation due to missed lessons, and a missed French test.

Most of the students (14 or 70%) declared that they still had enough leisure time; only six students (30%) reported a slight cutback of their leisure activities.

All students wanted to take up studies at a university after finishing school, but only six of them were convinced that they wanted to study the subject they had studied at university. Six students were sure that they would study a different subject. Only one student was sure that he or she would take up studies at the University of Koblenz. Seven were still unsure about staying, and 12 were certain that they would go to a different university.

The experience of real university life was mentioned by several students (N = 7) as something they enjoyed most in the program, followed by their being accepted by other students and university faculty (N = 4) and communicating with them, as well as gaining deeper insight into the studied subject (N = 4).

Suggestions for improving the university administration of the program included offering more courses in the afternoon in order to avoid students missing lessons at school[4] (N = 3). Two students would like to have received more mentoring.

Suggestions for an improvement on the part of the schools included providing adequate information for participating in "Frühstudium" (N = 3) and receiving more support and interest from their schools and teachers (N = 8).

Discussion

Target Group

The University of Koblenz-Landau, Campus Koblenz, is a small university with approximately 6000 students. As measured by numbers of participating students at larger universities (for example, Bonn with 30,000 students, approximately 70 participants and more than a 30% dropout rate per semester), the number of participants in the current study (*N* = 20) is representative, and the number of dropouts (15%) is within a regular range. The participating group, with respect to their social background, is representative of the population of grammar-school students in Germany, as a whole (see Baumert et. al., 2000), but it is less representative of the total population of participants in similar university programs for younger students throughout Germany (Deutsche Telekom Stiftung, 2008). Most of the students in this study are high achievers, which is due to the criteria set for the program.

Promotion of the Program

The secondary schools did not promote the program actively enough, as most of the students learned about the program through the media. Findings underscore the importance of the university's public relations and promotional efforts.

[4] Schools in Germany end in the early afternoon, allowing students time for completing homework and engaging in other activities.

Benefits

For students, the benefits of the program included escaping from boredom at school, obtaining a deeper insight into an interesting subject, and gaining information for making career and occupational choices. The option for acceleration was only a minor motivating factor for students, as indicated by their answers to the open-ended question on outstanding aspects of the program. Obtaining an insight into university life and being accepted by regular university students and faculty was more valuable for them.

Degree of School Support

A number of schools provided inadequate or little support for participating students. Students reported that most of their support came from friends or parents. Only eight students received assistance from teachers to compensate for missed school lessons. Others experienced negative reactions from teachers, for example, as reflected in the students' written statement, indicative of much of the oral communication with mentors: "I do not expect any support from my school. To me 'Frühstudium' is attractive because I can work independently. However, it would be nice if they did not permanently put additional obstacles in my way."

Nevertheless, most of the participants managed their work both at school and at university, as their school marks seldom dropped.

One can only speculate about the reasons for the lack of support, or even obstructive behavior, by some teachers. It is possible that the teachers have the same concerns regarding acceleration as are often expressed by opponents of acceleration. (Heinbokel, 2008). Teachers may also be uncertain about how to deal appropriately with the issue of missed lessons. Official guidelines formulated by the schools' supervisory board could be helpful for both teachers and students.

Can the program be evaluated as a success? The answer is tentative, as the data for the study are based on a small sample. The answer also depends on how one defines success. As an enrichment measure, "Frühstudium" is, clearly, successful. The participants enjoyed their stay at university. Some of them explicitly did not want to earn any certificates; they simply wanted to deepen their knowledge or determine the appropriateness of the subject studied for future pursuits. Most of them reported that they were satisfied with their university experience. One student, enrolled in chemistry courses, e-mailed his mentor, after one semester in the program, expressing certainty that chemistry was not the right subject for him and that medicine was his chosen field. While this might not be interpreted as a success, this realization can be seen as a positive outcome of the acceleration program, saving half a year of postgraduation studies by having to come to this conclusion early.

Even though the students' main objective in the program was not acceleration, more than half of them acquired certificates. Not a single student dropped out of the program because of difficulty with the subject matter.

Conclusion

The evaluation of two years of "Frühstudium" at the University of Koblenz reveals that this program is worthwhile as an enrichment measure for students who are insufficiently challenged at school. It also can serve as an acceleration strategy even if this is not the main goal of the participants in the program. Results show that the acceleration program is well received by the students. The findings, however, show that there is, evidently, a strong need for action concerning the way secondary schools manage the program. The data reveal that many schools did not inform their students properly about the program. Only a minority of students received support from their teachers in managing their double workload. Some even felt bullied or experienced obstructive reactions from their teachers. In view of these results and to ensure future success, the "Frühstudium" project managers should put more effort into their collaboration with the schools, provide timely and vital information about the program, and offer more guidance to the teachers so that they can better accommodate all participating students.

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4. Identification of Gifted Children Using Nonverbal Ability Tests Across Cultures and Languages

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Abstract

This paper addresses the development and use of the Naglieri Nonverbal Ability Test, Second Edition (NNAT2). It presents information about the standardization, reliability, validity, interpretation, and research findings on the test, which is available in both the paper and electronic form. This test measures general ability, using nonverbal questions, an approach which the research literature supports. The overarching goal of the NNAT is to ensure that educators assess children fairly, especially those from diverse cultural and linguistic backgrounds, so that they may be included in programs for the gifted.

Since IQ tests were initially formulated in 1905, with the publication of the Stanford-Binet (Binet & Simon, 1905), and in 1939, with the publication of the Wechsler-Bellevue Scales (Wechsler, 1939), IQ has been measured using verbal, quantitative, and nonverbal tests. These tests made a significant and long-lasting contribution to our understanding of how to measure and how to conceptualize intelligence. The results obtained from these tests have influenced the lives of countless children and adults in the United States and around the world. While intelligence tests represent one of the most influential contributions made by psychology to society, in general (Anastasi & Urbina, 1997), they also have become engrained in our culture as *the* way to measure ability.

Intelligence has been measured using tests that were organized into the now familiar verbal, quantitative, and nonverbal format, which have become idealized as measures of verbal, quantitative, and nonverbal "intelligences." There was no intention by the originators of these tests to measure three separate abilities. In fact, the division was a practical one, as noted by Yoakum and Yerkes (1920) when they wrote that the Army Beta (nonverbal) tests were used because it was known that a person could fail Alpha (verbal and quantitative) tests due to limited skills in English. To avoid "injustice by reason of relative unfamiliarity with English" (Yoakum & Yerkes, p. 19), these persons were then tested with the nonverbal tests. It was known from the beginning that general ability could be measured using verbal, nonverbal, and quantitative tests, but nonverbal tests were best for those with limited English language or limited educational skills.

It is important to note that Wechsler's view of intelligence was not that verbal and nonverbal were two types of intelligence, despite the fact that, for years, his tests yielded Verbal and Performance (nonverbal) IQ scores. Wechsler (1958) wrote, "[T]he subtests are different measures of intelligence, not measures of different kinds of intelligence" (1958, p. 64). Boake (2002) noted that Wechsler viewed verbal and performance tests as equally valid measures of intelligence. Similarly, Naglieri (2003) wrote that "the term nonverbal refers to

the content of the test, not a type of ability" (p. 2). Thus, tests may differ in their content or specific demands but still measure the concept of general intelligence. Moreover, Wechsler argued that nonverbal tests help to

> minimize the over-diagnosing of feeblemindedness that was, he believed, caused by intelligence tests that were too verbal in content... and he viewed verbal and performance tests as equally valid measures of intelligence and criticized the labeling of performance [nonverbal] tests as measures of special abilities. (Boake, 2002, p. 396)

Wechsler (1975) included all subtests in his test of intelligence under the term general ability (sometimes referred to as '*g*'). He wrote that "the attributes and factors of intelligence, like the elementary particles in physics, have at once collective and individual properties" (p. 138), saying that although his test, or other similar tests, has questions that are described as verbal, quantitative, or nonverbal, they can be combined under the concept of general ability. The origin of this idea was amply explained by Pintner (1923) when he wrote,

> [W]e did not start with a clear definition of general intelligence... [but] borrowed from every-day life a vague term implying all-round ability and... we [are] still attempting to define it more sharply and endow it with a stricter scientific connotation. (p. 53)

Identification of Gifted Children

There is considerable need for test administrators to examine carefully the content of tests used to identify children who are gifted across cultures and countries and to select those tests that provide all children an equal opportunity to perform. Bracken and Naglieri (2003) argue that traditional tests of intelligence with their verbal, nonverbal, and quantitative tests are best described as measures of general ability. They argue that "general intelligence tests with verbal content and nonverbal content measure essentially the same construct as general ability tests that are entirely nonverbal" (p. 247). Both types of tests measure general ability; however, one test measures general ability with varying content (verbal, quantitative, and nonverbal), and the other takes an exclusively nonverbal approach. It is important to recognize that the term "nonverbal assessment" describes the methods used to measure the construct of general intelligence and not a theoretical construct of "nonverbal ability" (Bracken & McCallun, 1998), that is, there is no assumption that nonverbal, as opposed to verbal or quantitative, *abilities* are being measured. Instead, general ability is measured using nonverbal tests so that a wide variety of individuals may be assessed, using the same set of questions.

The importance of distinguishing tests with verbal and quantitative (e.g., academic achievement) content from so-called nonverbal tests of ability is critical for the assessment of individuals with limited language skills or those from disadvantaged backgrounds. It is well known that high poverty is correlated with low test scores because of issues associated with educational opportunity at school and at home. Many students who live in poverty receive low test scores because of limited opportunity to learn. These students, who may be from any racial and cultural backgrounds and from any country, are penalized on traditional tests of intelligence and, subsequently, denied access to gifted-education programs and services.

Nonverbal measures of general ability are less influenced by limited language and quantitative skills, making them more appropriate for assessment of culturally and linguistically diverse children (Hayes, 1999; Naglieri & Ford, 2005; Naglieri & Yazzie, 1983; Suzuki & Valencia, 1997). For this and other reasons, nonverbal tests of ability are appropriate for a wide variety of persons, especially those with limited language skills and academic failure (Bracken & McCallum, 1998; Zurcher, 1998). Nonverbal tests can help identify children with high ability who may lack verbal and quantitative skills. The identification method, therefore, has considerable influence on who is served.

There is no consensus about how gifted children should be identified. Although standardized tests are often used as part of the identification process, there is considerable variability as to which tests should be used and what other information should be gathered. Some (e.g., Lohman, 2005) argue that verbal, quantitative, and nonverbal tests are absolutely necessary to identify "academically talented" students, but others (e.g., Naglieri & Ford, 2003, 2005) argue that limiting the definition of gifted to those who demonstrate high achievement and excluding children with high

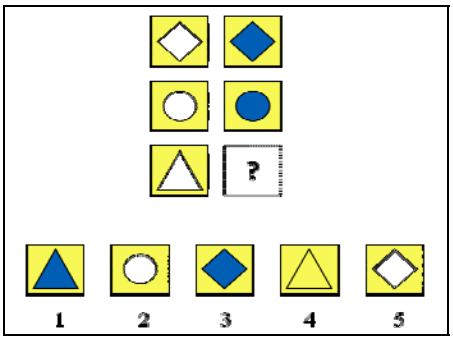

Figure 1. Illustration of a progressive matrices item from the Naglieri Nonverbal Ability Test – Second Edition

nonverbal scores but lower academic scores perpetuates the problem of under-representation of minority children in gifted programs. Naglieri and Ford (2003, 2005) suggest that nonverbal tests are necessary for a more equitable way of evaluating a wide variety of children and giving greater opportunity for those from culturally and linguistically diverse populations to participate in gifted programs.

General Ability Measured Using Nonverbal Tests

Naglieri, Brulles, and Lansdowne (2009) state that general ability is what allows people to solve a number of different types of problems that may involve words, pictures, sounds, or numbers. The tests used to measure general ability may include those that involve verbal, quantitative, or nonverbal reasoning, memory, sequencing, making inferences, problem solving, and so forth. What is important to recognize is that general ability is the foundation for all activities that we do in our daily lives. There is much scientific support for the concept of general ability as measured by tests, such as those developed by Wechsler and Binet (see Jensen, 1998, for a review), but general ability does not have to be measured using verbal, quantitative, and nonverbal tests. Nonverbal tests alone are sufficient.

The essence of a nonverbal test of general ability is that it does not contain verbal and quantitative test questions, although it may involve verbal solutions to the problem; for example, Figure 1 shows a nonverbal test question that could be included in a test described as a progressive matrix. The matrix varies across the horizontal and vertical dimensions. The difference between the top and bottom rows is that the shape inside that square changes (a diamond appears on the top row, a circle appears on the middle row, and a triangle on the bottom row). The difference between the first and second column is the color of the shapes in the boxes. The child needs to understand the interrelationships among these variables (shape and shading across the columns and rows) to arrive at the correct answer (option 1). The child may or may not use a verbal description (in any language) of the matrix, as just described, or the child may simply look at the shapes and understand which option is the answer with minimal verbal analysis. Most children and adults, however, do use verbal means to solve these problems.

Tests that measure general ability nonverbally may have different types of nonverbal questions, but the essential aspect of these tests is measuring ability nonverbally. Some nonverbal tests are made using blocks or puzzles; others may involve memory or sequencing, but the essence of these is that they measure general ability. The Naglieri Nonverbal Ability Tests, first (Naglieri, 1997) and second (Naglieri, 2008b) editions, for example, use nonverbal matrices exclusively and are group administered. Similarly, the Naglieri Nonverbal Ability Test - Individual version (Naglieri, 2003) also exclusively contains progressive matrices test items. The Wechsler Nonverbal Scale of Ability (Wechsler & Naglieri, 2006) uses a variety of subtests that vary in their nonverbal

content, but the goal is the same: to measure general ability nonverbally.

Nonverbal Measures of Ability

The NNAT-2

The Naglieri Nonverbal Ability Test – Second Edition (NNAT-2) (Naglieri, 2008b), is a group-administered nonverbal test of general ability organized into multiple levels of items composed of diagrams as illustrated in Figure 1. The NNAT-2 consists of seven separate booklets organized into levels, each of which is comprised of 48 items. The seven levels and corresponding grades for which they are intended are as follows: Level A - Kindergarten; Level B - Grade 1; Level C - Grade 2; Level D - Grades 3 and 4; Level E - Grades 5 and 6; Level F - Grades 7 to 9; and Level G - Grades 10 to 12. Each level contains items shared from both the adjacent higher and lower levels, as well as exclusive items. The shared items were used to develop a continuous scaled score across the entire standardization sample. These items yield a total raw score that is converted to a Nonverbal Ability Index standard score set at a mean of 100 with a standard deviation of 16 through an intermediate Rasch value called a Scaled Score. Thus, each child's raw score is converted to a scaled score (Rasch value), based upon the NNAT Level administered, and then the scaled score is converted to a standard score, based upon the age of the child. (For more information, see Naglieri, 2008a).

The NNAT-2 (Naglieri, 2008b) was standardized on a nationally representative sample of 52,053 children and adolescents from Kindergarten through Grade 12. All students were administered the NNAT-2 by their regular teachers or school personnel following standardized methods in their regular public schools. Sampling was conducted to obtain groups representative of the U.S. population according to sex, geographic region, socioeconomic status, urbanicity, and race or ethnicity (Naglieri, 2008b). The sample included children in special educational settings, such as those with emotional disturbances, learning disabilities, hearing and visual impairments, and mental handicaps. Children with limited English proficiency were also included in the standardization sample.

The NNAT-2 is different from the NNAT in several ways. First, the items are presented in the colors black, blue, white, and yellow (NNAT items were only blue, yellow, and white), but in both instances the colors are minimally influenced by color-impaired vision. Second, NNAT-2 uses a unique method for informing the examinee of the demands of the test called Pictorial Directions (patent pending), which are designed to provide a nonverbal and engaging method of communicating the task requirements to the examinee. Students are shown a series of pictures that illustrate what is required, along with gestures by the examiner, that draw attention to the correspondence between the pictured directions and the stimuli in front of the subject. Third, the NNAT-2 online version is also available.

NNAT-2 Online

There is little doubt that test administration is moving toward computer-based delivery, accompanied by the typical issues of reliability and validity related to traditional testing methods (Naglieri et al., 2004). The advantages of using online administration include the ease of administration (individually or in groups), an engaging testing environment, better control of materials, no storage of test protocols or booklets, automated scoring, immediate generation of test results, and multiple report options. (For more information, see Naglieri, 2008b).

Summary of NNAT Research

The validity of the NNAT and the NNAT-2, which has particular relevance to the assessment of gifted children across cultures and language groups, as well as a series of published research papers examining the tool, will be briefly described. This includes the examination of White and minority populations, bilingual children, gender differences, and relationships to achievement.

Naglieri and Ronning (2000a & b) studied mean score differences and correlations to achievement for matched samples of White (n = 2,306) and African-American (n = 2,306); White (n = 1,176) and Hispanic (n = 1,176); and White (n = 466) and Asian (n = 466) students in Kindergarten through Grade 12. The three pairs of groups were from the NNAT standardization sample and matched on the demographic characteristics of geographic re-

gion, socioeconomic status, ethnicity, and type of school setting (public or private). Only small differences were found between the NNAT scores for the White and African-American samples (Cohen's *d* ratio = .25 or about 4 standard score points). Minimal differences between the White and Hispanic (*d* -ratio = .17 or about 3 standard score points), as well as White and Asian (*d* -ratio = .02 less than one standard score point) groups were also reported. Additionally, they found that the correlations between NNAT and academic achievement were strong and consistent across the grades (Kindergarten through 12). It is notable that the NNAT correlated similarly for the White, African-American, and Hispanic samples. The small mean score differences and the significant correlations strongly suggest that the NNAT has utility for fair assessment of children who varied on the basis of race or ethnicity and that the scores the test yields are good for statistical prediction of academic achievement.

Naglieri, Booth and Winsler (2004) studied Hispanic children with (*n* = 148) and without (*n* = 148) limited English proficiency who were administered the Naglieri Nonverbal Ability Test (NNAT) (Naglieri, 1997) and the Stanford Achievement Test–Ninth Edition (SAT-[9], 1995). The two groups of Hispanic children were selected from 22,620 children included in the NNAT standardization sample and matched on geographic region, gender, socioeconomic status, urbanicity, and ethnicity. The results showed that there was only a small difference (*d* ratio = 0.1) between the NNAT standard scores for the Hispanic children with limited English proficiency (mean = 98.0) and those without limited English proficiency (mean = 96.7). In addition, the NNAT correlated similarly with achievement for the Hispanic children with and without limited English proficiency. The results suggested that the NNAT scores have utility for assessment of children regardless of their language proficiency and that these children earned scores that were close to average.

Naglieri and Ford (2003) studied rates of identification for gifted programs across race and ethnic groups and found that the NNAT may be particularly useful as a measure of general ability for gifted children from varying cultural and linguistic groups. They used a sample of 20,270 children from the NNAT standardization sample tested during the fall of 1995. These students were representative of the national school population according to socioeconomic status, urbanicity, and ethnicity; the characteristics of the separate Black, Hispanic, and White groups were also similar in composition. Naglieri and Ford (2003) found that 5.6% of the White (n = 14,141), 5.1% of the Black (n = 2,863), and 4.4% of the Hispanic (n = 1,991) children earned a NNAT standard score of 125 (95th percentile rank) or higher and 2.5% of White, 2.6 % of Black, and 2.3% of Hispanic children earned NNAT standard scores of 130 or higher (98th percentile). They concluded that this nonverbal measure of general ability could be helpful for identifying gifted children equitably across these race and ethnic groups.

More recently, Naglieri and Istrail (2010) compared the NNAT-2 mean scores, variances, and developmental changes across ages 5 to 17 years between males and females on a nonverbal measure of general ability, using a large U.S. sample. They found trivial mean score differences in general ability as measured by the NNAT-2 between the sexes, as Rojahn and Naglieri (2006) did with the first edition of the NNAT. Statistically significant but trivial differences in NNAT-2 standard scores were found for level A (males greater than females) and level F (females greater than males). Similarly, statistically significant but trivial differences in NNAT standard scores were previously found (Rojahn & Naglieri, 2006) for levels A and G (males greater than females) and levels B, E, and F (females greater than males). Naglieri and Istrail (2010) extended the examination to include differences in variance by sex, which were significant and meaningful (males evidenced significantly more variance at levels C, D, F, and G). Overall, the results indicate that there were minimal developmental disparities in the mean scores on *g*, as measured by the NNAT-2, but variances were greater for males than for females.

In summary, these data suggested that the percentages of children who would be identified as gifted if this nonverbal matrices test were used are similar across race and ethnic groups. There were trivial differences between the sexes. The results also suggest that the use of this nonverbal measure of ability was equitable across these culturally diverse populations, and, therefore, this instrument may help address the persistent problem of the un-

der-representation of diverse students in gifted education.

Wechsler Nonverbal Scale of Ability

When an individually administered nonverbal measure of general ability is appropriate, a test like the Universal Nonverbal Intelligence Test (UNIT) (Bracken & McCallum, 1997) or the more recently published Wechsler Nonverbal Scale of Ability (WNV) (Wechsler & Naglieri, 2006) could be considered. Rather than using one type of question (e.g., a progressive matrix), the UNIT and WNV use a multi-subtest format. The WNV, for example, is comprised of six subtests: Matrices, Coding, Object Assembly, Recognition, Spatial Span, and Picture Arrangement, all carefully selected to take into consideration developmental differences between the ages of 4:0 to 21:11 years. The age range was divided into two bands, ages 4:0 to 7:11 and ages 8:0 to 21:11 years, with each age band having different combinations of subtests comprising both a four- and two-subtest battery. The test yields a Full Scale standard score (mean of 100 and *SD* of 15) based on the combination of either 4- or 2-subtests which are scaled using a T-score metric (mean of 50 and *SD* of 10). This test was standardized on a large representative sample of children aged 4 through 21 years who closely represented the U.S. population on a number of important demographic variables. The WNV was also standardized on a large representative sample of Canadian children aged 4 through 21 years who closely represented the characteristics of that country. (For more details, see Wechsler & Naglieri, 2006).

The WNV, like the NNAT-2, uses pictorial directions which are designed to provide a nonverbal and engaging method of communicating the task requirements to the examinee. Pictorial directions are supplemented by simple verbal directions provided in English, French, Spanish, Chinese, German, and Dutch. The translated verbal directions are used only as needed and by a professional who is able to perform the testing in the examinee's preferred language. If the use of the pictorial directions and supplemental verbal directions proves ineffective for explaining the demands of the subtest, examiners are instructed to provide additional help as needed, assisting the examinee to ensure that he or she understands the requirements of the test.

The WNV is like other Wechsler tests in that it uses subtests that vary in content, but it differs from other Wechsler tests because it was designed to measure general ability using tests that do not have verbal content. The advantage of using nonverbal tests to measure general ability is that the influence of language skills is minimized, and requirements that the examinee have spoken or written language or mathematical skills are greatly reduced. While the nonverbal tests on the WNV are all alike in that they do not require language or arithmetic skills, some of the subtests have a strong visual-spatial requirement, others demand paper-and-pencil skills, and others require the recall of the sequence of information. This multidimensionality of task requirements distinguishes the WNV from tests that use one type of task requirement, such as the NNAT and NNAT-2 (Naglieri, 1997, 2008b). Despite the variability of subtest content and task demands, the WNV, like other nonverbal tests, have essentially the same goal of measuring general ability nonverbally.

Summary of WNV Research

Due to the recent publication of the WNV, there are comparatively fewer studies than on the NNAT, but there are important preliminary findings that bear on the assessment of gifted children that will be briefly described here. (See the test manual for more details.)

The WNV is strongly correlated with other Wechsler tests (see Wechsler & Naglieri, 2006), but, more important, it is an effective tool for measuring general ability for diverse populations. Gifted children earn high scores on the WNV, and the test yields Full Scale scores as high as 170 for both the 2- and 4-subtest versions. The WNV Manual provides a significant study of English language learners. The sample includes students whose native language was not English, the primary language they spoke was not English, a language other than English was spoken at home, and their parents had resided in the United States for less than six years. The 55 students, aged 8 to 21 years, were administered the WNV and compared to a group matched on basic demographics. The results showed that the students learning English earned, essentially, the same score (mean = 101.7) as the

matched control of English-speaking students group (mean =102.1). These results indicate that the WNV measures general ability effectively and fairly for those with limited English-language skills.

Wechsler and Naglieri (2006) provide evidence of the utility of the WNV for individuals who are learning English. The study involved examinees who speak English as a second language who were compared to a matched sample from the WNV standardization sample. This included 55 examinees aged 8:0 to 21:11 years whose "native language was not English, they spoke a language other than English at home, and the examinee's parents had resided in the United States less than 6 years" (Wechsler & Naglieri, 2006, p. 63). There were 27 Hispanics and 28 examinees who specified their primary language was Cantonese, Chinese (unspecified), Korean, Russian, Spanish, or Urdu. Additional information about this sample is available in the WNV Technical and Interpretive Manual (Wechsler & Naglieri, 2006). These examinees performed very similarly to their matched counterparts from the normative sample, with differences found between the mean scores.

Conclusions

Identification of high-ability and gifted students can be accomplished best using a nonverbal measure of general ability, particularly when assessing across cultural and linguistic groups. One of the most important obstacles to identifying children who may be very intelligent but with limited language and academic skills is the inclusion of academically and linguistically based questions in ability tests. Nonverbal measures of ability are more appropriate for identifying gifted children, especially those who come from disadvantaged environments in any country (Bracken & Naglieri, 2003; Naglieri & Ford, 2003, 2005). Recognition of the extraordinary value that highly intelligent children have for the future of any country cannot be overstated. The methods used and the assumptions made about who is gifted have influenced who has been selected to receive additional academic instruction. Administrators of gifted programs and teachers of the gifted around the world should ensure that high-ability children are fairly assessed so that they may be included in programs for the gifted even if they have needs in academic and linguistic skills. They will likely flourish and grow at a remarkable rate, especially given adequate instruction (see Naglieri, et al, 2009). The future depends upon finding and educating gifted students of all backgrounds and economic levels around the world.

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Investing in Gifted and Talented Learners: An International Perspective

Selected Papers from the 18th Biennial World Conference

THE WORLD COUNCIL FOR GIFTED AND TALENTED CHILDREN (WCGTC)
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It has been our great pleasure to have worked together, as coeditors, once again, and to play a vital role, in this enduring manner, to carry out the mission of the WCGTC.

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Introduction: Vision and Provision for Gifted Learners

As an introduction, this article provides a broad framework for rethinking gifted education and delineates some of the cautions that need to be observed in the identification criteria for diverse populations, enrichment programming approaches, and assessment considerations in gifted education. The core material for this volume originated with selected papers submitted to the 18th Biennial World Conference on Gifted and Talented Children, conducted by The World Council for Gifted and Talented Children, in Vancouver, Canada, August 3rd to 7th, 2009.

Prologue

The underlying theme that connects the selected papers is that of investing in gifted children and building human capital. Director of the National Research Center on the Gifted and Talented at the University of Connecticut, Joseph Renzulli, in the prologue, "The Empire Strikes Back: Redefining the Role of Gifted Education in the 21st Century," draws attention to what many have called a crisis in education and contends that methods adopted in recent decades have resulted in student boredom and public dissatisfaction. The remedies lie in an engagement-oriented pedagogy that moves away from rigidly prescribed curricula that have minimized the "sheer joy of discovery" (p. 1). This is particularly relevant for gifted and talented learners, who thrive in environments that provide challenges that meet their individual needs, potential, and interests.

Diverse Populations

While it is widely recognized that there are many students who are benefiting from gifted education initiatives, it is also acknowledged that there are many children whose gifts and talents are hidden or overlooked for a wide variety of reasons, including poverty, lack of opportunity, behavioral and learning challenges, and political constraints associated with immigrant and refugee populations, all of which may cause them to be ignored or serve to mask their potential. Prominent gifted-education scholar, Ken McCluskey, along with Andrea McCluskey, urges, especially in dealing with talented ADHD students, that we "offer a humane, flexible approach to help parents, teachers, and other caregivers turn negatives into positives and identify and nurture the talents of an often-misunderstood population" (p. 11).

Charlene Barva insists that the gifts and talents of high-achieving individuals with learning disabilities (LD) be recognized as part of the spectrum of intellectual diversity and maintains that "early (and accurate) identification of LD, for example, is critical to establishing learning skills and strategies important to [their] future academic success" (p. 25).

A similar case can be made for gifted immigrant and refugee children whose "problems associated with resettlement, such as securing housing, seeking employment, and adjusting to a new culture and language, often take precedence over identifying and providing for [their] educational needs…" (p. 29). Authors Carole Harris, Zenita Cunha Guenther, and Gillian Eriksson, working with minority, immigrant, and refugee populations in the United States, Brazil, and South Africa, respectively, suggest that the existing definitions of giftedness be filtered through a cultural sieve and be reflected in teacher training and programming for these disadvantaged groups. They conclude that "[i]ndeed, the future of the world depends upon mining the talents that, at present, [for these groups] lie below the surface" (p. 36).

Enrichment Approaches

Programming approaches to address the issues of diversity underscore the importance of teacher sensitivity, both in terms of the socio-emotional challenges facing gifted learners, who may be experiencing discrimination from unintentional or intentional disinviting behavior by their teachers, and in terms of providing appropriate, discipline-specific, intellectual

enrichment opportunities. Australian specialist in inclusive education, June Slee, who works with marginalized groups, addresses the issue of teacher attitude toward the gifted. She stresses the importance of teachers and students developing the necessary social and emotional competencies to avert the formation of negative mindsets that are detrimental to the full realization of their potential. To a significant degree, such competencies can be cultivated incidentally through rich, stimulating enrichment activities that target students' distinct proclivities and talents.

Errol Moore notes the by-products of the Music Heartland Project undertaken in New Zealand. The results of this comprehensive project show that extended, creative musical projects appear to accelerate the growth of mature artistic understandings, personal efficacy, and unique musicianship in gifted children.

Not exclusive to the arts discipline, ambitious extra-curricular school projects have been designed in the scientific field, not the least of these being the School Lab Oberpfaffenhofen, in southern Germany, under the headship of Dieter Hausamann. This lab is operated by The German Aerospace Centre, the national research center for aeronautics and space, with the objective of attracting students to science and technology. Like the previous two enrichment projects, this hands-on lab program focuses, first, on teacher education. These advanced labs are specifically designed for highly talented secondary-school students and require a high level of teacher expertise in dealing with topics such as environmental spectroscopy, meteorology, satellite navigation, robotics, flight-team simulation, and mobile rocket research.

Halfway around the world, in Mexico, a three-year pilot project to support talented primary and secondary students in science and mathematics was initiated in 2008. This Adopt a Talent Program, known by its Spanish acronym PAUTA, and PAUTAmor in the state of Morelos, consists of intensive workshops for science teachers, who are trained in both the specialized content and in pedagogy that moves away from the rigidly prescribed, conventional approach. National Coordinator of PAUTA, Janet Paul de Verjovsky, and her team developed and delivered a series of teacher workshops, emphasizing creativity, scientific skills, and positive dispositions towards the discipline, and provided teachers with instruments to identify optimal secondary-school candidates for future student workshops to take place in the following two years.

Assessment Considerations

The changes necessary for reforming the education system involves the key elements of redesigning instruction and teacher professional development. Together, however, these two strategies are still not sufficient to effect the change that the preceding authors have promoted. Solidifying such change also requires monitoring the effectiveness of interventions and ensuring their success. Assessment must be targeted and continuous at every stage. Dorit Neria and Miriam Amit, in developing the Kidumatica program in southern Israel, advocate for equity in the student-selection process by considering inclusive criteria, regardless of the children's culture and socio-economic background. Kidumatica, a mathematics club established in 1998, was designed to cultivate sophisticated and creative mathematical thinking in youth exhibiting mathematical aptitude. While the program was created for the benefit of its participants, the originators of the club, in this paper, are concerned about the selection process and ensuring that the "right" students get into the program—irrespective of their culture, background, and test-taking ability.

Although appropriate student assessment is a critical feature of successful innovations, the program, itself, must be subjected to evaluation. Eleoussa Polyzoi, Cathrine Froese Klassen, Jeff Babb, Stephanos Gialamas, and Christiana Perakis Evloyias evaluated the High Performing Student (HPS) Program at ACS Athens, an accredited Kindergarten to Grade 12 International Baccalaureate school in Greece. Adapting Williams' Performance Levels of a School Program Survey (PLSPS), the authors investigated the teachers' perceptions of the school's performance in six domains: intellectual, leadership, creative-thinking, visual and performing arts, psychomotor, and affective abilities. The assessment tool proved effective in highlighting the multiple strengths of the HPS Program and has provided direction for further program development and consolidation.

Acceleration and enrichment programs conducted outside the school setting may be more challenging to evaluate than those established on school campuses; nevertheless, university lecturer, Martina Endepohls-Ulpe, undertook such a task in the assessment of the "Frühstudium"[1] program at the University of Koblenz-Landau, one of the program options offered for students from secondary schools at some German universities. Students participate in selected university courses while continuing their studies at school, thus saving time in their future studies, while enriching their knowledge in several fields. Based largely on data gathered from various questionnaires, the evaluation centered on the benefits of the program, the promotion of the program at the school level, and the degree of support for the program by the secondary-school teachers. The results indicated that while "Frühstudium" is worthwhile as an enrichment opportunity for students, it has aspects that still require improvement.

Reforming instruction, improving teacher professional development, and monitoring the effectiveness of interventions all still presume a sound and flawless selection process of students—the fundamental basis of any program for the gifted and talented. Whether it is child refugees in Brazil or South Africa, immigrants in Israel, the disadvantaged in America, the at-risk in Canada, or the "excluded" in Australia, equity in the student-selection process must consider inclusive criteria, based on the child's culture and socio-economic background. This, however, poses an inherent difficulty, as language is often a factor in such cases. Professor Emeritus of psychology at George Mason University, Jack Naglieri, in his design of a nonverbal ability test for identifying gifted children (the NNAT2), has made a pivotal contribution to the field of gifted education in this respect. With the use of research-supported, nonverbal questions, the test can ensure that educators assess children fairly, especially those from diverse cultural and linguistic backgrounds, and include them in programs for the gifted. Naglieri's innovative test has arisen from his conviction that "[r]ecognition of the extraordinary value that highly intelligent children have for the future of any country cannot be overstated" (p. 117).

Conclusion

With elemental, structural change in the educational system, equity, inclusion, improved identification instruments, innovative programs, and the means to assess and improve them, we can convert our liabilities into assets, our losses into profits, and reap the desired gains in human capital, as we turn our vision into unparalleled provision in gifted education around the world.

Cathrine Froese Klassen and
Eleoussa Polyzoi
Editors
April, 2011

[1] "Frühstudium" means going to university early.

Prologue. The Empire Strikes Back: Redefining the Role of Gifted Education in the 21st Century

Joseph S. Renzulli

Abstract

Many national education leaders and politicians characterize the current challenges facing our schools as a crisis in the American education system. The methods that have been adopted, in recent decades, to address the achievement gap that exists between advantaged and disadvantaged students have produced flat-line academic growth among the most able students, rampant boredom, and public dissatisfaction with an education system that is immune to anything but the superficial trappings of change. Reform initiatives in the educational system have consisted of structural changes, primarily, and have not produced the anticipated positive results. Current learning theory indicates that student engagement and an inquiry-based, inductive pedagogy are the keys to higher achievement. To effect real change will require a recognition of and attention to the achievement-gap problem and a meaningful application of rapidly advancing technology. While technology has radically changed everyday life, in education, the applications are little more than electronic functions of the drill-and-practice forms of teaching. An engagement-oriented pedagogy—beyond online worksheets and online encyclopedias—must be able to address students' strengths, match resources to students' personal profiles through imaginative uses of technology, and provide appropriate teacher training. Students need to learn not only the basic skills but also the technological skills of inquiry that will create the motivation and engagement largely lost by rigidly prescribed curriculum and learning that has minimized the sheer joy of discovery.

The Three-Trillion Dollar Misunderstanding

How did we get into this mess? Why hasn't the estimated three *trillion* dollars spent on school reform since the 1960s made more of an impact (Miami-Dade County Public Schools, 2008)? We've tried just about everything—smaller schools, year-round schools, longer school days, single-sex classes, after-school mentoring, school uniforms, vouchers, charter schools, school-business partnerships, merit pay for teachers, paying students (and even parents) for higher scores, private management companies and for-profit schools, takeovers by mayors and state departments of education, distributive leadership, site-based management, data-based decision making—and just about every scheme imaginable into which someone can insert the words "standards-based," "accountability," or "brain-based." Additionally, every buzzword in a profession that already thrives on too much jargon, eventually, creeps into the repertoire of policymakers, shifting the focus off student needs and appropriate pedagogy for meeting these needs and onto inflexible bureaucratic solutions that ignore individual learning needs. All of these suggested solutions, usually launched with much fanfare, endless and usually mind-numbing workshops for teachers, and little, if any, research or track record for success, have been offered as silver bullets that can "save" our schools and raise the test scores of our lowest-achieving students. The sad fact is that these schemes simply have not worked!

What do all of these reform initiatives have in common? Most are built on structural changes, designed by well-intentioned policy-makers or agencies (usually far removed from the classroom), and calculated to have an impact on entire school districts, states, or even the nation. More important, however, is that these structural changes have drawn mainly upon (and even forced) a low-level pedagogy that is highly prescriptive and didactic—approaches to learning that emphasize the accumulation, storage, and retrieval of information that will show up on the next round of standardized tests. We have become so obsessed with content standards and test scores that assess mainly memory that we have lost sight of the most important outcomes of schooling—thinking, reasoning, creativity, and problem-solving skills that allow young people to *use* the information driven by content standards in interesting and engaging ways.

Are There Reasonable and Practical Alternatives?

Over the past decade, the mainstream diet for the majority of low-income and struggling learners has been dominated by a remedial and compensatory pedagogy that has not diminished the achievement gap, but, as research has shown, has actually contributed to its perpetuation (Ford, Howard, Harris & Tyson, 2000; American Educational Research Association (AERA), 2004). Many of these programs are designed to find out what a child can't do, doesn't like to do, and sees no reason for doing, and, then, teachers are told to spend the majority of classroom time beating him or her to death with it. This pedagogy of prescription and practice simply hasn't worked! Documentation of this failure is plainly evident in one national report after another (National Assessment of Educational Progress (NAEP), 2005; Center on Education Policy (CEP), 2008), and, yet, we continue our search for yet another quick fix through structural rearrangements of schools, rather than through alternative pedagogical modifications that deal directly with the enjoyment, engagement, and enthusiasm that result from a more inductive and investigative brand of learning. The solutions offered, by whatever new names we give them (e.g., competency-based, outcomes-based, standards-based), are always reiterations of the same pedagogy—the same drill-and-practice model for learning that simply has not worked. Furthermore, the universal criterion for accountability always remains the same, again with new names given to the same old achievement tests that mainly measure memorized factual information. It is the singular reliance on these tests for accountability, at the exclusion of other important performance-based outcomes, which forces the pedagogy of prescription, a pedagogy that drives good teachers from their profession and that lobotomizes those teachers who remain. Is it any wonder that some of our very best teachers are fleeing urban schools where prescription has become the almost universally practiced pedagogy?

Learning Theory 101: The Short Course

All learning, from diapers to doctorate, exists on a continuum ranging from deductive, didactic, and prescriptive, on the one hand, to inductive, investigative, and inquiry-oriented, on the other. Students who have not achieved are subjected to endless amounts of repetitious practice material, guided by the didactic model. Then, when scores do not improve, we often think that the obvious solution is simply to redouble our efforts with what has been popularly called a "drill-and-kill" approach to learning: an approach that has turned many of our schools into joyless places that promote mind-numbing boredom, lack of genuine student and teacher engagement, absenteeism, increased dropout rates, and other byproducts of over-dependence on mechanized learning. Proponents of popular, but highly prescriptive, reading programs frequently boast about test-score gains, but the endless drill and practice only prepare students for taking tests correlated to the worksheets *rather than actually learning to read*, let alone enjoying reading and making it an important part of their lives (Reis et al., 2004). Many students subjected to over-prescription never pick up a book on their own, a sad commentary on how we have messed up the teaching of reading by turning it into the teaching of test taking.

With this kind of a track record, shouldn't we be smart enough to blend the benefits of an inductive and investigative pedagogy into a system that has mainly failed our at-risk populations, and shouldn't we also be smart enough to note the rising dissatisfaction of middle-class parents whose children are also

becoming subjected to the same drill-oriented, test-prep curriculum? One high-school student recently described her Advanced Placement (AP) courses as "…nothing more than *high-speed* test prep." Two Ohio students, from an affluent school district, wrote in a letter to their governor, "Schools once renowned for their unique learning programs are becoming nothing more than soul-less factories that churn out those that can excel at standardized tests, while discarding those who can't." Is it any wonder that a parent from a high-status community speculated that there was, indeed, a sinister conspiracy afoot to close the achievement gap, and the conspiracy consisted of dragging down the scores of high-achieving students!

Research on the role of student engagement is clear and unequivocal. High engagement results in higher achievement, improved self-concept and self-efficacy, and more favorable attitudes toward school and learning (Herrington, Oliver & Reeves, 2002; Ainley, 1993). There is a strong body of research that points out the crucial difference between time spent and time engaged in school activities. In the recently published international PISA study (Organization for Economic Cooperation and Development (OECD), 2007), the single criterion that distinguished nations with the highest and lowest levels of student achievement was the degree to which students were engaged in their studies. This finding took into account demographic factors, such as ethnicity and the socio-economic differences among the groups studied.

The Most Important Outcomes of Education

The pedagogy of prescription has, perhaps unintentionally, but, nonetheless, clearly demonstrated that it has withheld from low-income children the exact kinds of thinking skills that are necessary for successful participation in today's higher education and our growing global economy. The word "perhaps" is used because I don't think there is a clandestine conspiracy on the parts of policymakers and the textbook and testing cartel to keep low-income children poorly educated, thereby, limiting access to economic mobility. Make no mistake—neglect, mismanagement, and a lack of courage to challenge unsuccessful practices is the equivalent of a *bona fide* conspiracy.

If failed approaches have continued to produce dismal results, perhaps, it is time to examine a counterintuitive approach based on a pedagogy that is the polar opposite of that used by Pavlov to train his dogs! Accountability for the truly educated mind in today's knowledge-driven economy should, first and foremost, attend to students' ability to perform the following operations:

- plan a task and consider alternatives;
- monitor one's understanding and the need for additional information;
- identify patterns, relationships, and discrepancies in information;
- generate *reasonable* arguments, explanations, hypotheses, and ideas, using appropriate information sources, vocabulary, and concepts;
- draw comparisons and analogies to other problems;
- formulate meaningful questions;
- apply and transform factual information into usable knowledge;
- rapidly and efficiently access just-in-time information and selectively extract meaning from that information;
- extend one's thinking beyond the information given;
- detect bias, make comparisons, draw conclusions, and predict outcomes;
- apportion time, schedules, and resources;
- apply knowledge and problem-solving strategies to real-world problems;
- work effectively with others;
- communicate effectively in different genres, languages, and formats;
- derive enjoyment from active engagement in the act of learning; and
- creatively solve problems and produce new ideas.

These are the student-engagement skills that grow young minds, promote genuine enthusiasm for learning, and, as our research has shown, increase achievement (Renzulli & Reis, 1985). Although student engagement has been defined in many ways, I view it as

the infectious enthusiasm that students display when working on something that is of personal interest in an inductive and investigative manner. It takes into account student learning styles and preferred modes of expression, as well as interests and levels of knowledge in an area of study. It is through these highly engaging approaches that students are motivated to improve basic skills and bring their work to increasingly higher levels of perfection. True engagement results from learning activities that challenge young people to "stretch" beyond their current comfort level, activities that are based on resources and methods of inquiry that are qualitatively different from excessive practice. Our research has shown that teaching students to think critically, analytically, and creatively actually improves plain, old-fashioned achievement (Renzulli & Reis, 1997; Renzulli, 2008). Our guiding principle in this kind of learning is simply "No Child Left Bored!"

Moreover, the key role of engagement cannot be over-emphasized for students whose achievement has been hampered by limited experiences, resources, or supports. In a longitudinal study comparing time spent versus time engaged on the achievement of at-risk students, conventional instructional practices were found to be responsible for students' increased risk of academic delay (Greenwood, 1991). Another study reported important differences in achievement outcomes favoring engaged over disengaged students of similar ability (Greenwood, 1991). Hours of drilling on American College Testing (ACT) questions in Chicago high schools may be hurting, not helping, students' scores on the college-admission exam, according to a study released recently by a university-based research organization (Samuels, 2008). The Consortium on Chicago School Research (2008), based at the University of Chicago, found, in their 2005 report, that teachers in the 409,000-student district would spend about one month of instructional time on ACT practice in the core classes offered during the junior year. The ACT scores, however, were lower in schools where Grade 11 teachers reported spending 40% of their time on ACT-test preparation, compared to schools where teachers devoted less than 20% of their class time to this activity. The boredom factor was cited as an explanation for this seemingly counterintuitive finding.

Although focusing on the engagement-oriented operations, listed above, may be counterintuitive to the "more-practice-is-better" pedagogy, we need look only at the track record of compensatory learning models to realize that we have been banging our collective heads against the wall and following an endless parade of failed reforms that have been forced through the schoolhouse door by people far removed from classrooms, schools, and local-level decision makers.

How did we allow committees of bureaucrats to write endless lists of content standards without equal or even greater attention to standards for good thinking and the kinds of authentic assessment that shows how good thinking is demonstrated? How did we allow textbook companies to stuff their books with increasingly monotonous practice materials that prescribe and dictate what teachers must do every minute of the school day? And how did we give the test publishers the gun that is held against the collective heads of every superintendent, principal, teacher, and student in the nation? Even state education commissioners, some of whom are responsible for buying into various silver-bullet solutions, are now being "held accountable" for low scores in their states.

If we are going to break the stranglehold that the perpetrators of failed practices have had on our schools and the lives of children, we need some leaders at all levels—federal, state, and local—courageous enough to explore bolder and more innovative alternatives that will provide all students with highly enriched learning opportunities typical of those in the nation's very best public and private schools. This is not to say that we should abandon a strong curriculum that focuses on basic competencies, nor should we forget to demand accountability data to evaluate returns on investment for alternate approaches to addressing the problem. We need to move the focus away from memorizing content and toward the kinds of thinking skills or operations mentioned earlier. We also need to develop accountability procedures (not just tests) that show us how well students are learning to *apply* their thinking to authentic problem-solving situations. This kind of accountability may not put the bubble-sheet companies out of business, but it will help force the issue of building a richer school pedagogy.

We also need to infuse the curriculum with a series of motivationally rich experiences that promote student engagement, enjoyment, and a genuine enthusiasm for learning. Common sense and our own experience tell us that we always do a better job when we are working on something in which we are personally engaged—something that we are really "into" and that we truly enjoy. How many *un*engaged students have you seen on the school newspaper staff, the basketball team, the chess club, the debate team, or the concert choir? Their engagement occurs because these students have some choice in the area in which they will participate; they interact in a real-world, goal-oriented environment with other like-minded students interested in developing expertise in their chosen area; they use authentic problem-solving, interpersonal, and creative strategies; they produce a product, service, or performance that is evidence of the level and quality of their work; and their work is brought to bear on one or more intended audiences other than, or at least in addition to, the teacher (Renzulli & Reis, 1985). The engagement that results from these kinds of experiences exemplifies the best way to approach joyful and engaging learning, one that differs completely from the prescriptive and remedial education approach to learning that is common in low-income classrooms.

Is There a Way to Make Real Change Rather than the Appearance of Change?

Recognition of the achievement-gap problem and the effect that failed solutions have had on schools that serve all of our young people has resulted in some very predictable activity. The usual national commissions and new rounds of federal, state, and foundation reports calling for "bolder and broader approaches" have, at least, recognized the existence of the crisis facing our schools, but we must be cautious of looking for approaches that emphasize the same structural solutions without primary consideration to the pedagogy that is at the core of any sustentative changes in learning. We must also be cautious about seeking solutions from the same people and practices that caused these problems in the first place. Requiring all students to take *x* number of courses, raising passionate calls for more teacher and administrator training, demanding a more rigorous standards-based curriculum, extending the regular school day and year, providing tutoring and homework helpers, and conducting summer school will not bring about sustainable change unless we change *how* teaching is done.

Three Strategies for Creating a 21st-Century Pedagogy

To a large degree, we have become what our technology has made us. We began communicating more effectively because of inventions, such as the telegraph, the telephone, and the Internet, and because travel became faster and more efficient with the inventions of the steam engine, the airplane, and jet engines. In his book, *The Power Makers: Steam, Electricity, and the Men Who Invented Modern America* (Klein, 2008), Klein documents the well-known, economic principle that supply creates its own demand. Education changed dramatically when the technology evolved from books that only families and schoolmasters had in hand to textbooks from which all students could learn simultaneously. When schools gained the technology of copy machines, easily reproducible workbooks and practice materials became a mainstay of the learning process. This technology has driven both what and how young people have learned for most of the past and present century. Students memorize factual material and engage in endless practice simply because such material is available. Supply creates its own demand!

Almost every area of modern life has made imaginative uses of technology, while, in education, we have settled for electronic applications of the same old technology that did not differ pedagogically from standard drill-and-practice forms of teaching (e.g., online worksheets). These early generations of educational technology may have given teachers some extra "helpers," but, because they were based on a knowledge-acquisition pedagogy, the skills that students need for success in the 21st century are still only by-products of present-day models of teaching and learning.

How can we bring about the changes in the engagement-oriented pedagogy necessary to turn things around? Although I will not argue that technology without planned teacher involvement and technology-savvy teachers is the answer to our prayers, we now have the next generation of education technology that

can give teachers the tools to do several important things to promote high-engagement teaching and learning. We must, however, be careful not to use this technology to recreate electronic forms of the same old pedagogy upon which we are trying to improve. This technology goes beyond the online worksheets, electronic encyclopedias, and online courses that were the earliest applications of technology for classroom use.

Although it may sound like a cliché, the advent of the Internet and easy access to most of the world's knowledge by young people is literally changing the time-honored learning theories that have guided curriculum and instruction for several centuries. Teachers and textbooks are no longer the gatekeepers of knowledge, and the old curriculum paradigm that consisted mainly of to-be-presented knowledge is giving way to, what I call, just-in-time (JIT) knowledge—the knowledge that students seek out when it is necessary to solve a problem, whether posed by the teacher or self-selected by a student (or small group) due to personal interest. Students will obviously need to learn the basic skills of the three Rs, but they will also need to learn technological skills of inquiry in order to make efficient use of JIT knowledge. Among these skills is the ability to

- identify trustworthy and useful information,
- manage overabundant information selectively,
- organize, classify, and evaluate information,
- conduct self-assessments of web-based information,
- use relevant information to advance the quality of one's work, and
- communicate information effectively in various genres and modes of expression.

This use of JIT knowledge is the paradigm that is available to all young people, and it will create the motivation and engagement that has largely been lost by a to-be-presented curriculum and a brand of learning that minimized the sheer joy of finding out things on one's own. So, let us now look at three applications of this new generation of education technology to modern-day learning.

Assessment of Student Strengths

The first innovative use of this next-generation technology is that teachers can now get a comprehensive look at all the major characteristics of their students, characteristics that go beyond simply knowing about their standardized achievement test standings. Using a computer-generated student profile, developed at the University of Connecticut, we are able to provide information quickly and easily about student interests, learning styles, and preferred modes of expression, as well as about student perceptions of their strengths in the traditional, academic subject areas (Reis & Renzulli, 2008). The simple assumption underlying the use of this technology-generated profile is that the more teachers know about these learner dimensions, the better able they will be to make decisions about what materials and activities have the highest potential for engaging the learner.

Matching Resources to Student Profiles

Although differentiation is an important, contemporary goal of much of today's efforts to make learning more meaningful for young people, the sad fact is that most teachers simply do not have the time to seek out the resources that can accommodate the varied learning needs of an increasingly diverse school population. The second way technology can affect pedagogy is by giving teachers easy access to the wealth of enrichment and engagement-oriented material that is available through the Internet and through materials and activities that have been purposefully selected and placed into easily assessable databases. Now, let's examine the "magic" of combining these two uses of technology. Through advanced programming techniques, a search engine can examine thousands of multiply classified,[1] high-engagement resources and match these resources to information about learner characteristics revealed in student profiles. This tool provides teachers with the means for true differentiation based on individual student profiles, with the computer doing the heavy lifting! In view of the number and diversity of young people that teachers must

[1] Examples include subject areas, reading level, state standards, interests, learning styles, and expression modes.

deal with every day, it would be impossible to achieve this kind of personalized learning without the use of technology. What is even more important is that the easy availability of highly engaging resources, in combination with the matching capability of the technology, "forces" the kind of engagement-oriented pedagogy with which we are trying to infuse the curriculum.

Teacher Training

The recommendation is to reexamine the ways that we train teachers, especially already employed teachers who have not had access to the technology courses now routinely available in most undergraduate teacher-training programs. Research shows that most school-based professional development that is occasional or short-term has little or no effect on teachers' classroom behaviors, and most teachers can tell their own horror stories about sitting through endless hours of "spray-and-pray" workshops. Never-ending lists of glittering generalities, flashy slide shows, flavor-of-the-month innovations, and strategies with no research support are paraded out by seductive speakers. I have no argument with a certain amount of professional development in both general and content-specific teaching strategies. All teachers should be constantly improving their subject-matter competencies, but the focus of professional development in a technology-driven pedagogy should be on strategies that allow teachers to help young people master the already-mentioned technological skills of inquiry. The acquisition and application of these skills will turn our teachers into the proverbial "guides-on-the-side" rather than simply traditional disseminators of information, which have characterized so much of our education system in pre-technology approaches to learning. This transformed role of teachers and approaches to instruction will bring about the sought-after differentiation and changes in engagement and motivation that have eluded us in reform efforts thus far.

National Resolve and Bold Action Needed

Many national education leaders and politicians characterize the current challenges facing our schools as a crisis in the American education system. It will not be easy to turn around a school system whose leaders have made massive financial and policy investments in one particular brand of learning, nor will it be easy to circumvent the powerful influence of the textbook and test-publishing industries that have thrived on a prescriptive curriculum and standardized-test-driven approaches to accountability. However, a gentle and evolutionary, rather than revolutionary, approach to school reform is possible if we begin to take advantage of the remarkable advances that have taken place in information technology, advances that have brought within reach the equivalent of a dozen teaching assistants in every classroom, all day, every day. This technology now makes it possible to assess students' interests, learning styles, and preferred modes of expressing themselves quickly and easily. What formerly took teachers weeks or even months to learn about student strengths can now be assessed in less than an hour, through computer-generated profiles. Powerful search engines can examine thousands of high-end learning resources that are matched to individual student profiles. True differentiation, much talked about but seldom achieved, can take place if we can let the technology do the hard work of finding and matching resources that are engagement-oriented rather than practice-oriented.

Leon Lederman, the Nobel Prize winning physicist, recently said, "Once upon a time, America sheltered an Einstein, went to the Moon, and gave the world the laser, electronic computer, nylon stockings, television, and the cure for polio. Today, we are in the process, albeit unwittingly, of abandoning this leadership role" (Berger, 1994). Every school and classroom in this country has in it young people who are capable of continuing this remarkable tradition of discovery and invention. The tradition, however, will not survive without a national resolve and bold action on the parts of policymakers at all levels to change the pedagogy that drives instruction in classrooms that serve all of our young people. You don't produce future scientists and inventors, such as Jonas Salk, George Washington Carver, Thomas Edison, Sally Ride, or Marie Curie, by forcing them to learn in a one-size-fits-all, drill-and-practice curriculum or by spending hundreds of hours preparing for state achievement tests. You don't develop the potential of thousands of Leonard Bernsteins, Aretha Franklins, or Miles Davises without providing them with highly engaging opportunities in

music that typically are only available in out-of-school opportunities and mainly to the children of the well-to-do. You don't develop world leaders, such as Martin Luther King, Golda Meir, Eleanor Roosevelt, and Mahatma Gandhi, by having them memorize endless lists of facts that today's technology-savvy kids can find when they need them with a few clicks of the computer keyboard. You also don't produce the next generation of talented writers, such as Rachel Carson, Langston Hughes, and Tennessee Williams, by having them spend endless hours completing mindless worksheets in preparation for the next round of state mastery tests. It is only through expanding our pedagogy, engaging all students, and making imaginative uses of technology that America's schools will be able truly to engage our children and develop their creative potential, as well as their love of learning.

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PART 1: DIVERSE POPULATIONS

1. Meeting the Socio-Emotional Needs of Talented ADHD Students

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Abstract

As the term, itself, indicates, ADHD is typically viewed as a disorder and, certainly, hyperactive and inattentive children present some interesting challenges at home, at school, and in the community. This article highlights many of the problems associated with ADHD and acknowledges that the prognosis for condition is, sometimes, far from benign; however, an attempt is made to put a more positive spin on things by recasting reality and pointing to the creative strengths that frequently go hand in hand with it. To illustrate, with proper support, might not stubborn behavior in childhood grow into determination in adulthood? Might not inattentive daydreaming turn into creative invention, overactivity into productive energy, and off-the-wall behavior into outside-the-box thinking? The overall intent is to offer a humane, flexible approach to help parents, teachers, and other caregivers turn negatives into positives and identify and nurture the talents of an often-misunderstood population.

Well over a decade ago, it was observed that ADHD (attention-deficit hyperactivity disorder) had become the "disorder du jour" in North America (Armstrong, 1996), and, judging from the abundance of current articles, books, DVDs, and training sessions on the topic, society's obsession with "hyperactivity" remains unabated. Certainly, children, youth, and adults continue to be referred, in extremely large numbers, to school resource centers, psychological clinics, and medical facilities for diagnosis and treatment of the condition.

It is not the purpose here to delve unnecessarily into questions of definition and treatment. These issues have been dealt with in comprehensive fashion elsewhere (American Psychiatric Association, 1994; Barkley, 1998, 2000; Goldstein & Goldstein, 1998; Rief, 2005; Weyandt, 2001). In general terms, though, we will touch on the highly visible primary characteristics of ADHD (e.g., excitability, overactivity, impulsivity, disorganization, distractibility, and inattention) and the more covert secondary ones (e.g., learning problems, emotional vulnerability, low self-concept, peer relationship issues, and familial distress).

The Downside

Longitudinal research has shown that a disproportionate number of youngsters with ADHD typically run into significant problems as they grow into adolescence and adulthood (Lambert, 1988; Weiss & Hechtman, 1993). Indeed, as Whalen and Henker (1991) have noted, the prognosis for hyperactivity is "far from benign." It really isn't surprising that ADHDers—many of whom have difficulty following rules, staying on task, and behaving appropriately—encounter problems at home, at school, and in the community. Due, in large part, to their impulsivity and lack of social judgment, they also often have a tough time making and keeping friends. Melmed (2001) has asserted that, because of school failure, loneliness, isolation, and a virtual ongoing assault on self-image, ADHD children are usually very unhappy individuals.

Amber of Yesteryear

At a personal level, we've lived it. Our daughter, Amber, who has become a poster child for ADHD in our part of the world, was troubled and troubling throughout her childhood and beyond. To summarize succinctly, one principal told us she was "the worst child" who ever attended school in his district. Quite simply, she behaved in impulsive and dangerous ways, got into everything, regularly lost even her most prized possessions, lied in patently ridiculous fashion, seemingly lacked the ability to concentrate, and consistently ran afoul of her peers. Before she even reached fourth grade, Amber had, at one time or another, been described by a variety of professionals as functionally illiterate, learning disabled, predelinquent, and schizophrenic. Not that we were on a Holy Grail-type quest for diagnosis, but the label of ADHD was conferred on her as she neared the end of her time in elementary school.

To make things come alive, we'll share a couple of stories we've related earlier (McCluskey & McCluskey, 2001). The first illustrates the social-emotional impact of the disorder:

> As she grew (and continued to run into problems at home, at school, and with her friends), Amber began to realize how different she was. In Grade 3, there was an episode that tore at our heartstrings. We were called to school, yet again, because Amber had been involved in an incident on the playground: She was caught kissing an ugly stray dog. We were thoroughly put out by her behavior, and asked, in our meeting with the principal, "Why Amber? Why this final ignominy? Why were you kissing the stupid dog?" Her response broke our hearts: "It's my only friend!" (p. 66)

The second example emphasizes the academic concerns, (which, of course, also affect emotional outlook):

> In that fifth-grade year, it was highlighted to us that Amber's basic skills were far from what they should have been. One day, before heading off for school, she took the time to leave a note for her older brother, who was sick that particular morning. Amber's goal had been to compose a kind, compassionate note, for she can be very considerate at times. She had attempted to write, "Get well soon, Chris. From Sweetie Pie." Now, where she got off calling herself "Sweetie Pie" we don't know, but that was her intent. Unfortunately, Amber misspelled "sweetie," and she also misspelled "pie" (as "piy"). Further, exhibiting her usual poor penmanship, she messed up the "y." The net result was that we ran downstairs to the kitchen table and picked up a note that read, "Get well soon, Chris. From Sweaty Pig." While such an effort might be humorous at home, we can appreciate that receiving work of this caliber could be distressing for teachers. It was embarrassing for us, as parents. Amber was again ripping our reputation to shreds in the educational community. (p. 60)

Disorder or Gift?

Nonetheless, we slowly learned to resist dwelling too much on Amber's problems, and, instead, decided to do our best to put a positive spin on things and help nurture whatever abilities she might possess. Bloom (1985) has stated that there are three central ingredients in developing talent in childhood: early recognition, nurturance, and motivation. In other words, whether the potential of young people is maximized or not depends very much on the identification of their talents by parents, educators, and other caregivers, on the opportunity to practice and build upon their strengths, and on somehow inspiring them to engage in such practice. We didn't want Amber to miss out on any of these elements.

Learning Disabilities Associations across the continent distribute material which suggests that Beethoven, Mozart, Verne, Einstein, Churchill, and other figures of note all displayed marked learning or attention problems. Contemporary entertainers have been identified as well: witness Henry Winkler, Whoopi Goldberg, Robin Williams, Jim Carey, and so on. All these uniquely talented individuals have overcome personal challenges to make their mark in the world. Various biographers have noted that Leonardo da Vinci would frequently lose concentration and bounce from task to task, that Robert Frost and Frank Lloyd Wright were unfocused daydreamers, that Thomas Edison was described by one teacher as "addled," that Nikola Tesla was highly distractible and accident-prone, and that Samuel Johnson lived in a state of perpetual motion (Cramond, 1995). In the world of more formal academe, as well, researchers have observed

that many of the traits of ADHD children are also evident in those who are deemed gifted, talented, or creative (Baum, Olenchak, & Owen, 1998; Cramond, 1994, 1995; Webb & Latimer, 1993). Many hyperactive young people exhibit keen powers of observation, lively humor, originality, spontaneity, and sensitivity—characteristics also associated with creativity. Csikszentmihalyi's (1990) conceptualization of "flow" as the intense, totally absorbing concentration shown by some gifted and talented people has a parallel in the "hyperfocus" of certain ADHDers described by Hallowell and Ratey (1994). Other similarities include excitability, sensation seeking, sensitivity to environmental stimulation, a tendency toward depression, and spontaneity in problem solving (Cramond, 1994, 1995).

Along the same lines, Rimm (1995) has recognized that some underachieving ADHD children can be extremely talented. Hartmann (1995, 1997) and Nadeau (1996, 1997) have presented several success stories illustrating how ADHDers of various ages can embrace and use the condition to their advantage and, in effect, live life in a stimulating "fast forward" style. In short, some individuals have demonstrated the ability to put the positive side of ADHD to good use at home, at school, and in the workplace (Hartmann, 1997; Nadeau, 1997; Solden, 1995). Nadeau points out that medication, counseling, and other treatments may, at times, be valuable in helping the process along.

Although he acknowledges the problems associated with ADHD, Hallowell has made it clear that he resents the term "disorder." In his words, there are

> advantages to having it...such as high energy, intuitiveness, creativity, and enthusiasm, and they are completely overlooked by the 'disorder' model. The disorder didn't keep me from becoming a doctor, and it hasn't kept many others from far greater success in a wide variety of fields. (Hallowell & Ratey, 1994, p. xi)

Kaufmann, Kalbfleisch, and Castellanos (2000, p. 12) have echoed that thought: "ADHD is not a defect that must be 'cured'.... [T]he condition can not only inhibit, but enhance the realization of gifts and talents." It goes without saying that the social context makes a tremendous difference. Back in the era of the hunters and gatherers, for example, those with hyperactivity might well have had an advantage. For today's ADHD child in a traditional school setting, however, "disorder" might well be quite an accurate descriptor.

Overlooking Talented ADHDers

If truth be told, we are unconvinced that ADHD necessarily goes hand in hand with giftedness, talent, or creativity. The literature in this regard, while interesting, is speculative and inconclusive. Besides, we're not overly worried about any formal connection or comorbidity.

The concern for us is that the symptoms of ADHD may, in many cases, mask underlying talent. The fact that we would expect at least the same proportion of gifted children within the ranks of ADHDers as in the normal population means that there are a significant number of hyperactive people around whose talents have likely gone unnoticed. Preoccupied as they often are with problems of basic survival, it is likely that parents and teachers of ADHD children (to say nothing of the youngsters themselves) rarely have the time or inclination to consider talent and its development. They are probably much more worried about getting through all their day-to-day trials and tribulations. Also, few diagnosticians think about uncovering creativity when assessing youngsters who are encountering difficulties in school (Cramond, 1995). All things considered, it may well be that ADHDers are less likely to have their talents identified and nurtured than most other children.

Kaufmann, Kalbfleisch, and Castellanos (2000, p. 11) have argued that accepting the fact that ADHD and giftedness can co-exist (and examining the interaction between the two conditions) "is a more productive way of looking at the problem than agonizing about a false dichotomy." In some cases, gifts and talents may be enhanced by the presence of ADHD. With hyperactive students, part of the challenge is to help them cope with the downside of their condition, while at the same time employing the upside as a foundation for talent development.

Unhappily, the necessary supports, encouragement, and opportunity aren't always available, and when troubled youth, including ADHDers with unique potential, are blocked from legitimate paths to goal attainment, they sometimes look for an outlet for their talents in socially unacceptable directions. By way of

example, misdirected talent can help wayward young people become "successful" members of youth gangs (Baker, McCluskey, & McCluskey, 2003).

Negatives Can Become Positives

For the past 20 years, we've worked directly with at-risk youth and adults who have somehow "fallen through the cracks." To be more precise, employing a combination of Creative Problem Solving (Treffinger, Isaksen, & Stead-Dorval, 2006) and mentoring (McCluskey & Torrance, 2003) has helped many of these marginalized individuals learn to make more productive educational, career, and life decisions. Outcomes have been well documented in terms of significantly reducing recidivism among Native-Canadian inmates in the *Second Chance* project (Place, McCluskey, McCluskey, & Treffinger, 2000), reclaiming relationship-resistant, high-school dropouts in *Lost Prizes* (McCluskey, Baker, & McCluskey, 2005; McCluskey, Baker, O'Hagan, & Treffinger, 1998); and increasing graduation and employment rates among disenfranchised Aboriginal teens in *Northern Lights* (McCluskey, O'Hagan, Baker, & Richard, 2000). More specifically, in *Lost Prizes* and *Northern Lights*, some 65% of the young people returned to and performed well at high school, entered and succeeded at community college or university, or moved on to a responsible, full-time job.

Interestingly, a re-examination of intake documentation has revealed that well over 50% of the more than 200 participants in these and related programs were referred at some point during their school years for hyperactivity or learning disabilities. It's easy to see how disenchanted, discouraged, and disconnected ADHDers can simply be lost to the system. Many of the individuals with whom we had the opportunity to work were, in fact, able to change direction and turn their lives around, but only after a liberal dose of concrete support, training, and opportunity were provided.

In all of these programs, hitherto hidden talents often emerged and, in some cases, appeared to be heightened by the presence of ADHD. It begs the question: Did Leonardo da Vinci, Thomas Edison, Samuel Johnson, and their like attain eminence in spite of ADHD, or because of it? Also, was their condition a problem to be coped with, an asset to be embraced, or both?

By changing direction a bit, parents and teachers can lighten the load somewhat for at-risk young people. Tonemah (1992) has expressed the view that educators tend to overfocus on remedial programming at the expense of strength building. Torrance, Goff, and Satterfield (1998) said something similar:

> We must reject the assumption that deficiencies motivate proper behavior and instead accept the more realistic belief that giving attention to successful behavior motivates the attainment of potential. This means recognizing, acknowledging, and using their potential to build success, skills, and abilities rather than wasting energy and resources by focusing on their deficits and neglecting their strengths. (p. vi)

By reframing or "recasting reality," we are more likely to notice and respond to the strengths of problem youngsters and recognize that negatives in childhood can evolve into positives later in life (McCluskey & McCluskey, 2001). It's essential to understand that, as children grow and mature, there can be a shift from stubbornness to determination, from bullying to leadership, from impulsivity to bravery, from inattentive daydreaming to creative invention, from disruptive fidgeting to productive energy, and from off-the-wall chaos to outside-of-the-box thinking. In many ways, it's all about how we, as parents and educators, perceive and react to the behavior of vulnerable children and youth.

Meeting Social-Emotional Needs

How do we, then, get from despair to satisfaction, from exclusion to inclusion, and from wasted potential to productivity? It's not easy.

Kaufmann, Kalbfleisch, and Castellanos (2000, p. 12) have identified the challenge clearly:

> Educators of gifted students with ADHD face a formidable task in that they must provide opportunities for students to apply their strengths while ameliorating their deficits….[T]his is more daunting for gifted students with ADHD because of the striking disparities these conditions can create.

Cramond (1995) has offered 10 useful suggestions for parents and teachers to follow

when ADHD is suspected, including being alert to the possibility that difficult behaviors may indicate special talents, (as well as problems), asking children what they are thinking about right after any daydreaming episodes, requesting that creativity checklists are completed along with those for ADHD, and providing opportunities in and out of school to develop creativity and self-efficacy.

Clearly, there are no magic answers, but we do have a few oft-overlooked tips to keep in mind when working with talented, hyperactive young people:

Offer acceptance and let them be who they are. Initially, in an effort to get Amber to behave "well," we may have tried too hard to force conformity. A quotation usually attributed to Mark Twain comes to mind: "Don't try to teach a pig to sing. It won't work, and besides, you'll annoy the pig."[1] Nylund (2000) has warned that we ought not to suppress talent by unnecessarily medicating our Huckleberry Finns. In our case, we certainly didn't want to lose the essence of Amber.

Be kind. The educational literature is chockfull of systematic approaches designed to improve classroom management, discipline, and student behavior. However, one very powerful strategy—simply being nice—is all too frequently forgotten. Long (1997) has emphasized "the therapeutic power of kindness" in interacting with at-risk children and youth. So often, "niceness" is the critical ingredient in reaching out to and engaging recalcitrant young people who desperately need to be accepted by others.

Find them friends. Many ADHDers crave the companionship of peers, but their impulsive, unpredictable behaviors get in the way and turn off potential friends. Rejection, loneliness, and alienation typically result. To us, it makes sense to intervene to support the social interactions of ADHD children and youth. It's possible, unobtrusively, to structure play and work settings to set the stage for successful relationship building by selecting empathic peers who have some understanding of and tolerance for the situation. We've had a couple of educators indicate to us that it's not their job to find friends for challenging, marginalized students. We disagree. Helping ADHDers form friendships is, perhaps, the most important thing anybody can do for them.

Let them help. Struggling ADHD students often find themselves overwhelmed by well-intentioned programs designed to improve their conflict resolution, anger management, and academic skills. It can, however, become subtly dehumanizing when one is always the helpee and never the helper (McCluskey, 2000). Not surprisingly, difficult children are less likely to get perks, rewards, and the opportunity to be helpful. It's interesting to see them visibly blossom when they have the chance to tutor younger students, run notes to the principal, or otherwise contribute and learn something about altruism. Importantly, though, such opportunities should be real, genuine, and valuable, and not obviously contrived (Curwin, 1992).

Avoid simplistic, cookbook approaches. By way of example, it is often assumed that firmness and structure are "good" for ADHDers. Might it not be the case, however, that too much structure will intimidate and stifle creativity in some hyperactive children? Although one must have rules and expectations, at times, it is wise to lighten up, show tolerance for ambiguity, and select appropriate teachable moments. We must continually ask ourselves, "Is this the hill I want to die on?" (With ADHDers, there are a lot of hills.) It is possible to think paradoxically and create "flexible structure" (e.g., by using "oral" tests that allow students to express their thoughts through conversation, movement, dance, or art). Similarly, kindness and firmness are not mutually exclusive: one can smile and still be serious. Using a style of "kind firmness" allows parents and teachers to show both caring and due diligence with hyperactive children and teens.

Encourage reasoned decision-making and responsibility. Feldhusen (1995) has stressed the importance of having gifted students recognize and take charge of developing their own talents. Likewise, others have offered suggestions to help ADHDers contain their volatility, cope more effectively, and manage their own condition (Amen, 1996; Frank & Smith, 1994; Goldstein & Goldstein, 1991; Nylund, 2000; Parker, 1988; Quinn & Stern, 1991; Walker, 2005; Weiss, 1994).

[1] The quotation is often attributed to Mark Twain, possibly as a result of the expression appearing in the film, *The Adventures of Mark Twain*.

Counseling and problem-solving sessions can teach inattentive, overactive students to slow down, think before they leap, and make better decisions.

Focus on long-term planning. Relationship building has been described as an endurance event (Brendtro, Brokenleg, & Van Bockern, 1990). It takes time. Given that there is no magic cure for ADHD, one has to be prepared to hang in there for the long haul, especially since hyperactivity is more often than not a lifelong phenomenon rather than a child-specific condition (Hallowell & Ratey, 1994; Kelly & Ramundo, 1993; Murphy & LeVert, 1995; Nadeau, 1996, 1997; Weiss & Hechtman, 1993; Wender, 1995). As mentioned earlier, with time, age, and increased maturity, ADHDers may be able to channel their energy and abilities in productive directions. For them, academic, vocational, and interpersonal success may come later in life. As a consequence, caregivers need to be patient, to refrain from expecting too much too soon, and to be ready to seize opportunities whenever they materialize (e.g., many ADHD individuals might not be ready for post-secondary education until long after most "continuous" students have taken that step). Career planning should be an ongoing part of the process. Obviously, as Hartmann (1997) observed, ADHDers would be best to avoid traditional "nine-to-five" desk jobs and to focus, instead, on other intriguing and stimulating opportunities that are available.

Become talent spotters. Recognition and nurturing of talent should become a top priority for all educators (McCluskey & Treffinger, 1998; Treffinger, 1998). Young (1995) has suggested that teachers ought to search diligently for indicators of special interests and abilities in their students (to the point of keeping a notepad on hand to record such observations), to design flexible activities and curricula that permit potential to surface, and to be on the lookout for talent over an extended period of time. Essentially, the notion is that all educators should view themselves as talent scouts who observe, listen, and gather information about the gifts of young people, including those with challenging behavior problems, in a variety of contexts.

Think enrichment. Educators don't typically try enrichment approaches when dealing with ADHD or other difficult students. In contrast, the first thought is, usually, to implement a "we-will-cure-what-ails-you" program. However, once one makes a conscious effort to identify talent in such populations, the next logical step is to develop it through enrichment. Type III enrichment activities allow students the opportunity to become actual investigators of real-world issues, to gather data, to employ problem-solving strategies, and to produce creative products in relevant situations (Renzulli & Reis, 1997). This type of action-focused, hands-on formula—which allows students to become "practicing professionals"—would seem to be ideal for hyperactive youngsters. And, certainly, it has been shown that employing contextually relevant, higher-order programming can have an extremely positive impact on at-risk underachievers (McCluskey, Baker, O'Hagan, & Treffinger, 1998; McCluskey, Baker, & McCluskey, 2005; Renzulli, Baum, Hébert, & McCluskey, 1999). Exciting programming through research, mentoring, problem solving, and self-directed learning should not be the sole prerogative of gifted education. Some ADHD students thrive on this sort of thing. Excellent programming models are available to guide us in enriching the educational curriculum for all students (Renzulli & Reis, 1997; Treffinger, Young, Nassab, & Wittig, 2004).

Amber Today

Gradually, oh, so gradually, we began to take a more strength-based perspective and recognize some of Amber's talents. Today, she has good friends in her life and, most importantly, she is now a dynamic mother of two wonderful children aged 12 and nine years. (Imagine this: she's the only mother of our acquaintance who would wake the babies up to play!)

Nine years ago, Amber decided she was going to become an early-years teacher who "will be nice to the kids and show people how to do it right!" She has done precisely that. Amber is soon to begin her fourth year of teaching in an inner-city classroom and reaching out in her inimitable way to challenging students with special needs. A few days ago, she took us for a visit to her school. (Amber has been away for a spell because of knee surgery.) It was a revelation to see how excited her young students were to see her back in the building—it would be difficult to describe the buzz of activ-

ity, the joyous hugging, and the frenzied shouting of the little ones. Our daughter truly seems to be making a difference.

For us, the negatives have, indeed, turned into positives. Amber has the boundless energy and infectious enthusiasm that make learning fun—and there is not a child born on the face of this earth who can wear her out! It took a long, long time, but our parental agony has turned to ecstasy and pride in her accomplishments.

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2.
They tell me I'm smart, so why do I have so much difficulty with 'laerning'?

Charlene J. Barva

Abstract

Most research on learning disabilities (LD) among adults has been conducted using males, an emphasis that has resulted in a limited knowledge of this disorder among females. Although an increasing number of high-achieving women with learning disabilities enter post-secondary institutions, LD in the adult female population is a much under-examined area. This research study explores the experiences of eight high-achieving female students with learning disabilities, attending two different universities in Alberta, Canada. Two semi-structured individual interviews were completed with each participant, and one large focus group was conducted. Interviews were analyzed using van Manen's (1990) hermeneutic, phenomenological approach. Two main themes emerge from the data analysis describing the nature of the participants' experiences: self as learner (involving personal beliefs, attitudes, and values as motivational forces for learning) and self as learner in relationship (focusing on their learning environment in relation to family, friends, educators, and others). A descriptive analysis and interpretation of the sub–themes within each of these two main themes is presented, along with a discussion of the implications for educators and parents as advocates for high-achieving female adults with LD, specifically pertaining to the importance of early identification and appropriate intervention.

> I have been told many times how 'lucky' I am to be only mildly learning disabled. 'It could have been much worse,' they say, an attitude which perplexes me … In my view, I am not lucky or unlucky; I'm just learning disabled. (Emma, participant)

Emma was one of the participants in my doctoral dissertation study, which integrated a hermeneutic, phenomenological research method with a feminist perspective to explore the educational experiences of high-achieving women diagnosed with learning disabilities (LD). Eight women who were enrolled in either undergraduate or graduate programs at the University of Calgary and University of Alberta were interviewed for this study. Before proceeding with a description of the study, it is important to clarify the term "high-achieving," as it is often used interchangeably in the literature with "high-ability" or "gifted" or both (Holliday, Koller, & Thomas, 1999, p. 268). For the purpose of this study, the term high-achieving refers to those women who are currently enrolled in or have graduated from a post-secondary institution.

Since its recognition as a federally designated handicapping condition in 1968, the field of LD has grown to represent approximately one-half of all students receiving special education services (about 5% of the school-age population) in the United States (Kerka, 2000). In Canada, approximately 5 to 10% of students in public schools have been identified as learning disabled (Statistics Canada, 2001). Coupled with these figures is a substantial increase since 1990 in the number of students with LD taking post-secondary education. The majority of research on LD has focused on students in primary and secondary schools, due to a belief by many clinicians that this condition can be remediated if addressed early enough. Current information indicates that LD is life-long (Gerber & Reiff, 1994). In the last ten to fifteen years, the field of LD has begun to direct in-

creasing attention to the varied and complex needs of adults with LD, prompted by increased advocacy and research, significant American legislation, and the changing demands of the workplace (Gerber, Reiff, & Ginsberg, 1996; Kerka, 2000).

Despite this trend, there has been little research about adults with LD and even less investigation related to the experiences of high-ability women with this condition (Levine & Nourse, 1998). Most research on LD has been conducted on male samples or on the learning of pre-adolescent and adolescent females and then extrapolated to adult women (Hayes & Flannery, 2002). This has resulted in limited knowledge of the disorder among adult women (Vogel, 1990). More important, in studying adults with LD, researchers in the field have been committed to a traditional empirical approach which emphasizes statistical data collection and analysis (Kavale & Forness, 2003) and studying children and adults with LD from the "outside in." Little investigative attention has been paid to studying LD from the vantage point of those who, themselves, have been diagnosed as LD, or what Gerber and Reiff (1994) referred to as the "personal, detailed contours of individual's lives, lived with, and in spite of, disability" (p. 9).

Impetus for the Study

This research study was an attempt to address the prevailing lack of information and understanding about adult women's learning and education that currently exists, especially as it relates to high-achieving women with LD. The impetus for this study arose from my own professional and personal experiences.

Following three years of employment as an educator, and newly graduated with a Master's degree, I began my professional career as a school psychologist with the Calgary Separate School District. In this position, I encountered many high-achieving students (mostly male) who were referred for assessment, placement, or both, on the basis of an identified academic weakness or disability. Few females were identified or referred for assessment and, if they were, it was because they were mentally challenged. I began to wonder why so many more males than females were being identified with LD. Did females not struggle with similar learning issues? Was there something that was being overlooked by educators and me with regards to learning by females? My experience working with students with LD was about to change as I embarked on a new career with the Calgary Board of Education.

I have worked as a school psychologist with the Calgary Board of Education for eight years, and it continues to be my place of employment, albeit, more recently, in a new capacity as a specialist in gifted education. Prior to this new role, my work primarily involved assessing and diagnosing students with exceptional needs. Beginning two years ago, I noticed an increase in the self-reported identification of bright females diagnosed with LD in senior-high school, especially in Grade 12. These women were referring themselves for assessment because of their difficulties with learning in many of their academically oriented courses. Many of them had a history of learning difficulties that were not formally noticed. Even their current educators were not aware of their learning problems. I was amazed at the number of females who were referring themselves and surprised that no one had previously noted these difficulties.

Self-identified bright women came to me out of frustration and anger, and many demonstrated low self-esteem, poor self-confidence, and depression. Many of them felt that the school system had let them down and that they now were going to start "taking charge." I was shocked that so many females with LD were being overlooked, confused as to why these women were identifying themselves at this point in their academic career, and saddened that the school system had let so many high-ability women "slip through the cracks." Research in the area of high-ability women with LD indicates that women are not normally identified because they are able to mask or hide their learning difficulties and compensate for them through their strengths (Bireley, 1995). For many of these bright women, however, signs of difficulties with learning were present even though they were able to cope very well. These incidents, arising from my professional work, helped to plant the seed that would take root in my research project.

On a more personal level, I have a good friend, who, I am sure, has LD and is definitely gifted, although he has never been formally diagnosed. His lack of diagnosis is not surprising, however, given that the concept of LD has

only existed for about 40 years (Kerka, 2000), and knowledge about LD is just starting to be disseminated in the public realm. Learning has never come easily for my friend. Throughout his academic years, he struggled severely in the areas of reading and writing. In Grade 6, he was sent to a special school for literacy intervention. While he notes that this was a very difficult experience because he was mainstreamed with students with diverse disabilities, including those with severe behavior problems, he is also grateful for the support he received in terms of learning strategies that would help him succeed in his learning. He was integrated within the regular curriculum for his remaining school years and continued to struggle academically. Educators often commented on his remarkably creative ideas and his high motivation but also on his weakness in synthesizing these creative thoughts on paper. His difficulties with reading and writing have never disappeared; however, he has developed some excellent coping strategies that have contributed to his success today. He has a remarkable interest in learning and in seeking ways to help himself learn. He has become his own best advocate. My friend has gone on to complete two university degrees and is outstanding in his field of work, having been recently nominated for an excellence award and having received an international award for his work in environmental conservation. In retrospect, he is positive about his accomplishments but, at times, feels that if he had had the proper interventions in place throughout his schooling, he could have achieved much more. Fascination with my friend's background, my Master's work with its focus on women's development, and my professional work experience led to my interest in this research phenomenon.

As previously noted, the participants in this study consisted of a diverse group of eight women diagnosed with LD who were attending undergraduate or graduate programs at either the University of Calgary or University of Alberta. One group and two semi-structured individual interviews were conducted in order to gain further understanding of the phenomenon. The analysis of my work was based on the work of van Manen (1990) in which learner coping strategies are developed by the researcher in the recursive process of examining data, developing emerging themes, and integrating this information with the literature on high-achieving women and LD.

Results: Interpreting the Women's Words

Two main themes, with various embedded sub-themes, emerged as being representative of the educational experiences of high-achieving women with LD: Self as Learner and Self as Learner in Relationship.

Self as Learner

The first main theme, Self as Learner, focused on the individual or cognitive (intrapersonal) aspects of learning, including the women's beliefs, attitudes, and values as motivational forces in their learning. Many of the women spoke of the impact of their LD upon learning as a transformational process that affected their self-identity and, ultimately, led to greater self-acceptance of their LD. Four themes were revealed within this larger theme: Something is Wrong with Me, Learning to Compensate, Taking Back Control, and New Images.

Something is Wrong with Me. This sub-theme highlights the problem of having LD but not being aware of it. It refers to the women's difficulties with reading, writing, or math and their feelings of frustration, confusion, and despair. Dawn, for example, recalled her experiences with reading:

> I was a very slow reader and I inverted a lot of letters and words…To me, a *p* looked like a *q*, a *d* looked like a *b*, and, what was that again, does *t* come before *s*, or is it before *r* ?…It didn't matter how many times it was explained to me, I could never keep up with the class.

Hallahan and Kaufmann (2003) write about the difficulties of living up to seemingly impossible standards, without knowing why they are so impossible when they seem easy for others. Further, the frustration associated with this can have a profound effect on self-esteem. One woman became very shy, quiet, and withdrawn and, eventually, entered into a six-year battle with depression. She notes that her self-esteem and self-confidence "took a real nosedive," and she credits a warm and supportive relationship with her therapist for bringing her back "from that dark and lonely

hole." Despite these women's adversity, they learned ways to compensate and cope.

Learning to Compensate. Orenstein (2001) used the term "bypass" to refer to the ways in which both people with detected and undetected learning disabilities get around their cognitive problems. The individual learns to compensate, usually without any help from others, by employing ingenuity and creativity to overcome a problem (Orenstein, 2001). For some of the women, spending additional time and effort was one way to create a bypass around areas of failure. This is exemplified by Ann's comment:

> I always knew that I had to work ten times as hard as anyone else….[E]very night, my mom would sit down with me as I tried to memorize my times-tables….[W]e used 300 flashcards (I remember the exact number), and we would practice and practice for hours on end. I hated it, but it has always been like that....[E]ven at university now, I attend classes and then spend additional time afterwards writing and re-writing my notes so I can understand them better….[I]t's very time-consuming. I knew that I could do whatever I wanted to do. It just took me a lot longer time to do it.

Another coping skill Ann used was to become very compliant, "the teacher's pet," as she noted. It was important for Ann to have her teachers and peers like her because, as she stated, "'If I'm good, people will like me.'"

Emma noted the time it took her to complete university:

> It's taken me six years to get through undergraduate school. I repeated a lot of classes. I'd tape everything and listen to it over and over and over again…If I start doing bad[ly] [sic] in a course, and I don't feel like I should be doing bad[ly] [sic], then I'll drop it and start all over again so that I do [well] [sic]….It's taken me forever and ever and ever, and I can't wait to be finished.

Many of the women in this study spoke of relentless hours spent in trying to develop a new skill or to complete an assignment, and no matter how time-consuming or difficult, there was a continued push to learn, a desire to excel, and a desire to be perfect. Perseverance and motivation were some of the qualities to which the women referred. Some of the women found ways to compensate for their academic difficulties by using skills that were outside of the academic domain. A few of the women found that it was much easier to cope by becoming "behavior problems" rather than to deal with the pain of their learning struggles.

Taking Back Control. According to Reiff, Gerber, and Ginsberg (1997), control refers to the drive to manage one's life. Being "in control" is vital to our sense of well-being and is a key element for success (Reiff et al., 1997, p. 101). For many of the women in this study, the experience of having LD, particularly in the school-age years, meant a loss of control. Individuals were left feeling "helpless," "frustrated," "stupid," and "alone." Most of the women were able to "gain a sense of control" over their environment through a formal diagnosis (and labeling) of LD. For some of the women, labeling had positive effects, in that they recognized the importance of the label in identifying their problem and bringing about greater self-evaluation. Others experienced the labeling as quite negative, carrying with it a connotation of personal imperfection, social demotion, or a loss of certain future hopes. They questioned why the learning disability categories had to be classified around negative attributes, rather than focusing on the strengths or positive attributes.

Judy, for example, found that accepting the label of LD was more difficult, as she associated LD with shame, stating that

> [e]ven though I recognize that it is not my fault…nor does it reflect on the kind of person I am or my intelligence…there is still a part of me that feels that telling people that I have a learning disability could shape the way they view me.

Jennifer found there is a misconception towards people with LD because it is not something you can see like a physical disability. She found it frustrating to have to explain to people what LD is because most perceive LD to be a developmental delay, "a disability of slow learners."

Emma hated the term LD particularly because it denoted having "a disability or lacking the ability to do something." She was adamant that, yes, she had a problem, but, no, she did not have a disability.

Nevertheless, the diagnosis and labeling of LD, whether positive or negative, or both, provided a type of reality check for the women, with a confirmation that there was something real going on with which they struggled and that it was not all imagined.

New Images. New images is the ability of many of the women to look back on their experience and perceive their LD as no longer negative and unwanted but, as one participant put it, as "blessings in disguise." Many of the women spoke of the transformation in their life that had taken place and how this change affected their self-identity and the self-perception as women with LD. One important aspect of this transformation was the ability to recognize one's LD which, for these women, usually occurred through their diagnosis. For many of the women, this recognition was the realization that they did things differently and that it was okay to be different from everybody else. Another aspect in the change process involves acceptance of the LD. Acceptance and understanding of their disability led many of the women to new-found feelings of empowerment that allowed them to take action, to seek out appropriate alternatives, and to make good choices for themselves. Judy elaborated:

> I'm not a whole, perfect person, and I've got some missing parts…but I have all these other talents and skills, and a lot of people have missing parts. I have not let my disability ruin my life….I've pursued my career in an area I know I can do well in….I don't sweat the small stuff anymore, I try to get through everything the best I can, and that's all I can do.

Like Judy, many of the women were able to take charge of their own learning environments and develop many different creative coping strategies. In their acceptance and understanding, they developed a "voice," which is a pervasive and powerful image in women's stories about learning.

Voice implies communication and connections with other people, as well as the ability to express thoughts and feelings so that they can be heard and understood by others (Belenky et al., 1997). Reinharz (1994) pointed out that, historically, women have been denied the right to speak, and women's efforts to claim a voice can be acts of resistance and rebellion against domination. Specifically addressing women's development as learners, Belenky et al. (1997) theorized that, as women develop, they change their positions toward self, authority, truth, and voice. They progress from a position of silence, in which they are unable to express their own ideas, to one of received knowing, in which they attribute ideas to experts outside themselves. An important shift occurs when they move to subjective knowing, in which they firmly establish their own identity, self-confidence, and self-esteem as learners. Finally, they arrive at a learning stance in which they creatively integrate their own knowledge and experience with that of others and make something new out of it for themselves and society—constructed knowing.

Self as Learner in Relationship

The second main theme to emerge from the women's narrative was that of Self as Learner in Relationship, which focused on the interactive, interpersonal nature of learning, that is learning within the social and cultural context. This theme was centered on the social meaning that women attributed to their learning environments within the context of their relationships with family, peers, educators, and significant others, such as mentors or special friends. Four sub-themes are included under this broader theme: Self and Family; Self and Peers; Self, Educators, and the Learning Environment; and Self and Significant Others.

Self and Family. In their study with highly successful adults with LD, Reiff, Gerber, and Ginsberg (1997) found that these individuals were able to survive rocky moments growing up with LD because they had some kind of significant support. In this study, parents were identified as valuable sources of support. The parents' influence, indeed, cannot be underestimated, as reflected in the women's comments. Judy, for example, described the extent of her parents' involvement with her schoolwork:

> My dad helped me with my math, algebra, and geometry, and my mom helped with spelling and writing. I started bringing things home before high school. My mother went over every paper I wrote. My dad would always go to the school and ask the teachers how I was doing. Reminders would be pinned to the refrigerator about bringing home the work I was having trou-

> ble with. My parents really did get me through high school.

Jennifer recalled that she had always needed her parents' help to write papers. Noting that her parents would never actually do the work for her, she indicated that this help was life-saving:

> With reports, papers, and stuff, I always needed somebody. When I wrote a paper, my mother would edit the paper for me. When I had a book to read, my father would read the book to me, explain the whole thing, and then we'd answer questions about it. My parents also hired a tutor twice a week to help me with my reading and grammar. They weren't so concerned about marks but about always doing your best. I wouldn't have done so well if they had emphasized high marks and achievement.

Parents would often help their daughters with writing assignments or would request weekly performance reports to scrutinize their performance. They also had very high expectations of them.

For some of the women in this study, both parents were instrumental in providing support and encouragement. For other women, it was the influence of one parent that was particularly significant. While some of the women commented that they had difficulty completing their academic work without their parent's (or parents') remedial or emotional support or both, some also resented or rejected such assistance and wanted to manage their difficulties themselves. Whether the women accepted or rejected parental help, most women reported having many arguments about grades and studying. The women's reactions to such assistance also reflected anxiety and confusion regarding what their academic difficulties and parental dependence meant for their personal identity, future autonomy, and intellectual competence—all sensitive issues for young adults.

Self and Peers. At every level of academic and social development, peers play a very significant role. For individuals with LD, research has indicated that peer relationships may pose particular difficulties. Students with LD have been found to be less accepted and more rejected than their non-disabled peers, and many students with LD tend to occupy a lower social status than other students (Kuhne & Weiner, 2000). Some of the women in this study found themselves in these kinds of situations and described struggling to get along with peers. They spoke of being the outsiders, rejects, or nerds. Keely recalled:

> I couldn't read or spell words. When it was my turn to read out loud, I would feel like such an idiot. I got teased badly by the other students, mostly boys, in my class. They would call me names, like retarded and stupid. I knew I wasn't dumb or retarded, but kids can be so mean. It got to the point where I didn't want to go to school; I was forced to go.

Teasing and name-calling by their peers in elementary school were common occurrences. The existing social difficulties were only exacerbated as the women entered adolescence. Ann and Wendy, for example, both recalled painful experiences of being bullied by their peers. Ann talked about the sexual harassment that she endured throughout high school and about feeling that she was "the victim" because, although she told her parents and teachers about the harassment, nothing was done. Like Wendy, Ann also felt very different from her peers in that she "just didn't know how to relate or fit in." Wendy noticed her social difficulties becoming more severe as she entered junior-high school:

> I never was a member of any social group, but as I moved into junior-high school, I was singled out by some of my peers, mostly girls, and ostracized. I tried to become friendly towards them, but I've always had difficulty with friendships…. [T]hey just didn't accept me. In high school, I continued to be an "outsider," and my best friends were the delinquent "rejects."

Not all of the women were affected negatively by their peers. Some of the women reported adapting well to being an outsider. As children, they accepted the fact, or at least rationalized, that they marched to a "different beat."

Self, Teachers, and the Learning Environment. For many of the women, the most vivid memories of LD began with school, and, like peers, teachers were cited as a powerful influence in both negative and positive ways. A common experience for many of the women was having judgmental teachers. Many of the women vividly recalled their teachers' negative

attitudes, as well as incidents in which teachers reproached them, making them feel "ashamed" or "embarrassed," or destroyed their hopes and dreams. Many of the women felt that their teachers blamed them for the difficulties they were having and that their teachers became frustrated and angry with them because of their disabilities. Judy vividly recalled a painful experience in high school when a teacher locked her out of the classroom because she was "two minutes late" in arriving for a quiz. This particular teacher accused her of being lazy and unmotivated and, by locking her out, wanted to teach her a lesson about working harder. The situation got resolved only when her father intervened with the principal, on Judy's behalf. Judy questioned why she had to go through such a painful, emotional experience and resented that she always had to "prove" herself to her teachers. She poignantly summed up her school experience:

> I remember coming [home] from school and being exhausted most of the time. I'd always have to be a step ahead of them [the teachers] so that they wouldn't ask questions like "Where's your homework?" or "Why didn't you do it?" I wouldn't know what to tell them. I didn't know why I didn't do it. I'd sit down and I wouldn't say anything. It was frustrating. I wanted the information everybody else was getting, and I wanted to get it the *way* they were getting it, and it was also more frustrating when some teachers reacted with that ignorance. I mean, as each class went on, not only did they act like they didn't care, but they were almost rude and condescending about it, like it was my fault, that I was just lazy, and that I had a lot of good excuses. There were times when I was ready to quit!

For some of the women, these experiences continued through to post-secondary education, as they also recounted professors who reacted negatively to their diagnosis and failed to understand or provide modifications for them. One participant, Margaret, described her negative experience in requesting accommodations and the reaction of one of her professors in graduate school:

> I remember asking one of my professors if I could have some extra time on an exam, and he said, 'Well, why should I give you anything extra? That wouldn't be fair to the other students….You don't look like you're learning disabled.'

Margaret felt that there was a complete lack of understanding by many educators about LD, and especially towards brighter students with LD. While most of the women recalled painful and negative experiences with teachers at all levels of their education, they also remembered some teachers as being very positive and caring and having a significant positive impact on their learning.

Self and Significant Others. Some of the women spoke of the importance of mentors or other especially supportive people—family members and educators—to help them deal with their learning difficulties and become successful. According to Orenstein (2001), mentors are people of wisdom who can be trusted to respect both an individual's strengths and weaknesses. Mentors can see others' potential and foster growth. Keely, who suffered from depression for six years, referred to her therapist as being her mentor. She credited her therapist with believing in her and helping her to believe in herself. Wendy, like Keely, also suffered from low self-esteem and long-term depression. She spoke highly of her therapist for "giving [her] the courage to move ahead and never failing to give up."

Two of the women spoke of the LD specialists as being very important to their feelings of self-confidence and success. Several explained how their partners or friends read to them, edited their work, did various routine tasks that their disability made difficult, and reminded them of important information when their memory failed them. For these women, support from a special person or friend was an integral part of their learning success.

Implications

The results of this study have significant implications for both educators and parents whose role is vital for the high-achieving female with LD. For educators, the findings indicate that teachers will have to take a systematic and ongoing approach to identifying, implementing, and evaluating classroom-based interventions and accommodations to assist high-achieving females who demonstrated characteristics of LD. Early and accurate identification of LD, for example, is critical to establishing learning skills and strategies important to future aca-

demic success. Particularly important is the role that sex differences play in early identification. Teachers must be more astute in recognizing the less visible characteristics of all students with LD if these students are to benefit from early identification. Another particularly important finding is how the stories of these women awaken us to the reality of how the women experienced school. For many of them, school was generally a place of negative experiences. Witherell and Rodis (2001) propose the concept of intellectual diversity as a socially responsible, pedagogically sound model for shaping classroom culture. Intellectual diversity is based on the idea that teachers need to appreciate not only their students' cultural and ethnic diversity but also their intellectual diversity, which is to say, their "differences of mind" (Witherell & Rodis, 2001, p. 167).

With respect to parents, research suggests that, particularly in the early years of schooling, parents are considerably more effective in identifying high-ability children with LD than teachers are (Kavale & Forness, 2003). Parents must become more aware of and involved in their child's learning. Parents need to participate in educational programs so that they can learn relevant educational concepts and be kept abreast of new knowledge in the field of LD. They may find it beneficial to join support or discussion groups, attend lectures, watch videotapes or DVDs, and participate in case-study presentations in order to increase their understanding of LD. A collaborative problem-solving, working relationship between the home and the school (and other outside agencies) is critical for enhancing the learning experience for all students with LD.

As a final comment, I believe that one of the most powerful contributions of the women's narratives gathered in this study is the way that they propose a shift in how learning disabilities may be conceptualized. The concept of LD has been understood from a neurological or psycho-educational perspective, but the women's stories suggest that it may be more meaningful to think of LDs, primarily, as constructs that influence and mediate a person's sense of *being* and *identity* or of self-in-relation-to-self and of self-in-relation-to-others. Undertaking this research project has been a personal journey, as well as an educational one, and one that will have a profound effect on my practice as a school psychologist.

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3. Gifted Immigrants and Refugees: The Gold Unmined

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Abstract

Although immigrants and refugees may have a profound effect on the global talent pool, problems associated with resettlement, such as securing housing, seeking employment, and adjusting to a new culture and language, often take precedence over identifying and providing for the educational needs of gifted students. International waves of immigrant and refugee groups have differed dramatically over the decades, but attitudes and educational interventions that tap into the potential of immigrant and refugee learners have changed little. In this paper, we present a very brief historical review of the immigrant and refugee influx in three countries: the United States, Brazil, and South Africa. This is followed by a discussion of consequent challenges and suggested solutions as they relate to identifying and meeting the needs of gifted immigrants and refugees. The paper concludes with a discussion, based on the collective, three-country review, about how we can better serve this gifted group within the global community.

International waves of immigrant and refugee groups have differed dramatically over the decades, but attitudes and educational interventions that tap into the potential of immigrant and refugee learners have changed little. Individuals emigrate for a variety of different reasons. They may leave their home country to escape poverty, to seek educational betterment, to avoid persecution, or to flee the ravages of war. Such concerns will often take precedence over identifying and providing for the educational needs of gifted and talented children as families adjust to a new environment and as they seek to deal with the immediate concerns of housing and employment.

Immigration and refugee movements, always in a process of flux, necessitate countries absorbing large numbers of individuals into an educational system that is often unprepared to meet their unique needs. This is particularly true of those who are gifted; most are lost in a maze created by an inadequate identification, placement, and programming process.

To understand the complexity of immigrant and refugee influx in the countries targeted in this study—the United States, Brazil, and South Africa—requires, at least, a brief examination of the nations' historical background. In this light, consequent challenges and possible solutions, as they relate to identifying and meeting the needs of gifted immigrants and refugees, can be considered with greater insight.

Gifted Immigrants and Refugees: American Gold Unmined

Historical Context

Since its founding, the United States of America has been a nation of immigrants with a rapidly diversifying population of young children, transforming the country's demographic, particularly since the turn of the 20th century. Over the past decade, the number of students whose native language is other than English

has grown significantly in American classrooms (Garcia and Cuéltar, 2006), a trend that will likely continue into the foreseeable future (Crawford, 1999; Garcia, 2001).

According to Foner (2008), the new groups of immigrants and refugees of the last few decades differ from those who came through Ellis Island in the early part of the 20th century. Recent immigrants originate largely from Third-World, non-Caucasian, linguistically diverse countries, with the greatest numbers being Hispanic and Asian.

The 2000 American census reported that close to 47 million (46,951,595) individuals in the United States speak a language other than English at home (Garcia and Cuéltar, 2006). This reflects a significant 47% increase from the 1990 census figures, representing over 20 different languages, with the largest increase being Spanish.

Early immigrants came to America for a variety of reasons. The Chinese, for example, who came in the early 19th century for economic betterment, entered primarily through San Francisco and were largely employed in building the railroads. Few were refugees escaping from untenable political conditions. The large numbers of Irish who emigrated in the mid 1800s to escape the famine settled around the Boston area. They had difficulty procuring work, discouraged by the infamous "Irish need not apply" signs put up everywhere by business owners. Examples of more recent refugee groups include Cambodians who escaped the Khmer Rouge, Cubans who often risked their lives coming to Miami by boat, the "lost boys of Sudan" who escaped the ravages of war, and Russian émigrés who resettled in the United States after the breakup of the Soviet Union in 1989. Currently, immigrants constitute an unprecedented 37.5 million of the American population, with major groups being represented by Mexicans, Chinese, and East Indians. Mexicans make up almost a third of all new immigrants (Foner, 2008).

Perpetuation of Old Patterns

In the *melting pot* theory, it was assumed that once new immigrants and refugees became Americanized, all cultural barriers would eventually disappear (Harris, 1991a). The assumption that assimilation would yield better opportunities for gifted immigrants and refugees (Zhou, 1999) is no longer tenable. Assimilation, in fact, decreases the productivity of gifted immigrants and refugees, and, as they become more Americanized and less visible, there is a significantly smaller chance of them receiving specialized programming (Ngyuen, 2008).

The legacy of the past has helped shape the immigrant experience and the reception of new immigrants and refugees (Foner, 2008). Although objectivity is essential to the identification process of gifted immigrant and refugee children, educators' stereotypical assumptions persist and frequently interfere with their delivery of effective programming (Manning and Guang-Lee, 2001).

Current Concerns

One of the most serious problems of immigrant and refugee children is their placement in schools, with the general practice being by age and little attention being given to their previous education. Students, for example, may have had little or sporadic schooling, possibly even no schooling, before coming to the new country (Harris, 1991b). A case in point is that of the "lost boys of Sudan," singular groups of unaccompanied minors escaping brutal ethnic cleansing, who made the long trek across Africa to the relative safety of refugee camps (Chanoff, 2005). Only 5,000 out of 20,000 in the original group survived. There were two subgroups of refugees: those under 18 years, who were placed in foster homes and those over 18 years, who were given jobs but no educational support. Although a few of the over-18 group made it to graduate school, most were not evaluated appropriately to allow them continue their studies (D. Chanoff, personal communication, November 25, 2008).

Still another problem that emerged is the misdiagnosis of children as learning disabled when, in fact, they exhibited a mere learning difference, based on a different learning style or linguistic challenge with the English language. Many immigrants, consequently, were over-represented in special education classes (CERI, 1987; Harris, 1991b). Some were clearly capable of honors-level work. Arroyo (cited in Garcia and Cuéltar, 2006) identified, for example, a group of capable refugees from El Salvador fleeing government violence in the 1970s who arrived in the United States without language skills. In addition, Korean immigrants, who came in the 1970s and 1980s,

experiencing severe economic hardships, were processed through an educational system without regard for their potential.

Gifted Education Models

Flexibility in identification and programming for gifted immigrants and refugees is exemplified by only a few projects in the United States. One example of a promising program is Open Gate (Fox, 2001; Kitano, 2003), a California program with four classrooms serving highly gifted students from third to fifth grade and teachers certified as educators of the gifted by the district. The Open Gate program is located in two elementary schools in a large, highly diverse, urban area. Project CLUE (Clustering Learners Unlocks Equity), in the Indianapolis Public Schools (Neumeister, Adams, Pierce, Cassady, & Dixon, 2007), directed to the gifted who are immigrants, is another outstanding program, but such initiatives are far and few between, and, for the most part, immigrant children are caught in a paradox: they do well initially, and sometimes better than their native-born peers, but, as they continue to assimilate and become more Americanized, they are less likely to be identified as gifted and placed correctly, with positive outcomes deteriorating over time (Nguyen, 2006).

Implications

The ethnic culture, it appears, has a protective effect during the assimilation process, with some progressive deterioration as immigrant children adjust to the host country. Immigrant children often have strong family bonds (Nguyen 2006), but acculturation may involve cultural erosion, cultural conflict, and adjustment problems, on the one side, and assimilation, linguistic adjustment, physical health issues, and psychological difficulties (i.e., in the case of refugees), on the other. In addition, there may be weakened coping strategies that originate in conflicts within the family, within the social arena, and within the school environment, giving rise to identity-related issues, altered self-concept, underachievement, and isolation (Harris, 2003a). Specific programming and curriculum development that speaks to these various needs, without prejudicial attitudes, assumptions, or instructional complacency, is sorely needed for educational excellence.

Suggested Solutions

According to Hannahs (1983), cultural compatibility with the mainstream culture is often necessary for academic achievement. Giftedness, however, must be considered and understood within a cultural context (Sternberg, 2004; Harris, 1991b) and needs to be taken into account during the process of identification and intervention. An understanding of giftedness, its characteristics and behaviors, in the light of diversity and cultural congruence, should be incorporated into teacher training to assist educators in their search for giftedness among immigrants and refugees. This will allow schools to provide more appropriate educational experiences, which will enable this population to maximize its considerable but hidden gifts and talents (Harris, 2003b).

Gifted Migrants: Brazilian Gold Unmined

Historical Context

The pattern of immigration in Brazil is different from that of the other case studies in this paper. According to historians (Botelho, 1998), the major immigration influxes occurred at the end of nineteenth and the beginning of the twentieth century. These immigrations were connected with government efforts to mitigate the end of slavery and its effects on agriculture and farm work. Such immigrants were mostly Europeans who were being pressed out of their homeland by a combination of population increases and corresponding shortages of agricultural jobs. They came earmarked to work in predetermined agricultural areas, such as coffee plantations, which attracted mostly young families with children. These groups received assistance to ensure acceptable living conditions for them, and their children were included in the regular schools (Botelho, Braga e Andrade, 2007).

More recently, the population drift in Brazil has been that of a migrant rather than an immigrant type. A large number of people have moved out of their home regions within the country, mainly from the north and northeast to the southeast, for virtually the same reasons as those of the immigrants—poverty and adverse social conditions (IPEA, 2010). Within these pressed-out-of-home groups, there are the ignored gifted children—the unmined gold. The focus in this section of the paper is, there-

fore, on internal migration in Brazil and its consequences for the education of gifted children and youth.

Throughout its history, even before its independence from Portugal in 1822, Brazil has faced the enormous task of promoting social integration for millions of its citizens who remain marginalized, unable to improve their lives or reach any noticeable degree of personal or social advancement. Entire regions of Brazil still live in conditions of economic, social, and cultural deprivation, its people excluded from achieving any measure of growth and development.

As a result of such circumstances, large numbers of people, especially the most able youth, are pushed out of their communities, in a desperate search for a better life (IPEA, 2010). Most of them, even the very able, never realize their dreams. Swallowed by the cruelty of an impersonal megalopolis and relegated to jobs far below their ability, they suffer from great bitterness, frustration, and failure. Many are overcome by poverty or are victimized by or attracted into organized crime, often resulting in their lives ending prematurely (Antipoff, 1992).

Often faced with health issues, lacking education and regular-paying jobs, families send their more able children to work as early as possible, without any kind of legal protection. Recent data (SINE, 1995) show that over 26% of all children in poverty-stricken areas have to work; for example, 18% of the total work force in the progressive town of Fortaleza are between 10 and 17 years of age. The largest proportion of children in the labor market is found in Brazil's northeastern region, comprising about 50% of the national labor force, with over 500,000 irregular child-workers aged 10 to 14 years. Other children, often younger than 10, have their social and artistic talents exploited by agents in highly publicized media appearances that cause intense public exposure for short periods of time. This often leaves them in a situation worse than before they were "discovered." (*Folha de Sao Paulo*, Outubro 2007).

Perpetuation of Old Patterns

Such conditions have continued to exist undisturbed, as reflected in the constant media reports in the national newspaper, *Folha de Sao Paulo* (2007; 2008), with sad stories like Pedro's. At age 10 years, Pedro, a very bright and outspoken child, was noted as being highly gifted in dealing with numbers. He could perform complex mathematics tricks in his head, which led him to be shown live on television and admired. Meanwhile, he worked selling home-made popsicles at a nearby gas station, where people would stop to give him mathematics problems to solve, in return for a little money. As the story goes, he was right most of the time, even with complex calculations, such as finding the square root for 56,169 or the cubic root for 9,261. Sometimes, he would startle the audience, giving all the right answers up to a decimal fraction. At 14 years, he still worked at the same gas station, but now at the gas pump. At 18 years, he secured a minimum-salary job in a fast-food store, where his task was to hand out sales-order slips to the clients. Nothing happened in his life that could be linked to his potential, and he seemed aware of it. When asked what he expected for his future, he said, philosophically, "Nothing has changed…and things will probably stay as they are…No hopes, no dreams, no expectations of any sort…And what a loss for the community and the country!" *(Folha de Sao Paulo*, Março 2008, p. 8).

Current Concerns

Is there any hope for people like Pedro? The main path to develop young people's potential and abilities has to be through education. It, however, is becoming ever harder to cultivate such ideals within our community, when companies seek cheap labor by recruiting able youngsters to the work force. Formal education, offered primarily through the public-school system, after decades of well-documented criticism, still shows a painful inability to deal with more able and talented students.

Implications

As far back as 1946, Antipoff wrote,

What is often waiting for gifted children in school? A climate of insufferable boredom that transforms these gifted children into agitated, loud, misbehaving boys and girls that mediocre teachers feel unable to contain in their classrooms without bitter complaints." (Antipoff, 1946, p. 11)

Has anything changed in nearly three quarters of a century? It can be said that there has been very little change, particularly for those who try to better their lives by migrating to the big cities. Recent studies at the IPPUR (Instituto de Pesquisa e Planejamento Urbano Regional), in Rio de Janeiro, show that children living in the slums do worse in school than children from equally poor families living elsewhere. Moreover, when attending public schools in slums located near *rich* neighborhoods (an existing situation in Rio), students perform still worse than those who attend school in other poor neighborhoods; this indicates that the risk of failing or evading school increases when a child lives in a slum near an affluent section of the town. The researchers expected these schools to offer some advantages, due to better living conditions in the neighborhood, but that proved not to be the case. Living in a slum is not only a bitter disadvantage for these students, but living in a slum located in the richer part of town turns out to be a yet worse disadvantage (Ribeiro, Franco, and Alves, 2007).

Gifted Education Models

What are we doing? Although not focusing on slum children, our Center for Talent Development (CEDET) attends to over 800 students enrolled in the public schools (Guenther, 2003). CEDET's mandate is to provide support, stimulation, and encouragement to higher-ability children needing instruction that is more ample and complex than that typically offered in a regular school. Once identified as gifted, the children follow an individualized education plan, according to their potential, needs, expressed interests, inclinations, and personal choice. This procedure represents an alternative to the usual "enrichment activities" approach which has proved not to leave any long-term results in adult life (Freeman, 2006). In an attempt to broaden their world, the Center brings volunteers from the community to guide content work with the children. Over 1000 volunteers have worked at CEDET since its inception, usually 60 to 70 in each semester.

Suggested Solutions

What more can be suggested? Obviously, our public-school system needs considerable improvement. No matter how optimistic the government may be, our public education has not improved enough. Even the educational authorities are known to enroll their children in private schools. That option is not the answer for our unmined talents; our talented children have to be sought out, and appropriate services must be provided for them.

Gifted Immigrants and Refugees: South African Gold Unmined

The African continent is facing a new age of migration, as civil conflict, political violence, and extreme poverty continue to prevail. South Africa, being one of the most economically stable democracies, with a liberal constitution and an excellent health-care system, has attracted immigrants from a range of backgrounds. Currently, South Africa has 48 million people, speaking 11 official languages (Languages of South Africa), of which 5 million are illegal immigrants (Illegal Immigration, South Africa). Legal immigrants come mostly from Nigeria, United Kingdom, Mozambique, Portugal, India, Zimbabwe, Pakistan, China, Germany, and Taiwan. Illegal immigrants come mostly from Mozambique and Zimbabwe (Statistics South Africa, 2003).

Asylum seekers in South Africa number well over 100,000, the largest contingent being from the Democratic Republic of Congo (12.2%) and Zimbabwe (10.1%), with large representation from Ethiopia, Somalia, and Pakistan (Redden, , 2008). With the economic collapse of Zimbabwe and a growing cholera epidemic, thousands of refugees have attempted to enter South Africa (Gordon, 2008). In every major city, large informal refugee settlements have arisen; some refugees live in garages or warehouses, while the fortunate few have built mansions on the beaches of Cape Peninsula. Their presence threatens the local African community, which faces unemployment and a high rate of HIV/AIDS. In 2008, the refugee influx generated widespread xenophobia, resulting in violent attacks and the tragic death of 42 immigrants (Igglesden et al, 2009). It was reported that

> [a]ttacks occurred mostly at night. Among the victims were people from Bangladesh, Burundi, DRC, Kenya, Malawi, Mozambique, Nigeria, Pakistan, Somali, and Zimbabwe, as well as South Africans from minority language groups. (Igglesden et al., 2009, p. 20)

Problems of Identification and Placement

In post-apartheid South Africa, forms of separatism have been rejected by the South African Government, with the new constitution having been designed to prevent possible discrimination (South African Department of Education, 2008). Due to the influence of the current constitution on educational philosophy in South Africa, the field of gifted education has been largely ignored and deemed inequitable. The general approach has been one of inclusion, with a stress on outcomes-based educational objectives and instructional differentiation. Past programs for gifted and talented students are viewed as elitist and Eurocentric, divorced from the realities and injustices of the inferior education that the majority of African students have experienced.

Differentiated instruction is viewed as an appropriate strategy for high-ability students. Innovative programs have stressed higher standards and content acceleration in mathematics, science, and languages. They also stress programs that accelerate students and bridge gaps in learning that have stemmed from previous, unfair educational systems; however, many immigrant students come from extremely impoverished, marginalized groups and communities in crisis. Students' abilities are often masked by hunger, homelessness, inadequate resources, inequitable programming, lack of opportunities to learn, and a culturally unresponsive curriculum. This problem is confounded by the rise of HIV/AIDS in Africa and outbreaks of ethnic conflict. In addition, language issues and differential standards for assessing students may serve to mask their high abilities.

Approaches to Intervention

Gifted immigrants from upper-income families typically attend independent schools, are linguistically competent, and meet stringent intellectual standards. Schools address the needs of such immigrants through a variety of services. Three distinctive schools—a school for refugees, a state high school, and a leadership academy—serve as models for what can be achieved.

Three2Six School for Refugees. This project is a school for the children of refugees and is operated after regular school hours and uses the premises of an independent Catholic school, Sacred Heart College. The program serves about 200 Kindergarten to Grade 6 refugee children with asylum-seeker permits that make them ineligible to attend state schools. The students are destitute, speak multiple foreign languages, and have cultures different from that of the local community. Students are bused from the refugee communities of Yeoville, Berea, and Hillbrow to Johannesburg and given lunch, school uniforms, and school materials.

The school is operated by teachers who volunteer their services. The languages of instruction are English and French, the core languages of the majority of refugees from Central and Western Africa. Many of the teachers are refugees themselves; they receive training and mentoring by the more seasoned teachers at Sacred Heart. Instruction is offered in mathematics, language, and social studies, with a focus on acculturation. This school is viewed as an interim or bridging school with the objective of, ultimately, transitioning these students into the state-school system. The principal of the school, in an interview with the third author, expressed the hope that "the school need no longer exist in five years" and that these students would, by then, be receiving regular-school instruction and have secured immigrant status.

Palmview Secondary School. This state high school is set in a high-crime area in one of the poorest communities in Phoenix, KwaZulu-Natal. It serves 980 students, 60% of whom are South African of Indian and Asian descent, 30% of whom are African, and 10% of other origins. The school incorporates homeless learners from "informal settlements," who live in extreme poverty. The school has 20 teachers, seven of whom are not fully certified, and the average class size is 45 learners. Facilities in this school are sparse; it has no gymnasium, no auditorium, and no technological aids in the classrooms.

What is astounding about this school is the fact that, in 2007, this school achieved a 100% pass rate in the Grade 12 Independent Examination Board national examinations (IEB), one student won the National Debating Championship, and three students won Provincial Debating competitions. Strategies accounting for the excellence achieved in this school include firm discipline, high expecta-

tions, performance monitoring of every student, a mentoring program offered by teachers for individual Grade 10 students, faculty in-service training, regular contact with parents, a supportive school, and general enrichment, including inviting motivational speakers for the benefit of all students. The teachers in the school identify 60 students, the top three students in each class, for the "High-Flyers Club." This Club provides a range of enrichment activities, including presentations by leaders in the community, visiting lectures, field trips, and access to mentors.

The African Leadership Academy. This is an independent boarding school, situated in Johannesburg North, with outstanding classroom facilities and technological supports, science laboratories, residences, and a minimal library. It opened in 2008 with 97 high-ability students who were identified and selected from 28 African countries. Students were identified in each country, based on teacher nomination, student school-achievement scores, and performance on the African Leadership Academy admission test. Criteria for admission include a high grade-point average (ranking in the top 10%), a high score on the school-admission test, which assesses leadership potential, entrepreneurial spirit, dedication to public service, and a passion for Africa.

Since many of the students come from low-income backgrounds, they receive scholarships to attend the academy. Teachers are representatives from different countries, including Ghana, Kenya, Morocco, Tanzania, France, England, China, United States of America, and South Africa. Students work towards challenging and rigorous Cambridge examinations with an Afrocentric curriculum.

There are three components in this curriculum: (a) The Multidisciplinary Academic Core (consisting of mathematics, science, English, foreign languages, African studies, and three A-level courses), (b) the Leadership, Entrepreneurship, and African Studies (LEA Curriculum), and (c) the Culminating Service Project. The curriculum is problem based and includes discussions, case studies, guest speakers, mentorships, collaborative projects, new technology applications, and visual and performing-arts projects. While this school does not address the needs of the immigrant community directly, it offers an exemplary curriculum that is appropriate for diverse, gifted students who speak a range of languages and come from many different countries. Considering the current political conflicts in Africa and the variety of challenges facing the country, these students have the potential to become South Africa's future leaders.

Conclusions

Although there are many common challenges and suggested solutions associated with appropriately identifying and servicing gifted immigrants and refugees worldwide, there are also differences that are unique to individual countries. Although only three countries are represented in this brief analysis, albeit from three different continents, it is, nevertheless, possible to deduce global implications, while recognizing issues, separately, as they relate to each country's changing immigration and refugee patterns, mobility, and geopolitical factors.

In the United States of America, a nation built on immigrants with multiple languages and cultures, the identification of and educational programming for its gifted has had its challenges (with findings suggesting that assimilation decreases productivity). According to Nguyen (2008), as immigrants shed their native language, culture, and identity, their achievement levels decline towards the achievement levels of average students. Misdiagnosis and inappropriate placement of immigrants and refugees in special education programs has been documented in the literature (Harris, 1991b). Since cultural compatibility with the dominant group seems to be essential for immigrant and refugee students to realize their potential, we suggest that definitions of giftedness and planning in the United States, alternatively, be filtered through cultural understanding, teacher training, and programming that speaks to the individual's cultural base and learning style and acknowledge that ethnic culture has a protective effect for gifted immigrants and refugees.

In Brazil, despite decades of well-documented criticism, the public-school system still shows a painful inability to deal with the more able and talented students. Consequently, the onus falls upon commercial companies to fill the need for training gifted and talented youngsters. Brazilian children attending public schools in slum areas located near rich neighborhoods have a greater risk of failing

because the economic contrast between affluence and poverty conditions is exacerbated, emphasizing disadvantage and a widening of the achievement gap. At least for this group, a more equitable course of action must be found.

Africa is undergoing a renaissance with the evolution of new ways of thinking and identity and education systems that reflect an Afrocentric perspective. Providing an appropriate education for its gifted immigrants is a fundamental part of this vision. This is addressed with a rejection of all forms of separation and with sensitivity to past inequities. Differentiated instruction for all high-ability students, regardless of race, is also seen as a priority. Successful programming for gifted immigrants is exemplified by the creation of schools for refugees, the identification of highest-performing students, and the establishment of a leadership academy.

Implications of the findings from the three countries discussed, one in each of North America, South America, and Africa, all point to a changing world picture and the importance of recognizing and educating the gifted among migrants, immigrants, and refugees. In the light of the move towards cultural congruence, an effort should be made to avoid the perpetuation of harmful, repressive patterns, including adhering to stereotypical views, importing negative values from their country of origin, and focusing exclusively on acculturation within the receiving country. Indeed, the future of the world depends upon mining the talents that, at present, lie below the surface. Recognition of educational problems faced by countries with large numbers of immigrants and refugees is only a first step, and every effort should be made to maximize this valuable human capital. This can only be accomplished through the use of appropriate identification and effective intervention procedures that address the needs of this population and provide working models that incorporate viable, flexible, and adaptable solutions.

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PART 2: ENRICHMENT APPROACHES

1. Teachers' Attitudes and Gifted Students' Socio-Emotional Competencies

June Slee

Abstract

Failure to address educational concerns, including academic advancement, psychological problems, and co-morbid learning disorders, can lead to gifted students experiencing difficulties in developing socio-emotional competencies. These have a positive impact on learning outcomes. Teachers' attitudes and pedagogies are central to the promotion of these competencies in gifted students. In this paper, field vignettes illustrate how some teachers intentionally and unintentionally affect their gifted students' social and emotional development. Teachers of gifted students require positive attitudes, advanced pedagogical skills, and, most importantly, the capacity to program for socio-emotional learning, both formally and informally. Strategies are outlined in this paper to guide teachers in the development of gifted students' socio-emotional competencies and, thereby, in the provision of equitable educational opportunities.

Gifted students in regular classrooms may fail to develop social and emotional competencies if their academic and emotional needs are not met (Davis & Rimm, 1994; Gross, 2004). This paper suggests, conversely, that unless gifted students are socially and emotionally competent, their academic work is likely to suffer. Field-work vignettes, included in this paper, illustrate instances where a combination of teacher attitudes and student skill deficits adversely affects gifted students' socio-emotional learning outcomes (Slee, 2007). While some teachers fail to nurture social and emotional competencies in gifted students, others assume they have these skills inherently. The field studies show there is little evidence to support this assumption and much evidence to challenge its validity.

In order to enhance the development of social and emotional competencies that have a positive impact on learning outcomes, teachers of gifted students require positive attitudes and advanced pedagogical skills. Most importantly, however, they need to include socio-emotional learning as an integral part of the curriculum. In the latter part of this paper, a discussion of pedagogical strategies is provided aimed at assisting gifted students to gain socio-emotional competencies, in inclusive settings (Cook, 2004; Slee, 2008), and, as a consequence, enjoy more equitable educational opportunities.

Socio-emotional learning (SEL) refers to educational programming which focuses on feelings, attitudes, and behaviors. Elias and Schwab (2006) define SEL as the process of gaining competency and intrinsic motivation for emotional self-awareness and self-regulation; safe and responsible behavior; and assertive, empathic, and skillful interaction.

Social skills are best described as learned sequences of individual behaviors that combine to form satisfying interactions. Essential social skills focus on the importance of positive peer relationships and include developing self-control, learning to reflect empathy, interacting positively with others, and expressing feelings sensitively (Larrivee, 2009). They are the building blocks of social competence and are taught informally and formally. Groundwater-Smith, Ewing, and Le Cornu, (2007, p. 130) claim that "like other skills, social skills need to be taught" and stress that the educator needs

to teach children "the explicit skills of relating positively to one another, working successfully in groups and working collaboratively." Teaching social skills—self-awareness, self-management, social awareness, relationship building, and responsible decision-making—in the inclusive classroom should be a curriculum priority as they are the core components of socio-emotional learning and lead to positive and productive interchanges with peers (Casel, 2003).

Teacher Support for Inclusion

The 1980s initiative to include students with disabilities in regular classes with same-aged peers was a significant paradigm shift for Australian educators. A recent government report found that teachers are still only moderately supportive of the inclusion of gifted students in the regular classroom, but this is a more positive view than had been held previously (DEEWR, 2007). For many years, in most Australian states, gifted students have had the option of competing for a place in an "Opportunity" class. Competition for limited places was strong, and, although gifted students were traditionally classified under the aegis of special education, those who did not gain entry to the Opportunity class remained in regular classes. With the move to inclusion, teachers were expected to accommodate their needs as thoroughly as they would for students with disabilities; however, teacher capacity to design and implement differentiated curricula based on individualized educational plans depended on the resources, culture, and support within the schools. Certainly, in the early days of inclusion, these components were limited, having a notable impact on the quality of inclusive practices and teacher enthusiasm for them.

Today, teachers still hold ambivalent attitudes towards inclusion with many finding that it adds to the overall stress of their work with few tangible returns.

Attitude and Behavior

Externalization of teachers' negative attitudes has detrimental effects on gifted students' academic and social learning. While it is not possible to be certain of how teachers feel about gifted students, it is possible to observe how they behave towards them. Teachers of gifted students need customized support to build up their knowledge, confidence, and capacity to deliver differentiated instruction. Before this, though, they need to examine their attitudes and behaviors towards gifted students.

In the 1990s, as an itinerant support teacher of behavior in a large Australian city, I received many referrals to assist gifted students who were failing academically and socially in inclusive settings. Some of these students expressed frustration and anger, disrupting teaching and learning, while others simply withdrew from learning altogether. Few of these students had been identified as gifted and were, consequently, languishing academically and socially. Although the referrals were student-based, I found, in most cases, teachers' attitudes towards the gifted students were a significant contributing factor to their negative behavior. In 1984, Purkey and Novak introduced a seminal model of teacher behavior as a change agent in the classroom. The model is supported with vignettes from the field illustrating interactions between teachers and gifted students. These vignettes suggest that teacher behaviors can consciously or unconsciously impede gifted students' socio-emotional development.

Purkey and Novak (1984) describe four types of teacher behaviors towards students: (1) intentionally disinviting, (2) unintentionally disinviting, (3) intentionally inviting, and (4) unintentionally inviting. It is important to appreciate the authors' definition of an invitation, namely,

> a summary description of message—verbal and nonverbal, formal and informal–[that is] continuously transmitted to students with the intention of informing them that they are responsible, able, and valuable. Conversely, a disinvitation is intended to tell them that they are irresponsible, incapable and worthless (Purkey & Novak, 1984, p. 10).

This model allows teachers to assess their behavior and provides them with criteria against which they can measure and compare their interactions with students.

Field Vignettes

The following vignettes of teacher behavior towards gifted students are based on my field experience as a support teacher of behavior.

Each vignette will be discussed in relation to Purkey and Novak's (1984) framework.

1. Intentionally Disinviting Behavior: The Mouse That did not Run up the Clock

> James is one of the twenty new entrants sitting expectantly on the mat in front of Miss Woods. She welcomes the five-year-olds to her class and asks, "Does anyone know 'Hickory, dickory, dock, the mouse ran up the clock'"? James calls out, "I do, Miss! And, I know them in French and Latin, too!" Miss Woods ignored James and, instead, asked a girl sitting with her arms folded: "Jane, can you tell us the words? You can? Then let's hear them, and James, in future put up your hand and don't call out."

Later, at morning recess, Miss Woods told her colleagues of this precocious five-year-old:

> Says he knows the words in Latin and French, too. I tell you what, the sooner he is out of my class of normal kids, the better.

It is significant that among the "normal" children in her class, Miss Woods had four students with learning disabilities, another one who came from pre-school labeled as a selective mute, and at least three more who demonstrated weak socio-emotional competencies. Yet, only James was identified by teachers in the staffroom as a potential challenge.

Miss Woods' behavior towards James was intentionally disinviting. She ignored his request, reprimanded him for calling out, and spoke disparagingly about him in the staffroom. Why did she react in this fashion? Her language in the classroom and staffroom indicated that she resented giftedness, believing it to be elitist. Her comment that "the sooner he was out of her class of normal kids, the better" was quite revealing. The use of the word "normal" suggested that she did recognize giftedness in James, but she was not prepared to teach to it. What really prompted her comment to her colleagues and her belittling behavior towards James? Was it that Miss Woods was not prepared to teach James because she had a negative attitude towards gifted students, or was it because she felt inadequate, as she had neither human nor material resources to design and implement an individual program which would challenge James?

2. Unintentionally Disinviting Behavior: A School with no "Name"

> Mary's parents were keen to have their daughter win a place in an Opportunity class, a homogeneous setting for gifted students in a local middle school. On the day of the entry examination for admission to the class, they accompanied their daughter to her local primary school for an interview with the principal. While waiting outside his office, they overheard him conclude a phone conversation by saying, "Well, I'd better go. I have some parents coming in to talk about getting their kid into the 'Opportunity' class. I don't know why they bother. She hasn't got a chance coming from this school." Hopefully, the principal would not have said this if he had realized that Mary and her parents were outside his office. As such, it could be called unintentionally disinviting, but, nonetheless, it had a devastating effect on Mary's examination performance that afternoon.

My field records show that gifted students are subject to more unintentionally disinviting comments than other students. Mary was a gifted student, and her parents wanted her to be challenged in a gifted, homogeneous setting. Parents who support their children through this process are often considered "pushy" by the referring school's teachers. The principal's comment that he did not know why Mary's parents were pursuing entry to the Opportunity class and that "[s]he hasn't got a chance coming from this [his own] school" is curious, given that the school is under his leadership. Mary, as a student there, is, unintentionally included in his low assessment of the school, and his remark may have, inadvertently, affected her chances to demonstrate her strengths at the entry examination later that day.

Unintentionally disinviting behavior demonstrated towards gifted students includes asking them to help other students with their work when they, the gifted students, are finished, rather than giving them more enriched and appropriate learning opportunities or accelerating them through the subject, or both. It also includes a failure by the teacher to notice and

question changes in students' academic and social behaviors. The student who is seldom praised, largely ignored, and subject to teacher put-downs is likely to stop trying, academically and socially, and to seek attention in undesirable ways.

3. Intentionally Inviting: Growing a Gift

> A young teacher phoned me one day and asked if I could see him the next time that I was at his school. He had a student in his class who had arrived recently from another state, and he felt that she had superior learning ability, and he didn't know what to do to meet her needs. When I saw him later that week, he gave me a list of the concerns he had. He wanted to know how to identify giftedness, how to accommodate this student in his mainstream class, where he could read "good stuff" about giftedness, whether it was possible to study the subject online, whether he needed to teach the student social skills, and whether there were any teachers in the vicinity who could mentor him.

This vignette describes intentionally inviting behavior which promoted the gifted student's successful inclusion in her new class. The first step in promoting this accommodation was the teacher asking for support. By initiating this action and seeking answers to his questions, he indicated that he was intentionally inviting the gifted student to be part of his class.

4. Unintentionally Inviting: A Flower Bloomed in the Desert

> Ms Forbes was overwhelmed by the challenges of teaching mathematics to Year-7 boys in a large, metropolitan secondary school. Most of the students did not want to learn, so she let them do what they liked, and, as a result, it was a totally unruly place, bordering on being dangerous. I was called in by the principal to offer some support, and, between ducking missiles, I saw a small boy at the back who seemed to be working. I went up to him and asked why he was working (as it certainly wasn't the culture of that class). He didn't hear me correctly and exclaimed that he was working. I told him I could see that and decided to drop the irony and inspect what he was doing. It was clearly advanced mathematics. He told me it was university-level work. Why, then, was he in this class, the lowest level of Year 7? He said he had repeatedly been placed in lower-level classes because when he was initially asked to do Year 7 mathematics, he had refused, finding it boring and his teacher thinking it too hard for him. Now, he was happy, as he could literally do what he wanted to do, and he wanted to do "hard" math.

This is an extreme example of unintentionally inviting teacher behavior, but it does make the point that the teachers need to be aware of the reasons students find teachers' behavior inviting. This type of behavior towards the gifted student can have serious ramifications, as it can lead to uneven rates of development or asynchrony (Winner, 2000). While gifted students are allowed to work continuously at advanced math, or sit at the back of the class, all day, every day, and produce outstanding artwork, or work privately on the computer, regardless of the subject area, it is to the detriment of balanced, academic- and social-learning outcomes and does not serve them well for future learning, employment, and social opportunities.

Understanding Teacher Behaviors

Why did the teachers in the first, second, and fourth vignette act negatively towards gifted students? Was it because Australians and New Zealanders pride themselves in their non-elitist, egalitarian approach to each other, believing that "Jack is as good as his master"? In Australia and New Zealand, the notion of egalitarianism pervades the education system and so, generally, inhibits the development of various education methods tailored to suit the needs of the individual's talent. To suggest differentiation of programming for the gifted to some teachers conjures the specter of elitism (Larsson, 1986).

When inclusion was first introduced, Australian teacher unions expressed concern that educators were ill-prepared and, in some cases, this was interpreted by teachers as opposition to inclusion, per se. Parents, allied professionals, and department officers were as ill-prepared as teachers for the complexities of the inclusion movement, and education lacked leadership in this area. The move to fully inclusive classrooms in the 1990s reignited the debate on the status of gifted students in regular classes. It was commonly believed that gifted

students did not need extra support, academically or socially, and that they did not experience social or emotional difficulties (Moltzen, 2000). My observations suggest that gifted students are still perceived as being able to make it on their own and, compared with students who have obvious disabilities, their needs are not seen as priorities (Slee, 2007).

Initially, the most challenging role for the regular teacher was to make special provision for gifted students. It is understandable that teachers who had an immediate and enduring interface with gifted students may have felt overwhelmed by the enormity of the task. Teacher attitudes can be affected by the learning characteristics of gifted students, which can be misinterpreted by teachers and lead to discord. Gifted students use superior learning processes (Munro, 2004), which can make high demands on teachers' preparation and teaching time; for example, they learn faster than other students because they know what learning entails, and they understand new concepts with ease and constantly seek more challenging work.

My field records show that identifying a gifted student can be difficult (Slee, 2007). In some cases, the student may not want to excel since the class culture does not support this. Berk (2008) states that some very able middle and secondary students deliberately mask their high-level ability. Certainly, the fear of being called a "nerd" is pervasive in schools. Often, a previous teacher has failed to recognize the student's exceptionality, and it remains unidentified as he or she progresses. In many cases, teachers have focused on what they considered more pressing concerns in the classroom and failed to identify gifted students.

Teaching Gifted Students Socio-emotional Competencies

The first step, as demonstrated in the third vignette, is to identify the gifted student. Failure to achieve early identification can result in the gifted developing dual exceptionalities, that is, being gifted and lacking socio-emotional competencies. The responsibility for initial identification of giftedness normally falls on the teacher. There is some evidence, however, that teachers often confuse conformity, neatness, and good behavior with being gifted and talented (Colangelo & Davis, 2003; Davis & Rimm, 2004). It is essential that teachers discuss their concerns about identification with school personnel who can facilitate the assessment process. In the meantime, the teacher should collect data to inform his or her decision making.

What information should be used in the identification process? Observations made over time in different contexts should produce examples of superior intellectual learning ability, specific academic aptitude or exceptional achievement in particular subject areas, creative or productive thinking, high intrinsic motivation, and critical thinking (Woolfolk and Margetts, 2007). There is also a need to identify concomitant social and emotional behaviors, including instances of anti-social or obsessive behavior and being the object of ridicule or bullying. If such factors are present, the student may experience low self-worth, pessimism, anxiety, depression, and even paranoia. These factors may affect academic performance, which can, in turn, make identification of giftedness more difficult for teachers.

Teachers must examine their attitudes towards gifted students and, if warranted, begin to change them. The first step is to acquire knowledge and skills that will inform inviting behaviors, including pedagogical approaches to programming that enhance socio-emotional learning. Academic, social, and emotional learning domains are interdependent, so it is essential that socio-emotional learning is taught as part of the curriculum, both formally and informally, regardless of whether approaches of acceleration, enrichment, or both are used.

According to the Australian Council of Deans of Education (ACDE), the role of education in the 21st century is about students developing self-awareness, self-management, social awareness, relationship skills, and responsible decision making (CASEL, 2003). The self-aware gifted student has a realistic understanding of his or her feelings, interests, values, and strengths, which contributes to a heightened sense of self-efficacy. The socially aware gifted student is able to empathize with others, understand social consequences of behavior, and act on the basis of social rather than self interest. Self-management is also referred to as self-regulation. The gifted student, competent in self-management or self-regulation, is able to monitor and adjust his or

her behavior to achieve targeted outcomes. Relationship skills involve learning to interact positively with others, resisting peer pressure, developing situational awareness, avoiding conflict, and seeking help when necessary. Responsible decision making is an essential skill for all students. It involves being able to make decisions that have no harmful consequences for others and that contribute to academic and social gains. Each of these core competencies must become part of the gifted students' overall pedagogical outcomes if they are to progress as socially and emotionally competent learners.

Specific Strategies

The premise of this paper is that gifted students, like all students, need to be taught core social and emotional competencies through the formal curriculum. These competencies, as identified by Goldstein (1999), an acknowledged expert in this area, are taught through five core strategies: modeling, role-playing, performance feedback, generalization training, and problem solving.

Teacher modeling. This strategy consists of the teacher identifying and praising a desired social interaction exhibited by a student in the presence of another student who lacks skills in this domain. If a non-gifted student is commended for using a social skill that a gifted peer fails to use (e.g., anger control) then, the learning can be bi-directional. It is equally important for non-gifted and gifted students to realize that they can teach their peers.

Small-group role-playing. Students can practice the sequences of a social skill by acting out scenarios that represent real-life situations. Students should be given the opportunity to play each role. The dynamics of the group are important. In the acquisition stage, two students with social skill deficits should not be placed in the same group. If education is meant to prepare students for a society characterized by interdependence and cooperative effort, teachers must provide all students with frequent and meaningful opportunities to work cooperatively in groups (Jones & Jones, 2001).

Performance feedback. The gifted student should receive constructive feedback from the teacher and peers during role-playing of social scenarios. The relationship skills must be reinforced in real-life in order to be authentic and become internalized. Teachers should provide many opportunities to reinforce unrehearsed, as well as rehearsed, demonstrations of socially and emotionally competent behaviors.

Teaching for generalization. Often, skills that are taught in the classroom stay in the classroom (Slee, 2008). Generalizing, the capacity to apply newly acquired skills in settings other than those in which they were learned, may be challenging for some if it is not taught explicitly. A major problem with teaching social competence is that newly acquired skills tend to be specific to the situation. Skills should be taught so that they can be generalized across settings and people. Generalization is likely to occur more quickly and be more effective if naturally occurring social reinforcers are used, including verbal comments and nonverbal gestures, such as smiles and eye contact (Rosenberg, O'Shea & O'Shea, 2006).

Problem solving. Problem-solving techniques should be taught, particularly when gifted students encounter difficulties using social skills. Even if they already have such skills, they may still lack the capacity to discern when and where each should be used. Problem solving for the student consists of identifying the reason for the failure in reaching a goal and constructing and implementing an alternative plan for a more successful outcome in the future.

Conclusion

This paper, examining the role of teacher attitudes and behaviors on the gifted students' development of social and emotional competencies, showed, through field vignettes, that teachers can exhibit behaviors, either intentionally or unintentionally, inviting or disinviting, that may impede students' academic, social, and emotional growth. Possible reasons for teachers' negative behaviors towards gifted students exist within the framework of Australia's inclusion movement. Teachers with anti-elitist attitudes may feel challenged if they lack the appropriate pedagogical skills, particularly in the process of identifying gifted children. Teaching for socio-emotional learning has posed difficulties for teachers whose attitudes are not aligned philosophically with the practice of inclusion and has proven detrimental to the development of gifted students'

social skills. This has necessitated the teaching of social skills explicitly, as an integral part of the formal and informal curriculum. The teachers' use of strategies, such as modeling, role-playing, performance feedback, generalization, and problem solving, may help to ensure that gifted students will have the opportunity to develop social and emotional competencies and, thereby, also be afforded a more equitable and challenging education.

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2.
Keys to Creativity Through the Music Heartland Project

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Abstract

In music education, encouragement of musical creativity among gifted children is often neglected in favor of technical and interpretive expertise, typically regarded as more essential in the discipline. Yet, in gifted and talented education literature, creativity is frequently cited as integral to the very idea of giftedness. This paper considers the effects of extended projects on creative aptitude and musicianship. It is based on data from Music Heartland, a Dunedin school-based project (2003 – 2005), which offered significant support for children's development of creative music products. Three examples of music are considered from a range of acoustic- and technology-based projects created by children after short periods of instrumental development. In the field, this music might be regarded as unique rather than original, apart from the acceleration of their technical skills. The results of the project show that extended, creative activity appears to accelerate the growth of significant musical understandings, independence, personal efficacy, and individual musical proficiency. Confirming the findings of Hargreaves (1999) and views of Piirto (1999), tentative guidelines are offered, that may be pertinent for schools or other providers, which seek to foster a broad sense of musicianship among musically gifted children, thereby finding ways to encourage a community of authentic creative activity.

Music Heartland was one of 17 gifted and talented projects that received three years of Ministry of Education funding in New Zealand, the first such initiative in that country. Between 2003 and 2005, nearly 250 children were nominated from a hub of eight south city primary and intermediate schools. One-hundred and sixty of these entered what was called a first ensemble stage. Of those, about 60 were selected to proceed to the more advanced stages of the project.

The program was loosely based on Renzulli's three-level Enrichment Triad Model (Renzulli & Reis, 1985), although, in retrospect, Music Heartland's Stage One level was, possibly, more intense than Renzulli's Type I activities. The yearly program included ensemble work, keyboard and theory, other instrument learning, and creative work. The focus on instrumental learning reflected the author's wish to engage children deeply, since research in New Zealand (Crooks, Smith, & White, 2009) suggests that children rate playing an instrument as the most enjoyable aspect of music at school, even though it may be only an occasional experience.

Literature Review

In evaluating children's creative outputs in the Heartland project, three literature threads became significant: the significance of society and culture in innovation, the significance of domain in conceptions of creativity, and the challenges around domain evaluation where the intention is to engender creativity.

Csikszentmihalyi (1996, p. 182-183) describes the production of novelty as the result of an unquenchable curiosity and fierce determination to succeed, regardless of the environmental influences of family or school. Important for educators, he suggests that domain training is increasingly necessary for high-end creative outputs to be produced. More recently, Renzulli (2004) and Gardner (2007) have highlighted a need for social conscience and appropriate leadership to be fostered within the creative outputs of children and adults (Renzulli, 2005a, p. 66; 2005b, p.

270). Morrisey's (2001) evaluation of Jimmy Hendrix's work, however, reveals, that careful scrutiny is advised where there is a likelihood of moral overtones overshadowing what might be considered creative.

Evaluating creative products is a complex undertaking. A predominance of international literature favors giving a student the opportunity to produce creatively, rather than relying on testing for evaluating creativity. Concerning breadth, Han and Marvin (2002) encourage educators to facilitate the development of success in one domain, as it is the most likely path to wider creative ability. According to Csikszentmihalyi and Wolfe (2000), while one might think of creativity as an identifiable, intrapsychic process, the evaluation of it occurs at an intersection of the individual, a domain, and the field.[1] Therefore, what is deemed creative reflects the predisposition of those assessing, including their "past experience, training, cultural biases, current trends, personal values, and idiosyncratic preferences" (p. 82).

Given the intention to empower children in their creativity, the frame, purpose, and significance of creative outputs merits careful consideration (Parkyn, 1984, p. 59; Piirto, 2002, p. 148). The significance of that is shown by New Zealand research data (Keen, 2004, p. 272) which suggests that gifted and talented students place a low value on learning processes that call for imaginative responses, in spite of schools recording evidence to the contrary. As a framework for creative outputs, authors, such as Piirto (1999, p. 154), Parkyn (1984, p. 56), and Fraser (2004, p. 159), advocate the need for exploration without the pressure for quick results in creative scenarios. Piirto, for example, identifies the enhancers of creative aptitude as an accepting environment that is sensitive to a specific product, the provision of space or solitude, and a collaborative spirit among students and teachers (Piirto, 1999, p. 154). Philosopher Suzanne Langer suggests that, in the music sphere, creative exploration is context driven and requires deep connection with subject matter (1942, p. 141).

New Zealand psychologist, George Parkyn (1984), in his description of appropriate creative work for gifted learners, supports the need for incubation and wait-time and underplays cognitive operations. While acknowledging that the artist eventually needs to convert creative ideas into perceptible form, Parkyn describes the pre-cognitive events as unconscious processes that are too complex to put into words (1984, p. 57). In this respect, curriculum frameworks can, all too readily, curtail desirable qualities of creative exploration, in favor of "getting it right." This poses a risk to the reflective potential of learning in the arts discipline, where the producers "constantly reflect on and refine their creative inventions, connect ideas with other musical and non-musical experiences, and transform these understandings into new contexts and new paradigms." (Dunmill, p. 75)

The significance attributed to children's creative outputs varies markedly within the literature. Citing Csikszentmihalyi's emphasis on field, Elliott (1995) proposes that the musical musings of the young child can be categorized as novelty and without substance to the domain (p. 221). Hargreaves (1999, p. 24), however, notes that there is a blurred line between improvisation and creative product. He cites Sawyer (1999) in describing everyday creativity which has improvisational thinking at its heart (p. 29). In highlighting potential in the social creative process, Hargreaves observes elements such as the individual wanting to make a contribution (social or collaborative), some brokerage of leadership within the composition, and cultural framing. Finally, in regard to what is significant about children's creative outputs, John Paynter (2002) stresses that creative activity or "early making up of [musical] pieces" engenders judgment, decision making, and the courage to stand up to those decisions (Paynter, 2002, p. 224).

Learning That Occurred in Heartland Creative Programs

The goals of creative learning in the Heartland programs were multi-fold: collaboration among classroom teachers, individual and shared work among students, purposeful composition, and the children's musical exploration and understanding of the discipline. The expected outcomes of the program included (a) an increased understanding of the elements of music and their interplay, gained through practice and discussion, (b) an ability to compose for the classroom, for conventional instruments

[1] Csikszentmihalyi's conception of "field" is the body of expert people and knowledge within the domain.

and voice, and for different audiences, (c) a growing awareness of sound quality, musical effects, and mood, (d) one to two compositions, developed individually or collaboratively, of up to two-minutes duration, and (e) engagement in workshops and reflecting on their own musical composition or performance and that of other students or composers (Heartland, 2003).

The organization of creative projects was complex because it included cross-curricular activity, multi-school and cross-grade-level grouping of children, an increasing desire on the part of teachers to group children according to ability, and the infusion of choral elements into some projects.

There was wide diversity in the in-depth projects, with various musical and curricular applications. Some projects were based on stories or themes; some were associated with distinct cultures; others utilized technology; and yet others focused on improvisation in various genres or composition for specific instruments.

Children worked independently and performed during designated sharing times. The expectation was that children would come to understand that creative work is a celebration of the practical skills and musical knowledge developed through the project.

Twenty-two creative projects were developed and performed for peers, schools, the wider community, and for the Heartland sharing times. In any given year, approximately 60 children (aged 7 to 13 years) were involved as a first-, second-, or third-year participant in ensemble, instrumental, or creative work. While all students involved in any part of the Heartland project were invited to be part of the creative projects in 2003, it was surprising that by 2005, schools and tutors were increasingly more open about their desire to bring together the highest-achieving children in the creative projects.

Evaluation of Creative Products

The pieces which the children created were evaluated according to the schema in Appendix I. The schemata were compiled largely from the New Zealand arts exemplars (Ministry of Education, 2003) and the National Education Monitoring Project (NEMP) achievement research (Flockton & Crooks, 2004). The intention was to evaluate the expressive and cohesive elements of the compositions, as well as their technical features.

Insight into the children's compositions can be gained by examining samples of their projects. Three exemplars, reflecting the diversity of interests and representative of children of all ages and their length of involvement in the Heartland project, are "Trash Band," "Journeys," and "Where We Belong."

"Trash Band"

"Trash Band," one of the earliest pieces of the project, was composed in 2003 around the theme of recyclable materials as instruments. The United Kingdom phenomenon, *Stomp,* was the inspiration for it. The project involved thirteen children, aged eight to ten years, from two schools. The piece begins with a single rhythm, played on recycling bins, and builds in intensity through a layering of several polyrhythms played on other sound sources, such as large coke or plastic milk bottles. The characteristics of the *Trash Band* piece include the following:

- a wide diversity and complex adaptations of base rhythms, some of which are intricate and feature an interplay of duple and triple meters;
- an application of many scoring devices, including long periods of rest and a variation of dynamics for instrument types and for the whole ensemble;
- layered and unbundled rhythms and inventive applications of instruments, creating diversity of texture, subtle tone-color shifts, and mood intensity;
- multi-layered rhythms revealing complex-level hocketing[2] devices; and
- structure demonstrating applied knowledge of overarching balance and mood shifts.

Within their performance, children provided leadership and responded to variations in performance dynamics, and sub-groups took responsibility for sustaining rhythmic consistency. There was overall accuracy in the playing, a good response to challenging

[2] Hocketing is a term applied to ensembles, such as bell ringers or Solomon Island Pan Pipes, where individuals are responsible for playing a few pitches on appropriate instruments where these occur in a melody.

rhythms, and sensitivity in the children's treatment of the enviro-instruments. There was also a balance of parts throughout and a regular variation of texture. There was little doubt that the children took enormous pleasure in thinking about and exploring a diversity of music elements.

"Journeys"

"Journeys" was created specifically for the Southern Sinfonia's 2004 school concert program and was performed for more than 3,000 children. The composition and rehearsal processes were extensive (approximately 36 hours), as it was essential for the child composers to be confident performers.

The music represents a condensed history of the Aotearoa region of New Zealand, reflecting the traditional tikanga, the music of new settlers and their integration, and ending with a song in a popular style about living in New Zealand. The arrival of new cultures and their integration into the mainstream is shown by snippets of music traceable to their country of origin. The music also includes historical features, with early sections being atmospheric and chant-like, indicative of the early music of the Māori.

"Journeys" reveals an elaborate use of musical devices, creative dynamics, and intricate instrumentation, which were assessed accordingly.

Story threads. Music was utilized to support storylines and related images. There were numerous short threads or fragments that suggest activity or culture. The music demonstrated the assimilation and application of musical understandings as part of the creative process.

Harmonic devices. There was a range of drone and pedal points, used as sustaining and linking devices, typically on the fifth of the relevant diatonic or pentatonic scale. Approximately two-thirds of the way through the piece, the pedal became the familiar drone of the bagpipes, then harmony for a reel. Counterpoint occurred between "Shortnin' Bread" and "In Excelsis Deo." Several melodies were chorded, the most distinctive being the hornpipe and the final song using alternating B^b minor and F chords, creating an energetic and effective resolution to the composition. In addition to the chordal progressions, several short, melodic sections near the beginning of the composition were characterized with passing, dissonant harmonies. The weaving pentatonic section was clearly a representation of new Asian settlers.

Instrumentation. Most of the "Journeys" composition was carried out using electronic keyboards and percussion, which remained the key tone colors in the finished product. The total composition of about twelve sections reflected careful consideration of instrumentation. All but guitar were used for melodic figures, and all but voice were called on in an accompaniment role. There were unusual pairings of tone colors, for example, a successful short question-and-answer section between clave and electronic keyboard.

Structure. For the most part, sections dovetailed through a rhythm being carried over, a restatement of rhythmic or melodic material, or, sometimes, a sustained drone. Some transitions, however, seemed more awkward with moments of insecurity about where to go next. Transition issues possibly reflected the significant performance pressures more than creativity matters. Accuracy might have been improved by the use of pauses to signify the beginning of new material or gradual fading to round off previous material. Although the ideas of multiple composers were woven together, there was an overall congruence in the thematic ideas within each section.

Symbolism. In regards to the musical content, the short sections frequently presented a known music idea intended to evoke an image, time, or place. Typically, there was an opportunity for longer sections to have evolved from these components; however, the composition moved on purposefully which, sometimes, left a feeling of being unresolved. Some sections featured an individual's work, for example, the opening melody played by one student. Other sections reflected creative exploration and arrangement, involving short duos and whole-group sections, a good example being the final song—a combination of "Shortnin' Bread" and "In Excelsis Deo."

Performance evaluation. While student-involvement levels varied markedly, most students showed sensitivity to each other in performance, reflecting the collaborative work

Table 1. *The Structure, Voicing, and Chord Progression of "Where We Belong"*

Introduction	Verse	Verse	Chorus	Improvisation	Verse	Verse	Chorus
Picked guitar, which introduces the chord progression for the verse: *G, G/F#, Em, G/D, C, D7	Verse melody with solo singer over established chord progression*	Flute melodic solo over established chord progression*	Solo singer takes top line, with other voices harmonizing on coloring notes of repeated chord progression: **Em, Em/D, C, B	A middle, eighth-like section in which there is improvisation on piano, guitar, and conga drums, all developed around the chord progression established in the verse*	Verse melody with solo singer over established chord progression*	Verse melody combined with the flute melody, acting as a counter melody over established chord progression*	Chorus repeats **and fades to close on mediant minor chord Bm

The * and ** indicate the placement of the two-chord progressions used in the song.

evident earlier in the project. Technically, the range of devices used across all music elements showed the students' ability to manipulate sound and their awareness of the effects of varied melodic structures, intervallic construction, simpler harmonic devices, and diverse textural effects.

The extent of challenge varied across sections of the composition, and the music reflected the technical instrumental capability of the children. With regards to tone color, balance of voices, mood and texture contrasts, and song character, however, a surprisingly high level of innovation, sophistication, and ownership were evident. The cohesion of the piece revealed that thought had been given to the emotional impact of the music, from its mother-earth-like atmospheric beginning to the final song. The diversity of blends, contrasts, and use of restatement showed that the participants applied relatively advanced knowledge of music elements successfully in this creative context.

The degree of learner independence in creating "Journeys" was difficult to assess as, no doubt, guidance and direct facilitation were critical to its overarching structure. Nevertheless, it was evident, in rehearsals and performance, that desirable variation emerged as different individuals contributed to thematic sections, and that, for the most part, the performers were obviously engaged when presenting their personal components or supporting others.

"Journeys" gave evidence of children responding to the demands of the composition process, including taking starter thematic ideas and exploring them, reworking, sharing, reflecting, and consolidating. The music contained numerous, familiar musical icons; however, over its eight-minute duration, originality, as well as conviction about the worth of personal creative ideas, seemed evident among the young composers.

"Where We Belong"

"Where We Belong" is one of the last pieces that the Heartland children created, composed as one component for a presentation at a Ministry of Education gifted and talented conference in 2005. The group presented approximately 30 minutes of music, including arrangements and instrumental pieces. The children were from four schools, representing a wide socio-economic spread, and were chosen as the most talented and committed children in Heartland at that time. The development of the complete program was half or whole days each week, spread over a 10-week school term.

Memorable melodic ideas showed genuine variation between verse and chorus. The verse melody was wide ranging and created a poignant mood through the use of a major sixth, repetition, and flowing rhythms appropriate to the lyrics. In the chorus, the melody became the top line of a stepped, descending sequence, reinforcing the repeated chord progression (See Table 1).

This arrangement has effective structural features befitting its popular ballad style, including the placement of verse and chorus sections

and its four-bar phrases. The major-minor alternation between verse and chorus also acts as an effective structural and contrasting device.

The instrumentation consists of two keyboards, three guitars, conga drums, flute, and solo and harmony voice parts. Even with the benefit of a sound system, this is a difficult combination to balance; hence, the performer's responses to dynamics and mood shifts reflected a strong sense of commitment. In this regard, the children's responses and confidence in each other, as performers, is traceable to the qualities encouraged in the creative processes that produced "Where We Belong."

Technically, the melodic and improvisational material is memorable, and, as a listener, one needed to have little concession for the young age of the creators and performers. In accordance with popular song styles, the chorus has greater urgency in the accompaniment lines and vocal harmony as it moves through the repeated chord sequence. Each improvisation has spontaneity, and players confidently assumed the mantle of soloist, albeit within the limits of their technical expertise. The improvisations did not stray far from chordal notes, but they were free and pleasingly shaped. The Pasifika rhythm feature, played on congas, intensified the mood, and the rest of the band matched this challenge.

The performance of "Where We Belong" reflected the application of successful strategies for creating a variation of mood and instrumentation, and there was a high level of accuracy throughout the song. The best demonstration of this occurred in the picked guitar opening, which set a contemplative mood leading to the more compelling rhythms of the verse.

The performance evaluation suggests that all performers had contributed to the development of "Where We Belong," playing the instrument learned through Heartland, even if it was their second instrument. The improvised sections and the integrity of melodic sections in shape and completeness all reflected the confidence of these performers, thinking creatively and expressing ideas through limited instrumental experience. This is of significance because, at the time of composition, the children had had fewer than 40 hours of instrumental coaching, spread over a period of one to three years, depending on when they were selected for the Music Heartland project.

Learner independence, noted through their interpersonal and individual strengths, was most evident as the children adjusted to variations in the song and adopted different roles. Their commitment in the live performance reflected children who think musically and enjoy their personal creative nature. The final harmony of an E-minor chord at the end of "Where We Belong" provided a poignant, musical affirmation of the children's view about where they belong.

Perceptions About the Effect of Creative Work in Music Heartland

Specific, creative music-making, led by specialist tutors with performance goals, was, almost certainly, new to most of the individuals involved, children, parents, and teachers, alike. Feedback on "Journeys," in particular, generated anecdotal responses that attested to the significance of this creative element in the project. Students commented on the fun of "[finding] out about making all the music…[and] getting the chance to make your own music" (Year-2 child participant, 2004). By early 2004, children realized that to have something creative to share was special. When asked what they would show off to a visitor, most children indicated it would be something group-based and creative.

Parents recognized the struggle involved in generating a creative product of quality and the fickleness of children's confidence, supported by comments such as "I don't think that they had a sense of how good it was, until they actually performed it" (parent of a Year-2 child participant, 2004). Those fulfilling the role of school-liaison teachers issued similar messages about the importance of creative activity in Music Heartland, and classroom teachers realized that creative activity was possibly a curriculum gap in their schools. They also agreed that the creative element set Heartland apart in terms of meeting the needs of gifted and talented children, that it emphasized "…the creative end and the application end rather than more of the same, which…is the danger with some of the things people call gifted and talented programs….This isn't blowing harder on the trumpet, this is actually totally different" (liaison teacher, 2004). The specialist tutors saw creative projects not only

as demanding and intense but also as providing an avenue for expressing commitment and independence in individual children. Unprompted, tutors recognized that the Heartland philosophy had brought a shift in their approaches to teaching in other contexts, saying that "I'm trying to get them [the children] to do more creative work in their individual lessons now...[I]t wasn't [part of] my learning experience, so it's taking me a while to get to that way…of teaching…" (tutor, 2004).

Conclusion: The Implications of Creative Work in Music Heartland

Much can be said about the effectiveness and implications of this creative musical activity. At the end of the first year, the creative projects were somewhat of a revelation, and there was a genuine resolve to continue the investment in the creative development that had blossomed among all of the participants.

Certainly, in relation to knowledge and practices in the music field, the work cannot be claimed as original; however, looking at the creativity of the project, relative to the knowledge and experience of the child participants, some extraordinary products emerged. These products demonstrated a response to a diversity of style, a high quality of understanding about melody, and the subtle use of tone color and texture. To a lesser degree, yet, with some depth, there was an active appreciation of simple harmonic effects and application of devices, which provided cohesive structure and clear development.

Socially, a genuine bonding and involvement was apparent among the groups of children from multiple schools and various grade levels. Numerous groups worked on sub-themes simultaneously, which the tutor and children eventually coalesced. With a long-term cooperation, by the end of 2005, the rather shy group of 2003 showed pride and a sense of belonging as they shared their work and responded to the work of others.

Placed gently into the context of schools wanting to foster musical talent, the Music Heartland model gives clear indicators of social and musical investment and suggests the level of challenge required to excite and engage musically gifted learners. Given an opportunity to create, the musically gifted child will desire to

- explore sounds and their qualities and look for sound potential in their surroundings;
- investigate how sound can be manipulated;
- think and talk about the effect of sounds, character and combinations of sounds, and enjoy their manipulation in order to hear and appreciate their effects;
- respond to the demands of different forms of musical patterns, involving tone color, texture, dynamics, rhythm, melody, and harmony;
- understand and apply elements of repetition, contrast, and unification, as well as "surprise" elements;
- record and perform their created music, experimenting with different technologies;
- create a portfolio of improvised pieces reflecting home-life, various cultural themes, specific knowledge of music, school-subject matter, and personal expression;
- investigate how others use sounds in different contexts (community, cultural, ceremony, genre) and, evaluate their own work and that of others;
- resist the pressure to truncate the development of his or her music to suit the teacher or program; and
- have the classroom teacher and the school value his or her creative outputs.

Products, such as "Journeys" and "Where We Belong," are more sophisticated than what one would typically expect of creative work in a generalist, or even a specialist, classroom for this age level in New Zealand. Furthermore, the children developed curiosity and a belief in their potential to create, attributable, in part, to the kind of self-evaluation processes recommended by Jane Piirto (2003), as well as to favorable conditions for promoting creative activity,[3] as described by George Parkyn (1984, p. 57). This perspective on creativity also aligns with VanTassel-Baska's (2009, p. 4) contention that "[t]he idea of creativity is more exotic than its reality which requires a harmonious confluence of variables in order to support its development."

[3] These conditions included wait time, incubation, and a learning frame in which the ideas of children did not have to be cemented quickly.

The Music Heartland project provides the evidence that the development of meaningful, applicable musical skills and understandings in children requires, of necessity, tutor expertise, the opportunity for deep, creative activity, patience with children as they create their products, and school commitment.

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Appendix 1: Evaluation of Performance and Creative Product

Element	Playing	Creative
Involvement of the child Intensity of concentration Interaction, wanting to participate	• Interest • Enjoyment • Acceptance of a wide range of music • Involvement and participation • Inspiration and aspiration • Collaboration and willingness to debate and contribute	
Response of the child to **musical style**	Control, given the instrument(s) being played, and the level of technical expertise	Composing appropriate to mood, purpose, and musical style
Response to **ensemble**	Tempo, playing in time, nuance, feeling changes, and responding to each	
Growth of **technical expertise**	Made evident on respective instrument or voice, encapsulating rhythm, melody, range, articulation, and fluency indicators	Application of instrument or voice, knowledge, and skills
Accuracy	Attention to correct melody, rhythm, and harmony parts, learned or improvised	Utilization and integration of music elements, in particular, melody, rhythm, harmony, dynamics, texture, and tone color; consideration of these within performance
Challenge	Considered against the time to learn the music, the nature of performance and group size, other Heartland activities influencing the performance	Level of, inventiveness, meaningfulness of contrasts and repetition, evidence of layering and of balance of parts, ability to utilize an element structure, such as blues or verse and chorus
Cohesion	Being aware of the musical structure, adapting to the music, responding to the other's lead, observing stopping and starting devices, providing leadership, responding to the group	Attention to structural elements of the music, including balance, blend of sections, musical consistency, and diversity
Reading and recording	Means used to learn the music, use of graphic or conventional notation and information technology, memorization	Utilization of learned and improvisational processes
Independence	Becoming increasingly autonomous and self-directed and depending less on teacher direction and support	Evidence of self determination in the sounds created, as specific elements or as an accumulated effect; evidence of ongoing action, reflection, and rehearsal, and variation of ideas among participants; evidence of pure originality in the music

3. Extra-Curricular Science Labs for Gifted Students

Dieter Hausamann

Abstract

In the past couple of years, numerous extra-curricular science laboratories (school labs) have been established in Germany, whose main objective is to attract students to science and technology. The German Aerospace Centre (Deutsches Zentrum für Luft-und Raumfahrt, DLR) School Lab Oberpfaffenhofen, operated by Germany's national research center for aeronautics and space, is a typical example of such a science lab. Apart from a variety of hands-on experiments offered for students, its key mandate is teacher education. In this paper, the basic concept behind extra-curricular science labs is presented, as illustrated by the DLR School Lab and its strong ties to state-of-the-art aerospace research and technology. The lab's expertise is described, based on numerous, high-level enrichment projects for highly talented secondary-school students. Furthermore, the model of teacher education with respect to giftedness is demonstrated. Finally, results are presented from both internal and external anecdotal evaluations, which support the success of the extra-curricular science labs.

Currently, in Germany, there is a serious lack of engineers and information technology specialists. This situation is 10 times more critical for Europe. Attracting talented young people to science and technology is, therefore, a national priority (Heller 2007, 2008; Heller & Ziegler, 2007).

The existing educational system cannot meet the demand. The regular science and technology curricula in secondary schools provide neither sufficient instruction nor student motivation for students to pursue this field. Because of this lack of exposure, many secondary-school students—even upon graduation—are undecided about their future studies. Options are even more limited for gifted students because the opportunity to use their talents is not made available to them, and their potential is lost. Since gifted students are often under-challenged by regular school lessons, they soon lose interest. It is important for them to experience real-life applications typically faced by engineers and scientists and assume the role of researcher working within the framework of an authentic science project within institutions involved in research and development.

In the last decade, in order to attract youth to Science, Technology, Engineering, and Mathematics (STEM), numerous extra-curricular science laboratories have been established by research centers and universities all over Europe. More than two hundred such labs exist in Germany, alone (LeLa, n.d.). In a typical school lab, students are able to perform high-tech experiments independently through what is called Inquiry-Based Science Education (IBSE), a technique recently recommended by the European Commission (2007). This technique was developed by Martin Wagenschein (1962, 1980).

In order to achieve a sustainable impact, the typical one-day visit to a school lab must be complemented by the teachers' regular mathematics and science lessons by linking the high-tech experiments and research to the standard curriculum. This requires advanced teacher training and enhanced skill development. Another important element of the extra-curricular science labs is ensuring the sustainability of its impact for both teachers and students.

In this paper, the DLR School Lab Oberpfaffenhofen is presented as an example of an

extra-curricular science lab, including its regular offerings for school classes. The school lab's methods of talent development are described, including several practical examples of enrichment projects, as well as the concept and practical experience of teacher training, especially with respect to gifted education. Additionally, student and teacher feedback on their experiences are presented, as well as the results of evaluation studies.

The DLR School Lab Oberpfaffenhofen – an Extra-Curricular Science Lab

The German Aerospace Center DLR

DLR (n.d.) is Germany's National Research Center for Aeronautics and Space. Its extensive research and development work in aeronautics, space, transportation, and energy has resulted in numerous national and international cooperative ventures. As Germany's space agency, the federal government has given DLR responsibility for the planning and implementation of the German space program, as well as representing its interests internationally.

Approximately 5,700 people work for DLR; the center has 29 institutes and facilities across 13 locations in Germany. The DLR site at Oberpfaffenhofen, near Munich, which employs approximately 1,500 people, is one of Germany's largest research centers. The main activities of the five institutes in Oberpfaffenhofen are devoted to space missions, climate research, development of earth observation systems and technologies, robotics and mechatronics, and the European space-based navigation system, Galileo. These activities are complemented by two space-operation centers: research flight operations and the remote-sensing data center.

The DLR School Lab Oberpfaffenhofen

Since 2000, the DLR has operated six extra-curricular science labs, one of which is the DLR School Lab Oberpfaffenhofen (n.d.). This science lab offers students high-tech experiments within the authentic research atmosphere of a large-scale research center (Hausamann et al., 2008). Students experience the fascination of aerospace research and become acquainted with methods of high-technology research. At present, the DLR School Lab offers eleven experiments: environmental spectroscopy, meteorology, analysis of satellite-based earth observation data, satellite navigation, robotics, virtual mechanics, flight-team simulation, mobile rocket research, and infrared, laser, and radar technology.

On a typical, one-day visit to the DLR School Lab, each student may perform two of these experiments, based on his or her personal interests. Each experiment involves two hours of intense activities and experimentation in the respective field of technology. By the end of the day, students have gained insight into two research areas and the respective experimental methods.

Students are supervised and supported by DLR scientists, as well as by university students, employed for this purpose. In principle, however, they are encouraged to work independently, to generate new knowledge and expertise about the interrelationships among the physical, technical, and geoscientific fields and their applications. Students work in small groups of four or five, generating a stimulating working atmosphere and bonding as a team.

The key success factor of this extra-curricular science lab is the use of state-of-the-art, high-tech equipment, which is unavailable in the school system; for example, students are allowed to operate a surface spectrometer, an infrared camera, mobile laser and radar systems, and sophisticated simulation programs.

Students' visits to the DLR School Lab Oberpfaffenhofen are complemented by and concluded with a visit to the German Space Operation Center (GSOC) and to the recently opened Galileo Control Centre. The latter provides insight into the control of satellites and the research activities of the International Space Station (ISS), as well as the operation of Europe's future satellite navigation system.

Since its opening in 2003, more than 7,500 students have conducted experiments in the DLR School Lab Oberpfaffenhofen.

Assessment by students. Both internal and external evaluations are conducted to investigate the sustainable effect of extra-curricular science labs. The DLR School Labs' standard, internal evaluation tools are anonymous ques-

tionnaires and oral testimonies. At the end of a visiting day, both types of feedback are requested from each participating student. In general, based on a preliminary analysis of several thousand questionnaires and oral statements, over two-thirds of the students indicated that they would like to visit the lab again.

An external evaluation, conducted by the Leibniz Institute for Science Education at the University of Kiel, Germany (Pawek 2009), confirmed these results. A different questionnaire addressing students who left secondary school in 2008 (and who had visited the DLR School Labs in past years) shows strong evidence that the future career decisions of numerous former students (up to 50%, depending on the individual school) have been influenced positively by their DLR School Lab experience.

Programming for Gifted Students

Acceleration and enrichment are proven programmatic measures designed for gifted students. Recognizing the limits of school curricula, Renzulli and Reis (2002) developed the Schoolwide Enrichment Model (SEM), whose goal is to overcome the limits of school curricula and promote the fascination for science and research beyond the regular instructional program. This, however, requires the cooperation between schools and experienced research partners who are able to communicate the enthusiasm for their respective discipline.

One of the key objectives of the DLR School Lab Oberpfaffenhofen is the promotion of gifted youth (Hausamann, 2005). The lab experiments, derived from current research activities at the DLR institutes, are adaptable to the potential of highly talented and motivated students. The labs are not constrained with respect to depth and complexity. The same holds true for the supervising scientists and university students, whose personal expertise far exceeds even the highest school levels. In the past years, the DLR School Lab Oberpfaffenhofen has developed, conducted, and successfully completed about 30 special projects and events for highly talented students. In principle, there are two possibilities for such projects, as detailed below.

1. Regular Visits to the DLR School Lab

School lab experiments can be used to extend the regular curriculum. Activities of the DLR School Lab can be adapted to the special conditions and requests of talented students either by acceleration or extension.

Acceleration. Gifted students are able to perform complex experiments at a much younger age than regular students. A typical example is the mechatronics experiment ASURO (n.d.) which involves assembling and programming a complete robot rover—a task suitable only for secondary-school students aged 16 years and over. Many highly gifted students, as young as 12 years of age, have successfully assembled the robot at the DLR School Lab (c.f. Hausamann, 2005).

Extension (depth). When performing an experiment, students have the chance to move to very complex levels of the physical theories involved; they can develop and perform new and sophisticated experimental techniques, and they can design complex programs and analytical methods beyond what is expected by the standard curriculum. Gifted students take advantage of these opportunities. The DLR School Lab has worked primarily with gifted students from the Maria-Theresia-Gymnasiums in Munich (n.d.). About 10 special classes for gifted students have visited the school lab in the past six years.

Pilot evaluation: Highly gifted versus regular students in the DLR School Lab Oberpfaffenhofen. The effect of the visits to the DLR School Lab Oberpfaffenhofen on gifted students has been investigated by the University of Würzburg (Stumpf et al., 2008) in a pilot study. Summary responses of gifted students were compared to those of students in regular classes. Results show that the visits to the School Lab are clearly positive for all students. More than half confirmed that their interest in natural sciences has been enhanced by the visit; nearly every second student plans to pursue a technical or scientific profession.

There were no significant gender differences in the feedback with respect to factors such as personal interest, comprehension, and selection of experiments.

There were significant differences between regular and gifted student groups; 85% of the gifted, but only 66% of the regular students, expressed an interest in making an additional visit to the school lab. The ranking of the individual experiments by the two groups also differed, with the more difficult experiments ranking higher (more positively) for gifted students. Overall, the feedback from the gifted participants was more positive than that from students in the regular classes.

The sustainability of the effect of visiting the school lab, however, could not be investigated in this pilot study because measuring the effect requires a significant lapse of time. A further extended study is being designed by the author to examine the long-term effects of the DLR experience, utilizing a control group of students who will not have the opportunity to visit this type of lab.

2. Type III Enrichment Projects

Renzulli's Schoolwide Enrichment Model (Renzulli & Reis, 2002) provides a practical basis for school programs to identify and nurture the talents of students with exceptional abilities. Renzulli introduces three types of enrichment activities of increasing complexity and demands:

- Type I enrichment moves students beyond the regular curriculum to consider potentially exciting new areas of interest;
- Type II enrichment targets the development of higher-level thinking (problem-solving, critical thinking, inquiry training) and specific learning skills, allowing students to undertake more advanced and differentiated topics; and
- Type III enrichment, the most advanced stage, "involves students who become interested in pursuing a self-selected area and are willing to commit the time necessary for advanced content acquisition and process training in which they assume the role of a first-hand inquirer" (Renzulli & Reis, 2000, pp. 370–371).

Enrichment activities provide opportunities for students to work independently on an applied subject, to develop authentic products, and to achieve an intended impact on a defined target audience. These students assume the role of researchers.

In the past couple of years, several Type III enrichment projects have been completed by gifted student groups from across Germany in collaboration with the DLR School Lab Oberpfaffenhofen. The following two examples show the distinctiveness and complexity of Type III enrichment projects, the extent to which talented student teams can generate highly interesting questions for current research, and the process by which students evolve from "learners" to "researchers."

The GPS-Einstein Project. Satellite navigation is one of the rare technical applications which is strongly influenced by both Einstein's special and general theories of relativity. It requires a change to the frequencies of atomic clocks on the board of GPS satellites in order to synchronize them with the clocks on the ground. The intention of the GPS-Einstein Project (Hausamann & Schmitz, 2007) was to investigate quantitatively how much adjustment the satellite clocks require. It was initiated by the DLR School Lab Oberpfaffenhofen, based on its expertise in the technical field of satellite navigation.

The half-year Project took place in 2005, during the Year of Physics, in a Grade 12 Physics course at the Christophorusschule Königswinter (CJD) in Germany. The gifted education model at this school follows the three-trimester system. By accelerating and compacting the curriculum, one of the trimesters is available for special enrichment projects. The Grade 12 Physics course (11 students) in the 2004 - 2005 school year was an ideal group for the GPS-Einstein Project.

In phase one, students were introduced to Einstein's theory of relativity, as well as to satellite-based navigation, in the context of a Type II enrichment activity, and the technology of GPS receivers. Each of the students had to work on a specific sub-area, such as the determination of the speed of light, astronomical methods for navigation, principles of satellite navigation, error analysis and correction, and economic and technological requirements for satellite navigation systems. Subsequently, students produced reports on their topics and presented their results to the class. These individual activities were all supported by the teacher at the students' secondary school.

Phase two of the Project consisted of a three-day excursion to the DLR School Lab

Oberpfaffenhofen. The school lab program was tailored to the requirements and abilities of exceptionally gifted students. One important didactical feature was a continuous alternation between independent experimentation and university-level scientific lectures. The main focus was an in-depth examination of satellite-navigation science and technology, time standards, atomic clocks and time measurement, and the consequences of Einstein's theories of relativity for navigation satellites. Finally, there were several opportunities for the students to discuss their respective subjects with members of the group, with the navigation experts, and with the supervising university students, who are studying electrical engineering, physics, mathematics, geosciences, biotechnology, food technology, and chemistry, and are employed by the science lab exclusively for advising and career-modeling purposes. The school-lab program helped define the next step of the Project.

In the third and final phase of the Project, four of the 11 students, upon returning home from Oberpfaffenhofen, took responsibility for empirically investigating the problem, synthesizing quantitative information, and generating answers to key questions; for example, they derived the frequency shift of the GPS satellite clocks and the subsequent consequences. According to all the supervisors, these students constituted the top group in the Physics course.

These four students demonstrated their final results, including a detailed poster presentation and an experimental demonstration of GPS receivers, at a festival at their school. As a further highlight, the group was invited to the Students' Congress in Munich, in December 2005, to present their final results. This national congress, which took place at the end of the Einstein Year of Physics in 2005, was devoted to Albert Einstein's life and research.

The project: Geophysics—Remote Sensing from Satellites. One of the most important methods to identify changes of the environment is "change detection." Satellite data acquired at different times are compared in order to analyze quantitative changes caused by natural or human impact, such as the sealing of the earth's surface by settling activities (e.g., dust from volcanic eruptions), environmental damage, or natural catastrophes. At school, this complex method has, so far, been applied only in special geography courses in high-level, secondary-school classes.

The goal of the enrichment project, Geophysics—Remote Sensing from Satellites, was to investigate the changes in the participants' home environment by studying the properties of the solar radiation spectrum and its influence on the geosystem and by analyzing remote sensing data from satellites (Hausamann et al., 2007).

The project was initiated jointly by the Hector-Seminar[1] and the DLR School Lab Oberpfaffenhofen. In early 2006, this external, talent-support program was officially announced on the website of the Hector-Seminar (n.d.). The focus groups, typically consisting of 10 students, were highly-talented students from Grade 9 and 10. Students from 10 different secondary schools applied for the project, and each seminar group was supervised by a team of two teachers.

The preparation phase began with a one-day workshop in April 2006, in Heidelberg, where the students were introduced to the scientific background, methodologies, and technologies of satellite-based remote sensing of the earth's environment. Hardware and software details of the respective School Lab experiments were presented, and the project goals were discussed and decided.

[1] The Hector-Seminar project (Heller, 2008a) is a program to foster highly gifted secondary-school students by providing enrichment activities in the areas of mathematics, informatics, natural sciences, and technology. It is financed and supported by the Hector Foundation. In the Hector-Seminar, especially gifted secondary-school students are supervised on a long-term basis throughout their school career. The seminar program supplements the regular school activities, from Grades 6 to 13. The projects are interdisciplinary, whose main objective is to facilitate a holistic development of personality, the fostering of cognitive, logical, personal, and social potential, and corresponding competencies. Each seminar course involves 60 students, who are chosen in a two-stage selection process from all 7,500 Grade 6 students of the secondary schools in north-western Baden-Württemberg. The first stage consists of a screening process, whereas the second stage utilizes the Munich High Ability Test Battery, developed by Heller and Perleth (2005), for selecting students. The cognitive, creative, and social capabilities of the selected students are far beyond the secondary-school average. The seminars are located in three cities—Heidelberg, Mannheim, and Karlsruhe. The project at each site is headed by two teachers and takes place in the afternoon, two hours per week. At present, approximately 400 students in eight courses participate in the Hector-Seminar.

The second phase of the project consisted of a visit to the DLR School Lab Oberpfaffenhofen. In May 2006, the Hector-Seminar students spent three days in Oberpfaffenhofen. Supervised by the DLR Lab's university students, all of them conducted the experiments involving the environmental spectroscopy and satellite data. Special attention was given to the operation of DLR's imaging hyperspectral ground spectrometer. Extended practical sessions focused on the application of two different software programs used to access, process, and analyze satellite data. Additional subjects of study included a theoretical course on infrared measurement technology and remote sensing. Project tasks were defined in detail, the most important being the analysis of changes, based on a comparison of satellite images from 1989 and 1999. The visit also included a guided tour of DLR's Crisis Intervention Center and the robot-operated data archive.

The third phase of the Hector-Seminar was initiated two weeks after the visit to Oberpfaffenhofen. The DLR School Lab supervising team went to Heidelberg for a measurement campaign[2] involving all instruments (spectrometers and infrared devices). Further investigation with these instruments provided students with deeper insights and more complex explorations in the field. Based on the information and results gained from this measurement session, the students performed the final task of the project. They classified satellite images and analyzed changes in their respective home environments and, finally, produced reports on the results.

At the end of September 2006, the students presented their Geophysics project at the 2006 Hector-Seminar project workshop in Mannheim. Results were shared, orally and visually, through posters, with teachers, students, and invited guests.

The exceptional work of this group was recently honored with the DLR School Lab Prize of 2008. This prize is awarded annually by the Society of Friends of DLR, on the recommendation of the DLR's Executive Board.

[2] The term "measurement campaign" means that equipment is shipped to another location to which a group of scientists relocates in order to make local validation measurements for the purpose of verifying analyzed data.

Students' assessment of the Type III enrichment projects. The feedback from each group involved in the DLR School Lab's Type III enrichment projects was extremely positive—even though there were distinct points of criticism and substantial recommendations for improvement. On a visit to the Christophorusschule Königswinter in May 2006 (half a year after the termination of the GPS-Einstein Project), four students of the GPS-Einstein Project reported that although preparing their final report and presenting the results was quite exhausting, it left a deep and very positive impression upon them. According to all four students, the project had strongly influenced their career decisions in the fields of physics, chemistry, information technology, and mechanical engineering.

Teacher Education at the DLR School Lab Oberpfaffenhofen

The DLR School Lab Oberpfaffenhofen offers advanced training courses for school teachers in order to prepare them for their class visits to the lab. The main objective of the teacher-education component at the DLR Lab is to help the teachers integrate the extra-curricular activities within their standard curricula and apply concepts to real-world examples. The DLR School Lab offers special courses for groups of teachers from individual schools or regions. They also offer advanced in-service training seminars for the Bavarian teachers, who will serve as the instructors of future teachers.

The key elements of teacher training offered at the DLR School Lab include both self-contained experiments, as well as lectures. In the former, teachers assume the role of their students, experiencing the same feelings of success upon completion of an experiment as their students do. Lectures are the vehicle by which background information about teachers' respective experiments and scientific research areas are disseminated.

Since 2003, more than 1,000 regular teachers have attended advanced teacher-training courses offered by the DLR School Lab Oberpfaffenhofen. The general feedback of teachers has been highly positive, especially with respect to successfully conducting high-tech experiments independently, developing advanced technical skills, and generating ideas for practical classroom teaching. Many

Table 1: *Teacher Participant Feedback on the Advanced Teacher Course on Robotics*

Teacher Participant Feedback on the Advanced Teacher Course on Robotics	Excellent	Very good	Good	Passing	Fail
Fulfillment of expectations	14	5			
Practical usability of results	6	9	3	1	
Quality of presentation	12	7			
Organization, venue, atmosphere	14	5			

of the teachers have been motivated to bring their students to visit the DLR School Lab Oberpfaffenhofen.

An example of advanced training offered to teachers at the DLR School Lab is a one-day regional session on robotics, which took place in Regensburg, Bavaria, in October 2007. Together, the 19 participating teachers built and programmed six ASURO (n.d.) robots. The feedback presented in Table 1 was officially requested by the organizing school administration.

Education of Teachers of the Gifted

Teachers play a key role in gifted education. Key teacher characteristics and competencies have long ago been summarized by authors such as Seeley (1985). Especially, in Type III enrichment activities, the teacher's role changes from that of an educational instructor to that of an initiator, mentor, supervisor, coach, consultant, and assessor of achievement. The teacher's most important function is to support the independence, motivation, and creativity of gifted students (Cropley & Urban, 2002). Pedagogical approaches such as open learning (Peschel, 2002) or self-regulated learning (Fischer, 2004) are ideally suited for Type III enrichment projects.

The teacher-education model developed at the DLR School Lab Oberpfaffenhofen (Hausamann, 2008a, 2008b) is especially suitable for teachers of gifted learners because it links the science labs to the standard school curriculum, includes teacher-run experiments, promotes the acquisition of the requisite background science knowledge, and uses the lecture as a method of instruction. In addition, the scientific fundamentals required in individual experiments inspire talented participants who want to tackle more complex problems and questions. Teachers are exposed to different combinations of various experiments and technologies, and they receive relevant, essential information for making experiments more feasible for and interesting to younger students.

A one-day workshop for a group of Hector-Seminar supervisors at the DLR School Lab Oberpfaffenhofen, conducted in December 2004, is a typical example for such an advanced-level training course, specially designed for teachers of the gifted. The goal of the workshop was to create new ideas for the Hector-Seminar projects and became the nucleus, so far, of two successfully completed Type III enrichment projects: Geophysics in 2006 (see above) and Satellite Navigation in 2008. The feedback on the workshop, the first of four since 2004, was enthusiastic and evaluated as "excellent" by the seven participating teachers.

The DLR School Lab's extra-curricular, gifted education model is also integrated in The European Council for High Ability (ECHA) Diploma teacher-education courses of the International Center for Giftedness at the University of Münster, Germany (ICBF, n.d.). Since 2007, the extra-curricular science labs in gifted education, such as the DLR School Lab Oberpfaffenhofen, have been presented as an option in the education practicum, with the main focus on Type III enrichment projects. Additionally, the DLR School Lab has been designated as an official observation site for students in gifted courses. Two such observations are mandatory for each ECHA Diploma applicant.

Conclusion

This paper explores the basic concept behind extra-curricular science labs, exemplified by the DLR School Lab, with its strong links to state-of-the-art-aerospace research and technology. The described enrichment model for gifted students has been developed and successfully implemented through numerous projects at the DLR School Lab Oberpfaffenhofen. The associated gifted-education, teacher-training model, developed at the DLR Lab, has formed the scientific and didactic basis for Type III enrichment projects at a pre-university level for secondary-school students. The success of these projects has been supported by anecdotal evaluations; however, further studies are required to assess the effects of the projects in terms of their long-term impact and sustainability.

The enrichment projects described in this paper have demonstrated how students, by working with scientific subjects far above the regular school level, are transformed from self-regulated learners to self-regulated researchers. This transformation, effected through their DLR Lab experience, has helped students make the transition from school to university with greater ease, enabled them to gain a more profound understanding of their field of study, and assisted them in making more informed career choices in fields such as physics, chemistry, information technology, and mechanical engineering.

The DLR Lab is one approach by which gifted learners become gifted researchers. Alternative approaches remain the object for further research in the area of giftedness.

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4. The Mexican PAUTA Project: Identifying and Supporting Talented Students in Science and Mathematics in Morelos, Mexico – A Pilot Study

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Abstract

This paper describes the Mexican Programa Adopte Talento A.C.[1] (PAUTA) or Adopt a Talent Program,[2] and the specific development and initial evaluation of PAUTAmor, the PAUTA branch in the state of Morelos. PAUTA was created by Mexican scientists and educators for the identification and support of primary- and secondary-school students with talent in science and mathematics. The program began in various parts of the country in primary schools in 2007, while PAUTAmor started in secondary schools in 2008. Workshops were developed and conducted, first with science teachers and then with students nominated by these teachers. The aim of PAUTA is to develop creativity, scientific abilities, and attitudes indicated as essential by PAUTA. Multiple assessment instruments were selected, adapted, or designed to create a broad database, both quantitative and qualitative, to evaluate the pilot program. Nominated students continue with the workshops for two years, and from this group, a select core continues to a third year of the program, working with scientific mentors in their areas of interest.

The Adopt a Talent Program[3] (PAUTA) began in 2006, coordinated by the Mexican Academy of Sciences[4] (AMC, Academia Mexicana de Ciencias), with the mandate of infusing two fundamental principles of education: excellence and equity. The main focus of this mandate is to identify and develop the scientific and mathematical talents of students at the primary- and secondary-school levels and to offer continuous academic support throughout their schooling, up to university. The vision of the program is to establish direct links between the teachers of basic education and the scientific community in Mexico, and, through them, to identify talented students, as well as to involve the community, private enterprise, and governmental and non-governmental organizations. The ultimate aim is to improve the quality of science education in Mexico and to achieve a greater awareness of the importance of science nationally.

[1] A.C. Means civil association and is part of the name.
[2] http://www.pauta.org.mx/home/
[3] http://www.pauta.org.mx/home/
[4] http://www.amc.unam.mx/

In Mexico, various indicators reflect serious problems regarding the inequity in education, particularly in scientific areas. In 2005, 77.6% of the eligible population, nationwide, had completed secondary education (Bracho, 2007). Graduation rates varied widely in different regions of the country; for example, in Mexico City, the rate was 102.6%[5], while in Chiapas, one of the poorest states in the nation, the graduation rate was only 60.4%. Nationally, only 60% of people between 15 and 29 years of age had finished secondary education, while in the 25- to 45-year-old group, only 24% had completed such education. This is by far the lowest among the countries belonging to the Organization for Economic Cooperation and Development (OECD, 2007). Even worse, all of the corresponding statistics for indigenous populations are much lower than the national averages (Bracho, 2007). Further OECD statistics show that only 26.2% of Mexican 19- to 23-year-olds reach higher post-secondary education (Brunner, Santiago, García, Gerlach, & Velho, 2008), and, of these, only 11% pursue science careers (OECD, 2007). In the Mexican 25- to 34-year-old age group, there are only 984 per 100,000 with a tertiary science degree, compared with an OECD average of 1,675. Only 0.2% of young Mexicans enter advanced research programs at the tertiary level (OECD, 2007). An additional concern is the "brain drain" of university graduate students in science and technology: approximately one out of every five persons studying outside of Mexico does not return (AMC, 2007).

In the state of Morelos, Mexico, the site of PAUTAmor (PAUTA Morelos), 17.8% of the youth between the ages of 12 and 15 years (secondary level) do not attend school, a figure which is below that of the national average of 19.4% (SEP, 2003). Of those who begin secondary school, 20.8% of boys and 18.5% of girls do not graduate. Possible causes may include academic failure, family and economic problems, and lack of relevance of school to daily life, their needs, and their interests (SEP, 2003).

These figures reflect a problem of educational equity at both the national and state level. Additional statistics indicate very low levels of excellence among students still in school. The results of the Excale (grade-school achievement) exams, applied by the Mexican National Institute for Educational Evaluation (INEE)[6] in 2005 (Bracho, 2008), and the exams given by Programme for International Student Assessment (PISA) (OECD, 2006), both applied to 15-year-old students, show a very poor level of scientific literacy, nationally. Results show that approximately one-half of the students are *below* basic levels in reading, mathematics, and science, indicating insufficient competence to continue to more advanced levels of education. Only 3% demonstrate high levels of competency (PISA, 2007).

Research also shows science teaching in Mexico to be very traditional, with large classes and little student interaction, homogeneous treatment of content and teaching-learning strategies, characterized by transmission of scientific "facts," fixed algorithms for solving problems, and evaluation promoting simple memorization of content (Paul de Verjovsky, 2005; Quiroz, 2000). This teaching model does little to develop abilities and attitudes, such as divergent and critical thinking and creativity, required in scientific professions. Of equal concern is the loss of talented students due to the lack of identification and support of potential talent in these areas.

The PAUTAmor Project

PAUTA[7] was created through the efforts of high-profile Mexican scientists and science educators to promote the scientific development of talented children and youth and to cultivate a solid, scientific culture in Mexico. PAUTA believes that talents flourish under different circumstances and proposes to create favorable conditions to foster creativity and develop abilities in science among talented children and youth. By providing appropriate tools, motivation, and support and by helping teachers develop different instructional strategies in the scientific areas, PAUTA aims to improve scientific literacy and generate interest among *all* students. Close links with families, schools, and the scientific community, such as the committees of the Scien-

[5] Graduation rate is defined as the ratio of graduates to the population at typical age of graduation.

[6] Instituto Nacional para la Evaluación de la Educación

[7] PAUTA is supported by the SEP (Secretary of Public Education), CONACyt (National Council of Science and Technology), and UNAM (National Autonomous University of Mexico).

tific Olympics (internal document of PAUTA[8]), are essential.

PAUTA targets certain abilities and attitudes that the Mexican scientific community has deemed essential for any scientist. The abilities related to working in the scientific field include the key categories of intellectual, communicative, and creative potential, while attitudes encompass motivation, persistence, and respect. Each of these categories is further divided into numerous subcategories of more specific traits, as outlined in the next section. The provided list, neither exclusive nor definitive, is an initial guide to fostering the development of scientific literacy among students. It, basically, proposes guidelines for observing, evaluating, and further developing the requisite skills. The activities designed for the PAUTA workshops vary in complexity and content and are adapted for their geographic area within Mexico, as well as for the developmental and curricular context of each age group.

In 2007, the PAUTA project was initiated in primary schools in Mexico City and in the states of Michoacán and Chiapas. In 2008 and 2009, the programs were introduced in secondary schools in the state of Morelos (PAUTAmor[9]). In the latter case, the Morelos Academy of Sciences (ACMor[10]), an organization of scientists from over 40 research centers in the state, supported the project.[11] Professional training workshops were offered to science and mathematics teachers for students at the secondary level (ages 12 to 15 years). In 2008, the first year of the workshops, 24 teachers, from 20 different secondary schools in the state of Morelos, were involved. The workshops presented the PAUTA model, which offers alternative pedagogical strategies to teach science and mathematics. The teachers participated as "students" in seven different PAUTA activities and, in the last session, were provided with information and nomination forms for identifying their own talented secondary students in the sciences in preparation for the first student workshop in the spring of 2009.

The workshop leaders, primarily undergraduate and graduate students who participated in the design of the activities, were assigned responsibilities within the project (e.g., database maintenance, finances, evaluation) and also worked directly with teams of teachers in the workshops. They facilitated the teachers' collaborative work during the activities and observed their specific scientific abilities and attitudes. They worked 10 hours per week. In the first stage, the teachers merely "experienced" the activities in the workshop as "students," so that they would understand the design of the activities. At a later stage, the teachers will replicate these in their own classrooms, and then, in the final year, the teachers will participate in the design of the activities.

Evaluation of Year 1 of the PAUTAmor Project

Each state modified the program, based on the socio-cultural context and developmental levels of its students.[12] PAUTAmor is an adaptation of Renzulli and Reis' (n.d.) triadic Schoolwide Enrichment Model and Renzulli's (2004) Revolving-door Identification Model. The program is designed to facilitate the identification and support of talented students in science and mathematics and to promote higher-level scientific abilities and attitudes. Renzulli's triadic model is used to describe an expanded conception of scientific talent, with a broad-based student-selection process. Multiple criteria and a wide variety of assessment methods are used in the student-identification process.

PAUTAmor was designed as a three-year pilot project, with an ethnographic emphasis, employing multiple instruments in the collec-

[8] Published by the Academia Mexicana de Ciencias (no author and date)

[9] Financial support from PAUTA Nacional and FOMIX (Fondo Mixto – Morelos: Project MOR-2008-C01-93345, "*Implementación y desarrollo del Programa Adopte un Talento (PAUTA) para fomentar la vocación científica en los jóvenes del Estado de Morelos*"

[10] http://www.acmor.org.mx/

[11] ACmor has a tradition of promoting scientific activities and offering support for students through a number of initiatives: developing a student congress for secondary schools, drawing from numerous states in the country, to present research results; establishing a summer research program for students in Morelos; supporting the scientific Olympics; and sponsoring teacher-development programs, principally through "Scientific Thought in the Classroom," a diploma course for secondary- and high-school science teachers.

[12] In the state of Chiapas, for example, the program works with indigenous, primary-school children living in extreme poverty, who speak Spanish as a second language.

Table 1. *Three-Year Program PAUTAmor*

Year of Secondary School	Year of PAUTAmor Program		
	2008 – 2009 Pilot Stage	2009 – 2010 Development Stage	2010 – 2011 Consolidation Stage
First	Workshops* (focus on biology[13])	Workshops* (focus on biology)	Workshops* (focus on biology)
Second		Workshops* (focus on chemistry and physics)	Workshops* (focus on chemistry and physics)
Third		Selection	Research projects with mentors

* All workshops address mathematics, as well as the application of mathematical strategies in other scientific areas.

tion and analysis of qualitative and quantitative data, in order to evaluate the success of the program. It uses questionnaires, checklists, Likert scales, observations, field notes, videos, interviews (Adler & Adler, 1998), and participant portfolios (Johnsen, 2008). The quantitative data are evaluated with the SPSS (version 13) and the qualitative data with discourse analysis, using emergent categories (Clandinin & Connelly, 2000; Lemke, 1997; Lenoir, 2006). The descriptive analysis of the data is designed to provide a broad-based view of the development of each participant at each stage. The constant comparative method, over time, permits the identification of key issues and recurrent events as they relate to each student's observed creative and scientific abilities and attitudes. Despite the small sample size, the collection of data with multiple instruments serves to increase the reliability of the observations, the authenticity of the data, and the validity of the conclusions (Adler & Adler, 1998; Taylor & Bodgan, 1990).

The program consists of three stages: Pilot (2008 - 2009), Development (2009 - 2010) and Consolidation (2010 - 2011). The first year of the program is devoted to training teachers. The second year will involve secondary-school students, with the aim of developing specific scientific abilities. In the third year, a selected subsample of students, based on their successful performance in the PAUTAmor workshops, will continue in the program, working with scientist-mentors on various, advanced research projects of interest (Table 1).

Pilot Stage 2008 – 2009

Workshops

The first steps in the pilot stage included selecting six leaders[14] to develop workshops on different science topics, four in biology (the science taught in the first year of secondary school), two in mathematics, and one in physics (see Table 2). As well as being workshop leaders in their own discipline, each leader served as facilitator for a group of five "students" in other workshops.

Each workshop was developed according to a pre-established format of PAUTA National[15] (see Table 3). The purpose of each workshop was to present intellectually stimulating problems, to re-examine previous scientific concepts covered in the basic curriculum, to generate questions, to promote curiosity, and to conduct research relevant to the specific challenges raised, but not to introduce new concepts, per se. Each workshop was designed with the use of the simplest and least expensive materials possible in order to make

[13] The scientific focus of the workshops is related to the national curriculum of the SEP.

[14] Workshop leaders were chosen on the basis of a series of exams and interviews by members of PAUTA National and the general coordinator for PAUTAmor. Four are postgraduate students in biotechnology, one an undergraduate biology student, and one a psychology undergraduate.

[15] PAUTA National is an association with a national perspective although it currently involves only four states.

Table 2. *PAUTAmor Workshops, 2008 – 2009*

Science Area	Title	Content
1. Biology: Classification	"Look Lively!"	Identification of living organisms, determination of their characteristics and different bases for classification, and development of food chains
2. Biology: Respiration	"Sweet Energy"	Yeast cultures with different carbohydrates to determine which is most effective in producing carbon dioxide
3. Biology: Asexual Reproduction	"1 + 1 → 4"	Model of exponential growth of bacteria and effects of different variables on growth
4. Biology: Evolution	"Butterflies Through Time"	A simulation of natural selection of differently colored butterflies against different backgrounds, and relevance of genetic variation
5. Mathematics: Logic	"I Bet you Can!"	Solving two games of logic using concrete objects to represent the problems to be resolved
6. Mathematics: Logic	"Sure you Can!"	Proposing a method to determine which of 21 identically sized balls weighs most, using a balance, making 3 attempts
7. Physics: Optics	"Mirror Vision"	Geometry of the formation of images in a mirror

workshops easier for teachers to duplicate in their own schools. Each workshop leader was also given a specific administrative responsibility within PAUTAmor. Progress in workshop development was reviewed during weekly meetings with the project coordinators and all workshop leaders. The groups who developed the respective workshops were each responsible for the piloting process.

During the first semester, multiple instruments were selected, adapted, or designed to obtain feedback on the workshop content, delivery processes, and projects throughout the program from all the participants. This same model will continue to be used each year with new topics and new workshop leaders.

In September 2008, the first three workshops were piloted with teachers from two different schools, (delivered on Saturdays), and adjusted accordingly, based on the experiences of the workshop leaders.

Checklists of student abilities and attitudes

In October 2008, a group of secondary science and mathematics teachers[16] were invited to participate in the workshops on a weekly basis, two hours each Saturday, from October to December. A total of 24 teachers accepted the invitation,[17] first attending a presentation of PAUTAmor, then participating in the seven workshops, as "students." The workshop leaders served as presenters of their own work and as facilitators of the subgroups of five "students." During these sessions, the facilitators piloted the use of the observation checklists of scientific abilities and attitudes, an instrument to be used later with students in the PAUTA workshops. The items on the checklists include the ability to

- organize and plan (e.g., express ideas, formulate problems, identify variables, generate original questions, elaborate on predictions or hypotheses, and devise feasible action plans),
- engage in scientific activity (e.g., manipulate materials precisely; adapt materials or methods; select, organize, and classify relevant information; control variables; conduct orderly work; develop observation skills),
- interpret (e.g., engage in abstract thought, process and analyze information, identify patterns and relationships, show originality, explain or justify conclusions, establish causal inferences, evaluate strengths and weaknesses of processes, identify limitations, and develop new research questions), and

[16] The teachers were taking the diploma course, "Scientific thought in the classroom," offered by ACmor.

[17] Each teacher is registered in the SEP, and, at the end of the workshops, receives a letter of recognition for his or her participation if he or she has attended at least 50% of the sessions.

Table 3. *General Format for Workshops*

Workshop Stage and Length (min.)	Procedure	Questions
1. Presentation (20 min)	Presentation of the topic, problem to be studied, and general procedures (maximum: 30 per group)	Specific questions on basic comprehension and predictions with rationales, related to each theme Examples: What do you know about …? Can you suggest a way to …? What do you think will happen when …? etc.
2. Development / Construction (60 min)	Subgroups are assigned a workshop leader and facilitator (maximum: 5 students per group) Activities: exploration of the problem; constant reflection of processes; testing of ideas and predictions; collecting, analyzing, and evaluating data; interpreting patterns and relationships; and drawing conclusions Observation and evaluation of student participation by workshop leader	Questions related to specific observations, strategies, explanations, interpretations, and analyses of original predictions Examples: What are your results? Are your results the same each time? What are the differences? Why? How did you determine that? How do your results compare with your prediction? If you change …, what would happen? etc.
3. Plenary (20 min)	The whole group reunites to exchange experiences, observations, conclusions, and relationships to common activities.	Questions contrasting the results of each group of students Examples: What did your group observe? Why are there different results? How did you organize your work? What would you change? How did your group work together? How does this work relate to….?
4. Closure (20 min)	Students reflect on the workshop. Additional challenges are presented. (Optional challenges are assigned in preparation for the next session.)	Questions to promote individual reflection Examples: What did I learn? How did I learn it? What have I discovered? What could I still investigate?

- communicate (e.g., use correct scientific terminology, argue effectively, discuss and verify predictions, establish relationships, reflect on work, and write clearly).

In addition, an observation checklist assessing student attitudes was designed with a double entry of quality (four levels from "regular" to "exceptional") and frequency (four levels from "almost never" to "almost always"). The resulting matrix identifies students' dispositions relating to

- collaboration (e.g., engaging in group work and positive interdependence, learning cooperatively, negotiating, reflecting),
- respect (e.g., listening, sharing, supporting others' efforts, keeping an open mind to others' ideas),
- persistence (e.g., showing self-motivation, responsibility, patience, and tenacity),
- initiative and creativity (generating unique ideas, solutions, and procedures),
- flexibility (e.g., viewing ideas, problems, and solutions from different perspectives),
- self-reflection (recognizing one's strengths and weaknesses, aspiring to constant self-improvement), and
- independence (e.g., pursuing intellectual autonomy).

Rating scale for workshop content and teacher participation

At the end of each session, the teachers, as students, also completed an evaluation of the specific workshop. This was in the form of a questionnaire designed with 24 items (12 assessing the workshop and 12 assessing the teachers' participation), all with a 5-point Likert scale ranging from 1 ("insufficient") to 5 ("excellent"). This was followed by nine open-ended questions on various aspects of the workshop, such as level of difficulty, appropriateness for the students' varying abilities, and overall strengths and weaknesses.

Rating scales for use of constructivist principles and approaches in their teaching

During these sessions, the teachers, as students, also completed two additional questionnaires, one on their vision of constructivist learning for their own students and a second one on science teaching. The purpose of these evaluation tools was to provoke reflection on their own teaching practices, as well as to add relevant pedagogical information to the database on each teacher.

The 6-point Likert rating scale on constructivist learning was adapted from Salish I (Salish I, 1997), consisting of 42 items. The items form six categories of analyses of the teachers' perceptions of students' roles in the classroom: (1) ensuring personal relevance of science for their students, (2) nurturing student awareness of scientific uncertainty, (3) encouraging constructive student criticism of teaching and learning activities, (4) fostering student control of the learning environment, (5) promoting student-teacher interactions or negotiations and, (6) engendering student attitudes (validity check).

The five-point Likert rating scale on science teaching was adapted from Martinez et al. (2002), with 59 items, organized into four categories: (1) workshop content, (2) methodology, (3) evaluation, and (4) professionalism. The frequency scale was then organized into three categories: constructivist, intermediate, and traditional, permitting the identification of the perceived teaching and learning model of each teacher.

The responses to the two scales were recorded and analyzed, with results forming part of the initial profile of the teachers in the database.

A final debriefing session was held with the teachers to discuss possible conceptual uncertainties or challenges emerging from each workshop. The teachers were encouraged to use these same workshops and strategies with their own students, thus, generalizing their experiences to their own teaching practices to improve science teaching for all. In this way, the workshops served as professional development for teachers.

Periodic training sessions were given to workshop leaders to establish the norms for interpreting the categories used to design the observation checklists for assessing students' scientific abilities and attitudes. Sessions were also designed to train leaders on the use of the instruments to increase interrater reliability (Renzulli & Callahan, 2008). Video excerpts of collaborative work from all participating pilot groups were observed by all potential workshop leaders, who made individual notations on the instruments. After each training session, the results were compared and discussed, with the process repeated until overall agreement on the interpretation and use of the instruments was reached.

The PAUTAmor workshops, in January 2009, culminated in a special session involving teacher attendees, ACmor diploma-course students, and teachers from other schools. Its purpose was to give teachers the basic tools to identify their own students with notable interests and aptitudes in science and mathematics. This was a prerequisite for inviting their students to participate in the next set of PAUTAmor workshops for students from February to June 2009.[18] At this session, 18 teachers from 13 different secondary schools were present. The instruments and specific procedures for nomination were explained and distributed, with the request that the teachers nominate their students before the end of January 2009.

Results of the Evaluation of the First Pilot Year

Rating scale for workshop content and teacher participation

Of the 24 teachers registered in the workshop, only half had a minimal attendance of 50%.[19] The results of the evaluation of each workshop were highly positive, with virtually all aspects of the materials, design, and their own interaction graded as excellent or close to excellent (averages above 4.5, with 5 as excellent), with the exception of their own par-

[18] IQ tests are rarely used in Mexican schools, so this information is not available.

[19] A teachers' strike in Morelos blocked all public basic education for two months in the fall semester of 2008, affecting the numbers of teachers taking the ACmor diploma course, the point of contact for teachers to participate in the PAUTAmor workshops. The two-hour workshops followed the two-hour diploma course every Saturday, time for which the teachers received no compensation.

Table 4. *Teachers' Perceptions of Their own Constructivist Practices*

Teachers' Scores	Elements of Teachers' Constructivist Practice					
	Ensuring personal relevance of science for their own students	Nurturing student awareness of scientific uncertainty	Encouraging constructive student criticism of teaching and learning activities	Fostering student control of the learning environment	Promoting student–teacher interactions or negotiations	Engendering positive student attitudes
Mean	2.47*	3.16	1.99	3.82	2.73	2.94
Range	1.7 – 3.6	2.9 – 3.6	1.1 – 2.7	2.9 – 5.4	1.6 – 3.6	2.3 – 3.7

* The six-point scale is from 1 (always[20]) to 6 (never).

ticipation in one workshop, which had an average evaluation of 4.0 (good). In the open questions, all answered that the workshops met their expectations and described the work as interesting, fun, motivating, and challenging, with good integration of mathematical skills. All said that they were motivated to renew their own teaching practices and desired to apply the workshops in their own classes, with some indicating a need for further assistance to do so. The noted strengths of the workshops included the knowledge of the workshop leaders, their teaching strategies, the simplicity of the materials, and the size of the small groups. For weaknesses, most recorded "none," but some mentioned problems of punctuality of the participants that resulted in less time to conclude the work properly, inadequate publicity about the program, and limited space for presentation setup.[21] Suggestions for improvement included providing more specific content information on the various topics, time to study the topics beforehand, and, in a few cases, clearer instructions. According to observations made by the workshop leaders during the different sessions, some of the teachers (as students) were frustrated by having their questions answered with more questions, but, generally, agreed that it motivated their own efforts to solve the problems.

Rating scales for use of constructivist principles and approaches in their teaching

Eight teachers completed the rating scale on constructivist learning, and eight completed the scale on science teaching practices, with four teachers overlapping, allowing for a limited comparative analysis.

The data on constructivist learning (Table 4) indicate that these teachers provide the environment for some aspects of constructivist learning in their own science classes, for example, by permitting student criticism of and participation in the teaching-learning activities. The least constructivist practice is the teacher maintaining control of the learning environment, although there was considerable variation in the teachers' perceptions in this respect. These response patterns indicate a somewhat contradictory view and merit further investigation.

The data on science teaching practices (Table 5) indicate that the teachers consider themselves to fall between traditionalism and constructivism in the areas of content, evaluation, and professional perception, but lean towards constructivism in the area of methodology. Of the four teachers who answered both questionnaires, there was an overall consistency in their declared practices as intermediate.

In succeeding years, these questionnaires will be administered to all new teachers participating in PAUTAmor and may also be used again with the original teachers at a later date to see if there are changes in their teaching practices, particularly if they, indeed, apply the new strategies learned in the workshops in their own school classrooms. In future, it

[20] *Always* refers to constructivist practices.

[21] The teachers' workshops were held in a large science laboratory in the Institute of Biotechnology of the UNAM. The student workshops will be held in a new science museum for children, to be opened in Cuernavaca, Morelos in February 2009, which has an appropriate space for workshops.

Table 5. *Teachers' perceptions of their science teaching practices: traditionalist or constructivist?*

Teachers' Scores: (traditional = 1 intermediate = 2 constructivist = 3)	**Categories of Science Teaching**			
	Content	Methodology	Evaluation	Professionalism
Mean	1.98*	2.40	2.14	2.02
Range	1.6 – 2.5	2.1 – 2.6	1.7 – 2.7	1.8 – 2.2

* The five-point frequency scale is reduced to a 3-point scale: 1 (traditional), 2 (intermediate) and 3 (constructivist).

would also be relevant to confirm the declared practices through direct observation of these teachers and to ascertain that the statements are not merely expressions of intention or belief (Paul de Verjovsky, 2005).

Conclusion

This paper describes the Mexican Programa Adopte Talento A.C.[22] (PAUTA), or Adopt a Talent Program,[23] and the specific development and initial evaluation of PAUTAmor, the PAUTA branch in the state of Morelos. The aim of PAUTA is to develop creativity and essential scientific abilities and attitudes among students.

In the PAUTAmor project, all the participants, materials, processes, products, strategies, and instruments were constantly being evaluated in an attempt to assess the success of the pilot project. The first complete evaluation was carried out in the summer of 2009. The impact of the pilot workshops was analyzed from the different perspectives of the participants, in search of constant improvement of the program. Pilot workshops were redesigned where considered necessary, and new ones were developed for the following year, with an emphasis on chemistry and physics, the science classes in the second- and third-year curriculum of secondary school. Early in 2009, an external evaluator, appointed by PAUTA Nacional, made periodic visits, observing workshops and meetings and interviewing different participants. The evaluator's report formed an important complement to the internal evaluation. Ultimately, the success in identifying talented students in Mexico, providing supportive programming to nurture their potential, and finding them flourishing in science careers will provide more definitive validation of the PAUTAmor program.

PAUTAmor also has the intention of supporting students with pressing economic needs in order to continue their attendance in the workshops and projects and, if necessary, to remain in school.[24] The scientific community and the entire social sector have been invited to participate in this innovative Adopt a Talent Program to support the mission to establish excellence and equity in education throughout Morelos.

[22] A.C. means civil association and is part of the name.
[23] http://www.pauta.org.mx/home/

[24] This has occurred mainly in the state of Chiapas where a number of indigenous students have received scholarships that have enabled them to continue their schooling.

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PART 3: ASSESSMENT CONSIDERATIONS

1. Identification of Mathematically Promising Students in a Diverse Society: A Question of Equity

Dorit Neria
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Abstract

How one defines academic talent is influenced by one's culture and socio-economic background. Therefore, ensuring an equitable and unbiased process for identifying promising students in a diverse society is complex. This paper, first, provides a brief review of the available identification methods and their respective limitations for addressing the inclusion of students from diverse backgrounds. It, then, offers an example of a successful strategy used in southern Israel to select talented students from various cultures to participate in the "Kidumatica" mathematics, which aims to promote the abilities of mathematically talented youth.

One of the core aims of education is to develop each student's potential, regardless of his or her ethnic and religious affiliation, socio-economic status (SES), or gender. Therefore, it is troubling to learn that, in many cases, there is a link between placement in educational programs and these factors. Disadvantaged groups are overrepresented in low-track classes and underrepresented in programs for the gifted and talented (Borland & Wright, 2000; Donovan & Cross, 2002).

This under-representation has wide-scale implications for involving students in programs for those gifted in mathematics. Mathematics is considered an academic gatekeeper (Galbraith, 1993) for advanced education in the fields of science and technology. Participation in programs for the academically gifted and talented in mathematics has unmistakable consequences for an individual's further academic growth. The challenge of mathematical problem solving contributes to the development of students' cognitive abilities and promotes changes in non-cognitive aspects of learning, such as self-confidence and increased interest in and enthusiasm in the discipline (Olszewski-Kubilius & Yasumoto, 1995; Wieczerkowski, Cropley, & Prado, 2000). This may also lead to students' improved social and economic status (Moses & Cobb, 2001).

Educators and researchers have not agreed on the exact definition of academic giftedness and talent (Feldhusen & Jarwan, 2000; Gagne, 2004). The vagueness of the general definition of giftedness also extends to mathematical talent and, consequently, influences the selection of candidates for advanced mathematical programs (Wieczerkowski et al., 2000).

The definition of mathematical talent is influenced by the perception of academic talent, as well as the essence of mathematics. The different definitions are conceived as a continuum, the two ends of which can best be described as *quantitative* versus *qualitative* (Wieczerkowski et al., 2000). Mathematical talent as a quantitative trait pertains to students who are capable of solving conventional mathematical problems well and quickly; as a qualitative trait, it describes students whose

talent is solving more challenging and non-conventional problems using original and elegant strategies.

Krutetskii (1976) argues that mathematical giftedness consists of several abilities, such as logical thought, effective organization and processing of information, pattern recognition, generalization, reasoning, flexibility of mental processes, and clarity and simplicity in generating solutions. The prominence of these traits has been confirmed by several researchers (e.g., Dahl, 2004; Diezmann, & Watters, 2001; Koichu & Berman, 2005; Sriraman, 2003). Affective traits, such as motivation, interest, and persistence, also distinguish academically talented students from their non-gifted peers (Wieczerkowski et al., 2000).

Approaches to Identifying Mathematically Talented Students

There are a number of methods for identifying mathematically talented students. The most frequently used approaches are reviewed below.

IQ tests. Traditionally, the identification of giftedness has been rooted in psychometric evaluations of intelligence quotients. IQ tests are easy to administer to a large number of students. They, however, do not take into account domain-specific talent, such as mathematics, and do not assess non-intellectual factors, such as motivation and task commitment. There is a continuing debate regarding cultural sensitivity in IQ tests, and research has found IQ tests to be biased against minority students, since intelligence tests are largely constructed to meet the norms of a dominant white, middle-class population (Barber, 2005; Ford, Baytops, & Harmon, 1997; Katzman, 2003; Suzuki & Valencia, 1997).

Standardized tests. The use of standardized tests, a common method, has the advantage of being content specific. As the test is simple to administer, identifying promising students in mathematics is relatively easy. Standardized tests are criticized mainly because of their inability to reveal specific *qualitative* mathematical traits. They may test students' memory and ability to repeat a learned procedure rather than original mathematical thinking. The emphasis on right or wrong answers may obscure insight into students' thinking processes. An analysis of solution paths can provide important information beyond the correctness of the solution and reveal mathematical promise (Neria & Amit, 2006; Niederer & Irwin, 2001), as well as other traits, such as motivation, perseverance, and creativity (Wertheimer, 1999). Like IQ tests, however, some standardized tests have been found to be culturally insensitive (Ford, 1998).

School and teacher nomination. Another means of identifying students is through teacher nomination since teachers can provide much information about their students' abilities. Not all teachers, though, have a sufficient knowledge of giftedness. Teachers often associate assertive students or high grades with academic talent, even though poor academic achievement does not necessarily indicate a lack of giftedness (Maitra, 2000; Wilson & Briggs, 2002). Lack of performance may be a result of boredom (Reis, 2003). In addition, some teachers may have biases with respect to gender or ethnicity (Elhoweris, Mutua, Alsheikh, & Holloway, 2005; Maitra, 2000).

Mathematical problem-solving test. A teacher-designed test comprised of tasks used to identify various aspects of mathematical ability is an alternative method for identifying mathematically gifted students. Such tests are content specific; however, they are time consuming and administratively demanding. The testing, typically, involves a large number of students, and the checking and grading process is performed by the teacher (Wertheimer, 1999). In identifying students, one must ensure equal opportunity for all.

An unbiased process must consider that excellence is not defined by similar values in all cultures and that not all students receive the same degree and kind of schooling (Borland & Wright, 1994; Peterson, 1999). Therefore, the purpose of the identification process should be not only to find students who can demonstrate their talents but also to find those who have potential (Ford et al., 1997).

The "Kidumatica" Mathematics Club

This paper describes the selection process for participation in a mathematics club—the "Kidumatica" club—designed for developing

and nurturing mathematically promising students in the southern region of Israel.

Kidumatica was first established in 1998 to provide a framework for the cultivation and promotion of youth (aged 10 to 17 years) with high mathematical abilities. Kidumatica activities expose students to a variety of mathematical subjects, varying in content and strategy. These subjects provide enrichment and enable students to develop sophisticated and creative mathematical thinking. Since its founding, Kidumatica has attracted a multitude of applicants. With a limited number of spaces available in the club, some selection of students is required to ensure that a challenging, high-level mathematical environment is maintained.

Due to Israel's diverse population, with representation from a variety of ethnic, religious, cultural, and social backgrounds, the process of identifying and selecting students for the mathematics club is complex. To create equal opportunities in a diverse society, one must adopt different approaches in both curriculum and assessment (Amit, 2000; Amit, Fried, & Abu-Naja, 2007). One of the main concerns of the Kidumatica leaders is not to overlook promising students who study in schools that do not provide high-level mathematics studies.

A Two-Stage Identification Process

A single identification method is insufficient to determine eligibility for gifted and talented programs; both quantitative and qualitative information about the students' abilities is needed (Ford et al., 1997). Therefore, the screening process is multidimensional, and special consideration is given both to the students' problem-solving processes and their absolute and relative ranking, as described below.

Stage 1: Teacher- or self-nomination. Letters are first sent to all the schools in the region, asking mathematics teachers to recommend the top students in their classes. This initial recruiting method has the advantage of providing an opportunity for all students in the region. It also has its disadvantages; for instance, some teachers tend to view the more assertive pupils as talented and ignore the quiet ones. Also, bias might prevent teachers from recommending some of the students, especially members of minority groups (Elhoweris et al., 2005; Maitra, 2000; Wilson & Briggs, 2002).

Therefore, students are also invited to nominate themselves. The self-nomination provision is based on the assumption that motivated students who are overlooked by their teachers but consider themselves eligible deserve the same opportunity as their peers.

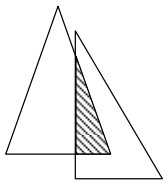
Stage 2: Entrance exam. The students are asked to take an exam that is designed to reveal the abilities that the mathematically gifted are assumed to have, including, among others, a capacity for generalization, abstraction, data organization, as well as other important traits, such as persistence and motivation. The latter are important in assessing a student's intellectual stamina and will to succeed, even in the face of frustration and lack of knowledge. The test consists of routine and non-routine tasks. Tasks are based on the school's curriculum because schools with low-income students or with large minority populations may have less-experienced and less-qualified teachers (Burney & Belke, 2008). Rather than aiming at evaluating students' command of schoolbook problems, the tasks are aimed at revealing mathematical potential. This is achieved by qualitative analyses of the applicant's solution strategies to tasks that demand such mathematical traits as organization and processing of mathematical information, reasoning, use of number sense, and logical thought (See Figures 1 and 2).

During the exams, the Kidumatica teachers are present to assist the examinees. Students may lack the appropriate terminology (such as "natural numbers" or "pentagon"), and having such terms clarified does not harm the validity of the exam, whose aim is to reveal mathematical promise rather than the command of mathematical terms or reading comprehension. In addition, new immigrants are given assistance with the language, and tests for students from the Bedouin minority are translated into Arabic.

Selecting Students

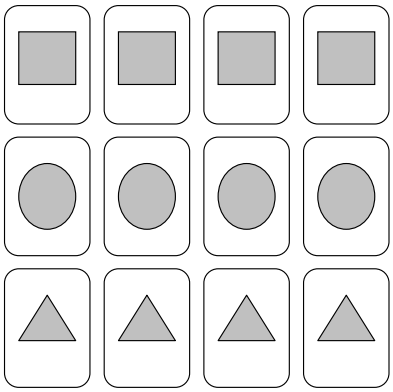
Grading process. Correct answers are allotted maximum points, but there is also an emphasis on the solution paths and their justifications, so as not to overlook students' cognitive abilities, such as solution strategies, reasoning, or elegance. When one looks only for correct answers, crucial information about

The following drawing consists of two triangles. Their overlapping area is also a triangle.



Draw two triangles with an overlapping area that forms a pentagon.

The following drawing consists of 12 cards.



A boy shuffles the cards and puts them facing down on a table. He picks up one card at a time.

The game ends when one of the two possibilities occurs:
* He holds three identical cards.
* He holds three different cards.

How many cards does he have to pick up in order to be sure that the game has ended?

Explain your answer.

Figures 1 & 2. Examples of Problems from the "Kidumatica" Entrance Exam

students' cognitive abilities may be bypassed, whereas their answers to non-routine tasks reveal mathematical promise, regardless of their correctness (Neria & Amit, 2006; Niederer & Irwin, 2001).

Selection. Acceptance to the "Kidumatica" mathematics club is based mainly on the exam scores. The students who achieve the highest scores, overall, are accepted, but special care is taken to ensure that some candidates from every nominating school are accepted. The students with the highest grade from each school are automatically accepted, even if they did not score highly, overall, since they are best in relation to the standards of their school. This approach provides an equal opportunity for all students, regardless of their comparative mathematical ability and level of schooling.

Conclusions

The process of identifying promising students in mathematics is complex, and several aspects should be considered in such a process. Both cognitive traits (such as mathematical logic and reasoning) and affective traits (such as motivation and persistence) must be taken into account. In addition, an effective method must be found to identify students of diverse cultural and social backgrounds. In order to ensure equity in the acceptance of students, regardless of their social background and previous schooling experience, the identification process must be two-staged and include testing of material not solely based on the school curriculum. The selection of students should not be based on the rank ordering of entrance-exam grades, alone, but must be multi-dimensional and based also on affective traits, such as motivation and the will to participate in the program.

The process described above has proven successful. Kidumatica students have won countless national and international contests, participate in university courses at a young age, and, most importantly, acquire the tools that will equip them to be the potential future technological and scientific leaders of Israel.

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2. Engaging the Minds of our Youth: The High Performing Student Program at ACS Athens

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Abstract

ACS Athens is an accredited Kindergarten to Grade 12 International Baccalaureate school, which offers students enriched programming across all subjects. The newly implemented High Performing Student (HPS) Program, unique in Greece, is part of the school's Optimal Match program in which the curriculum is matched to the students' needs and abilities through differentiation and extended learning. The authors developed a survey (adapted from Williams' Performance Levels of a School Program Survey, 1979) to review the HPS Program initiated at ACS Athens in the fall of 2008. Sixty-two teachers, administrators, and counselors (across all grade levels) completed the survey in May 2009, reflecting a 78% response rate. The survey addressed students' abilities in domains such as intellectual, leadership, creative-thinking, visual and performing arts, and affective abilities, which were assessed with respect to teacher training and professional development, community involvement, student-centered programming, and independent student learning. Results from this initial survey identify the program's multiple strengths and set the foundation for further development and consolidation of the school's HPS Program.

> *The world can be a wondrous playground of energy, curiosity, enthusiasm, like a ball of fire bouncing off of a court, twisting, turning, changing directions, angles, height and depth, seeing, observing, evaluating, contemplating, seeking meaning and understanding. It is through the process of reflecting that a simple isolated idea or concept can be transformed into a realm of infinite possibilities.* (Eleni Froustis-Vriniotis, Educator and Counselor, ACS Athens School, 2008)

In 2006, the University of Winnipeg (UW) in Canada and the American Community School (ACS) of Athens, an accredited Kindergarten to Grade 12 International Baccalaureate (IB)[1] school in Greece, signed a memorandum of understanding inviting UW senior education students in the final year of their degree program to complete their five-week practice-teaching block, as interns, at ACS Athens.

In 2008, the first two authors visited ACS Athens as representatives of The World Council for Gifted and Talented Children. Dr. Stefanos Gialamas, President of ACS Athens, expressed an interest in initiating a gifted program at his school and asked us to evaluate the program at the end of its first year of op-

[1] The ACS Athens high-school diploma is recognized by the Ministry of Education and Religious Affairs.#

eration. We accepted his invitation and undertook the evaluation in May 2009. The goal of this article is to report on the results of this evaluation, identify the strengths of the gifted program, and recommend areas for further development. A secondary objective of this study is to assess the usefulness of the evaluation instrument, a teacher survey for evaluating gifted programs in schools, adapted from Williams' Performance Levels of a School Program Survey (PLSPS).

The Context

ACS Athens School

ACS Athens is an international school that was founded in 1948 to serve the families of the newly established American military base in Greece. Currently, there are almost 800 students enrolled, representing over 45 countries. Approximately half of the students are American citizens of Greek origin; the remaining students are from the Middle East, Canada, Africa, Europe, and the People's Republic of China. Students are typically children of diplomats, chief executive officers, academics, government officials, and businessmen. Accredited by the Middle States Association of Schools and Colleges, as well as by the International Baccalaureate Organization, ACS Athens is located in the Halandri suburb of Athens, Greece.

As a state-of-the-art facility, ACS Athens is a full-capacity, wireless campus with interactive boards in most classrooms and laboratories. It has an extensive library containing the largest collection of English language books in Greece, numerous fully equipped science laboratories, a large professional-quality theatre, a fine-arts classroom suite, and a music room. The school also has outdoor basketball, volleyball, and tennis courts, as well as a large gymnasium, a weight-training room, and an Olympic-size swimming pool.

Staff includes 96 teachers, 64 of whom have Master's degrees and four of whom have doctorates. Teacher-student classroom ratios range from 1:8 to 1:25. Several teachers are accomplished authors in their own right, having published books in the fields of mathematics, history, poetry, counseling, leadership, and linguistics. The physics teacher is the author of the IB text in Physics used by IB schools throughout the world.

ACS Athens has an outstanding record of student placement following graduation, with over 95% of graduates placing in top universities around the world, including Cambridge, Harvard, Princeton, Yale, Duke, UCLA, Cornell, and Tufts.

The school is developing a Stavros Niarchos Foundation grant proposal to establish a Research and Development Centre and an In-Service Training Institute for teachers around the world.

Enrichment Opportunities

ACS Athens, as a premier school in Greece, is known for its numerous program initiatives that promote innovative teaching and learning, including a Summer Leadership Institute, a major Newscoop student journalism project, and its award-winning Institute for Creative and Critical Thinking.

Summer Institute on Academic Leadership. In 2009, ACS Athens initiated a summer leadership institute, in partnership with the University of Richmond, Virginia (Jepson School of Leadership Studies). ACS Athens students from Grades 11 and 12 first attended a three-day workshop at their home school, designed to challenge their personal concept of leadership as they explored its theoretical links with democracy, ethics, and community service, even as they explored the leadership potential within themselves. This was followed by a week-long series of workshops at the University of Richmond, focusing on the philosophical, historical, ethical, and social science foundations of leadership, the Jeffersonian ideal of democracy, and leadership in the field of science and environmental issues. As a follow-up to their academic studies, students had an opportunity to observe leadership in action in Washington, DC to learn, personally, from leaders in politics, business, law, government service, the military, medicine, journalism, and public-interest lobbying. Steve Madeiros, the school's academic director, reported that "[s]tudents were engaged in discussion, debate, role-playing, consensus building, negotiating, problem-solving, and project work, supported by a rigorous program of multidisciplinary reading" (Gialamas, Pelonis, & Medeiros, 2009, p. 21).

Newscoop student journalism project. Newscoop, an organization founded by Harvard University's Kennedy School of Government, has developed stellar student journalists who write about world issues from a student's perspective. The Newscoop project at ACS Athens offers students the opportunity to write, edit, and produce news documentaries in collaboration with other students throughout the world. The goal is to create a trusted news source, accessible on the web by students around the globe to inform each other. In 2009, ACS Athens students produced their first piece, a 26-minute documentary on the Israeli-Palestinian conflict that was covered nationally by the Greek television media, with rave reviews (Kelly, 2009).

The village project. Since 2007, when fires ravaged the Greek countryside, ACS Athens has supported the Lepreo Village Elementary School, located in the Zaharo municipality. ACS Athens helped renovate the school, test the local water sources for contaminants, plant 150 trees in the burned forest area, establish a Technology and Education Centre to teach computer skills to students, and raised 5,000 Euros to purchase the school's first computer lab**.**

The world debate tournament. In 2009, ACS Athens hosted eight national teams for the first round of the World Schools Debate Championships, under the auspices of the President of the Hellenic Republic. Countries represented included Germany, Mexico, Netherlands, Indonesia, Romania, Scotland, Israel, and the Philippines. ACS Athens students had a unique opportunity to watch world-class competitors in action.

Institute for Creative and Critical Thinking (ICCT). Successfully launched in the summer of 2006 by ACS Athens, in conjunction with leading universities, worldwide (Williams College, USA; Tufts University, USA; and York University, Canada), the first Athens Summer Institute marked a milestone in the school's history. The Institute established an innovative school and university partnership to promote critical and creative thinking across the disciplines for students enrolled at ACS Athens. It offered a unique, educational experience for young people from all over the globe who aspire to become world leaders in science, technology, business, government, education and community affairs, and the arts. Its Director, Steve Medeiros (2007), elaborates:

> … [In the summer of 2006], over the course of two weeks, our learning community was introduced to an amazing range of artifacts and ideas: the art of Mark Rothko as a meditation on the concept of infinity, a psychological approach to the issue of managing change, the idea of a map as a metaphor for and theory of how we interpret the world, the poetry of Emily Dickinson set to the musical forms of Protestant hymns, knot theory and its relation to the structure of DNA and the science of cloning, a Chandra Sheka meditation on the White Dwarf and the clash of old and new ideas in the field of physics, exploring African changes and rhythms through voice and movements as a means of creating theatre, the elegant and profound simplicity of the movement of a pendulum and what it tells us about the way the universe works, and the paradoxical mathematical concept that there are different sizes of infinity. And, all of this before the students and teachers moved on to the class!...Through collaborative inquiry and problem-solving, presentations, demonstrations, formal debates and discussions, experiments, writing in a range of genres, critical reading, games, improvisations, simulations, performances, field trips to Epidaurus and Delphi, and regular reflections on their learning, Institute participants explored the content of their…courses, honing their academic skills, while expanding their understanding of literature, science, mathematics, theatre, and politics. (Medeiros, 2007, pp. 20–21)

In 2009, the ICCT was awarded the prestigious Nikolai N. Khaladjan International Award by the American Association of University Administrators, the first time in its 40-year history that it had been offered to a Kindergarten to Grade 12 school, rather than to a university.

Virtual science fair. In 2009, ACS Athens middle-school students participated in the first ever virtual science fair, which involved hundreds of students, mentors, judges, and teachers from schools from around the globe. NVSF[2] Project Director, Stuart Fleischer of Israel, noted that "[w]hat was once considered

[2] NVSF stands for NESA Virtual Science Fair and NESA for Near East South Asia.#

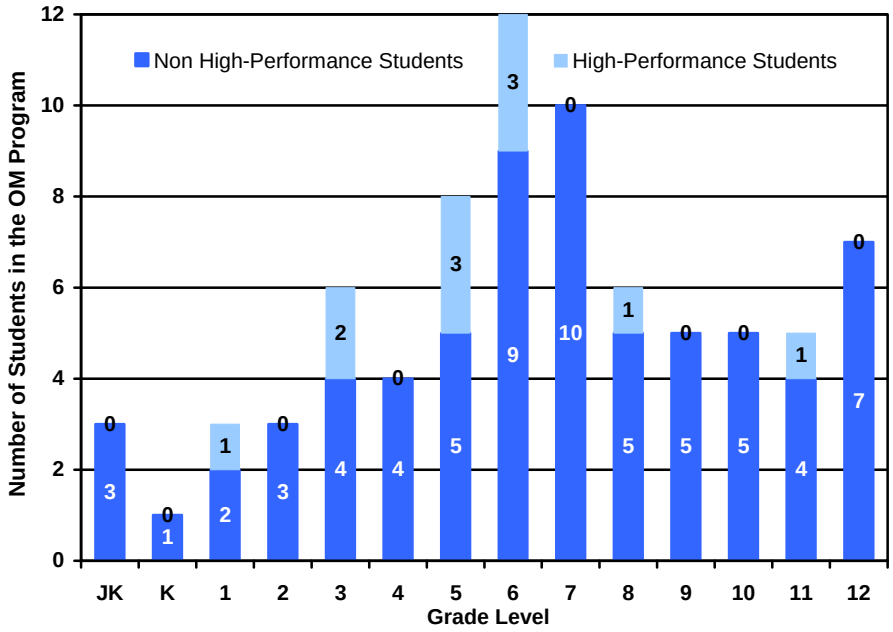


Figure 1. Number of Students in the Optimal Math (OM) Program by Grade Level

impossible is now being accomplished with today's e-learning tools and e-mentoring, i.e., pairing experienced science educators and scientists with middle-school students. In doing so, it helps establish content-related, curriculum-based 'tele-apprenticeships,' or what is referred to as 'e-mentoring'" (Fleischer, 2009, p. 31).

Articulation with American universities. Recently, the school has established an articulation agreement with two American universities in Virginia, namely, the University of Mary Washington and University of Richmond, which allows students to gain credit or course equivalencies for IB and Advanced Placement courses completed at ACS Athens. Discussions are underway with twelve other American universities to develop similar articulation agreements.

In addition to the many enrichment opportunities afforded to all students attending ACS Athens, the school, in 2008, introduced a new program for gifted or (what ACS Athens calls) high-performing students.

The High Performing Student (HPS) Program

Service delivery for the school's high-performing students is provided through its Optimal Match (OM) Program, housed on campus at the Stavros Niarchos Learning Centre. Johns Hopkins University defines optimal match as "the practice that seeks to equate a child's educational experiences to his or her abilities, achievements, interests, and motivations" (Haldiman, 2004). The OM program is innovative in Greece in that it serves students who have various special needs, including learning disabilities, ADHD, Asperger Syndrome, speech and language difficulties, Down Syndrome, vision impairments, oppositional disorders, and dyslexia.

In 2008 – 09 academic year, the OM program served a total of 78 students, of whom 11 were gifted or high-performing (see Figure 1). Most OM students were from Grades 5, 6, or 7, and the majority of HP students attended elementary school.

Teachers who serve high-performing students in their classrooms work closely with OM specialists to help differentiate the curriculum, develop more appropriate learner outcomes, and offer a variety of challenging learning experiences. Specific programming strategies used by ACS Athens include curriculum compacting, acceleration, differentiated instruction, and pull-out enrichment. The approach to enrichment delivery through these strategies is reflective of that advocated by Renzulli in his

Figure 2. Renzulli's Three-ring Conception of Giftedness

Schoolwide Enrichment Model (Renzulli, 2003), as these programming options are integral to his model. Curriculum compacting, for example, is to be offered to any eligible students, that is, to those who have already mastered the curriculum being taught and can benefit from having content compacted and then use the resulting freed-up instructional time on alternative studies of their particular interest. Such students are not necessarily selected from the talent pool, which Renzulli defines as the "10 – 15 percent of above average ability/high potential students…identified through a variety of measures, including achievement tests, teacher nominations, assessment of potential for creativity and task commitment, as well as alternative pathways of entrance (self-examination, parent nomination, etc.)" (Renzulli, p. 187). The percentage of students participating in the OM Program corresponds favorably with the talent-pool recommendation.

Renzulli contends that in order for identified students to reach their potential, diverse educational opportunities have to be provided, ones which are not part of the normal delivery of services in schools. His categorization of the types of enrichment required, as presented in his Enrichment Triad Model, has become popular around the world. In brief, they consist of three types of enrichment activities: Type I, which are intended to expose students, generally, to a broad range of topics of interest in various disciplines; Type II, which consist of group training and instruction in specific areas for the purpose of developing particular skills (e.g. in critical thinking, research, or communication); and Type III, which are self-selected by the students, either in small groups or individually, in their own areas of interest and involve acquiring advanced knowledge and undertaking the development of an authentic product (Renzulli, p. 186). At ACS Athens, the HPS Program specialist works with classroom teachers to ensure that the curricula are differentiated and that learning experiences are designed to meet the individual needs of the students in the program. Such program delivery involves mentorships, guidance in small-group activities, individualized projects, ability grouping, individualized learning plans (ILPs), and offering of internationally recognized, specialized programs. The numerous enrichment activities at the school, as outlined earlier, correspond to the Type I, II, and III activities in the Enrichment Triad Model.

The High Performing Student Program, as part of the OM Program, was designed to provide appropriate educational opportunities for students with exceptional abilities and thereby challenge them suitably in order for them to reach their potential. In order to be eligible for the HP program, students must have above-average ability (an IQ of 130+), display superior talent or giftedness in a given area, and be highly motivated, which is reflective of Renzulli's three-ring conception of giftedness (Renzulli, p. 186) (See Figure 2). The critical aspect of this concept is the interaction among the three qualities.

According to Kalyvas, the school's counseling psychologist and OM teacher specialist, stu-

Table 1. *Sample Student Profiles*

Grade: 3 Israeli Male	Age: 9 years IQ: 150
"Sam is curious, polite, and inquisitive about the world around him. Last September, he came to ACS Athens speaking only Hebrew, but, nine months later, he is fully fluent in English. He provides a positive energy to the class with his uncanny ability to learn. He learns math with ease at the middle-school level. Sam is a teacher's dream. He constantly wants to be challenged."	
Grade: 5 Hungarian Male	Age: 11 years IQ: 140
"Joe is an enthusiastic learner who constantly craves knowledge. This year, he grew out of his shy stage, and his sense of humor really blossomed. Joe gets bored easily if not stimulated in class and is impatient with routine tasks but loves to help his peers understand complex concepts."	
Grade: 6 Mexican American Male	Age: 13 years IQ: 130
"Anthony has made tremendous strides in his studies this year. His effort was lackluster at the beginning of the year until he realized that he can be an "A+" student. He strives to be the best at everything. Anthony is talented in all school subject areas, including music. Last term, he composed and played his own music in front of his classmates. He is a modern-day Renaissance kid."	

dents qualify for the program based on criteria such as superior problem-solving skills; a wide range of interests (is well-read); a creative imagination; keen insight (looks for truth and justice); flexible, original thinking ability; abstract and complex thought capability; and a strong intellectual curiosity. Sample student profiles, provided by the OM teacher, showcase the diversity of talents of students attending ACS Athens.

The Study

The goal of our study is to report on the results of an evaluation of the High Performing Student Program at ACS Athens, to identify its strengths and recommend areas for further program development. A teacher survey, adapted from Williams' PLSPS by the authors, was used to collect the data for the evaluation. A secondary objective of this study is to assess the usefulness of this evaluation instrument.

The Method

Participants

A total of 62 teachers across the three schools participated in the program evaluation, representing a 78% response rate (see Table 2).

Evaluation Instrument

The authors developed a six-page survey, adapted from Williams' (1979) Performance Level of a School Program Survey (PLSPS). The adaptation involved streamlining the diction and dropping the cognitive domain because of its overlap with the intellectual domain. The instrument was piloted, and

Table 2. *Participants in the Evaluation Study*

Participant	Level			
	Elementary School	Middle School	High School	Total
Teacher	13	11	30	54
Specialist Staff[a]	2	1	5	8
Total	15	12	35	62

[a] The staff specialists include the principal, school psychologist, counselor, OM director, and teaching assistant.

thereafter further changes were made, including adding the "have no knowledge" response option and refining the instrument, as a whole.

The instrument assessed six program domains by surveying the teachers' perceptions of the school's performance in addressing the following areas:

- **intellectual**: fostering critical thinking, problem-solving, and informed decision-making;
- **leadership**: enabling the development of leadership qualities to influence, guide, or inspire others;
- **creative thinking**: encouraging the engagement in divergent, fluent, flexible, original, and elaborative thinking, resulting in creative productions;
- **visual and performing arts**: providing opportunities for the showcasing of exceptional talent for developing aesthetic productions in graphic arts, sculpture, music, dance, or drama;
- **psychomotor abilities and talents**: promoting excellence in sports, track and field, gymnastics, and dancing; and
- **affective abilities**: nurturing empathy, compassion, moral sensitivity, and a strong sense of justice.

Across each domain, 10 common questions were asked of teachers: (1) How is this domain measured? (2) Are special enrichment classes available in this area? (3) Are there opportunities, outside of class, to develop this talent further? (4) Are there advanced lessons within the inclusive classroom specifically targeting individual students? (5) Does the school offer any recognition or incentives for those who excel in this area? (6) Are there special opportunities given to students to develop or showcase their talents within the regular curriculum? (7) Are others brought from outside of school to work with students? (8) Is teacher professional development offered in this domain? (9) Do students with this gift or talent work with or serve as mentors for other students in the school? (10) Are students excused from classes to pursue further activities in this domain, in or out of school?

The questions were particularized to the demands of the domain; for example, within the intellectual domain the following questions were asked: How are intellectual abilities measured? Do you offer special enrichment classes? Are students accelerated? Do you individualize student goals? Can students pursue advanced work? Do you offer special options like honors classes, advanced placement, special electives, or self-directed research projects? Do you bring outside specialists to work with students? Is professional development available for teachers in this area? Are high-ability students encouraged to work with or help others in their talent area? Do you excuse students from regular class so that they can pursue independent work away from the school building?

Participants were asked to respond to each question, under each domain, using one of five options: 1 = not being done (this practice is absent at my school); 2 = rare (it hardly ever happens); 3 = usually being done, but we need more of this; and 4 = adequately being done (leave as is). A fifth option was "I have no knowledge of this."

Procedure

The principals of the three school divisions (elementary, middle, and high-school) distributed the hard-copy surveys to all teachers, specialists, and administrative staff during a general faculty meeting. Surveys were completed during the meeting or taken home and returned to the principal the following day. All surveys were then forwarded to the first author three to five days after the general meeting. Data were recorded on spreadsheets by a senior research assistant and analyzed by a statistician, using SPSS.

Results

Results are reported for all teachers, for all domains, including the "I have no knowledge" response.

Teacher Responses: Program Strengths and Weaknesses

The overall composite mean score for all teachers, combining all domains, is 2.80, a score falling between "this practice is rare (it hardly ever happens)" and "it is usually being done, but we need more of this." Such a score is not unexpected since the HPS program has only been in place for one year.

Mean overall scores, broken down by domain, in descending order, are as follows: psychomotor, 3.11: visual and performing arts, 2.91; leadership, 2.84; affective, 2.72; creative 2.63; and intellectual, 2.60. The higher the score, the more adequately ACS Athens is addressing the target domain within its HPS program. These scores reflect the traditionally strong physical education program (highest score) and theatre program (next highest score) that exist at ACS Athens. Leadership, too, is a relatively strong element (third-highest score) that permeates all subject areas at the school. Additionally, there is emerging school support for the intellectual, creative, and affective domains of the school's HPS program.

When the mean scores are examined by domain *and* specific question posed, as shown in Figures 3 to 8, one sees the rich detail that can inform how successful a gifted program is; how it relates to professional development, community involvement, and student-centered programming; how well the program is evolving over time; and what specific areas need greater attention in order to consolidate the program and ensure that it is adequately meeting the needs of its gifted students, as well as of the teachers who deliver the program. In Figures 3 to 8, the horizontal axis represents questions 1 to 10. The vertical axis on the left-hand side represents the teachers' mean response scores, ranging from 1 (not being done) to 4 (adequate, leave as is). The higher the bar, the more adequately the school is addressing that domain in the HPS program; the lower the bar, the less sufficient the school's response.

The alternate vertical axis on the right-hand side of each figure represents the percentage of teachers who responded "I have no knowledge" to a given question. This is visually represented by the line graph superimposed upon the histogram. The higher the line is, the greater the proportion of teachers who know very little or nothing of the HPS program. Thus, the line graph visually depicts how well-informed or knowledgeable teachers are about the HPS program. The figures below show mean response scores for all of the teachers in each of the domains of the survey.

"No Knowledge" Responses

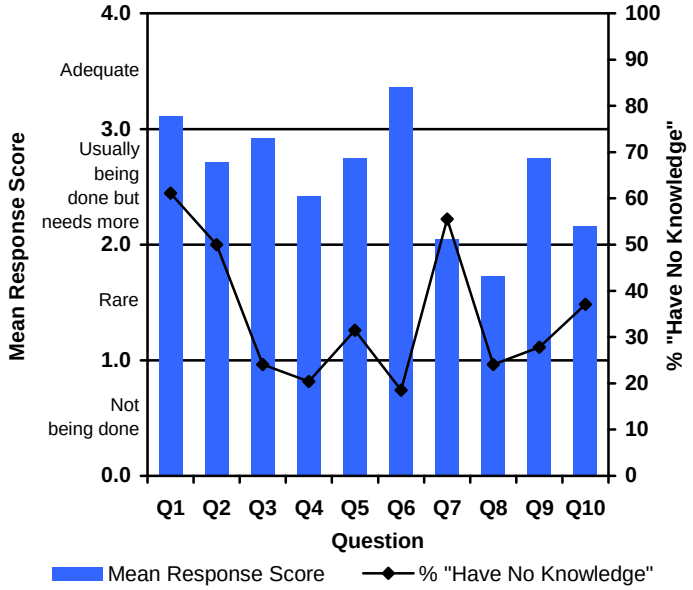
Table 3 shows that a significant number of teachers at ACS Athens have "no knowledge" of selected aspects of the HPS program. For each of the domains—intellectual, leadership, creative thinking, and affective abilities—roughly 30 to 35 % of teachers marked "have no knowledge" on at least 50% of the survey responses. Teachers were considerably less knowledgeable about the domains of visual and performing arts (46.3%) and psychomotor abilities and talents (61.1%).

Teacher Responses by School Level

Overall mean scores, broken down by school level, reveal that scores for elementary-school teachers and middle-school teachers tend to be higher than those for high-school teachers (2.92, 2.88, and 2.73, respectively, out of 4). This is most likely due to the fact that the majority of HP students are currently in the elementary and middle schools where teachers have more experience with and are more informed about the HP program.

Table 3. *Percentage of Respondents Answering "I have no knowledge" on at least 50% and 75% of Questions by Domain: Teachers vs. Specialist Staff*

	Have no Knowledge on at least 50% of Responses		Have no Knowledge on at least 75% of Responses	
Domain	Teachers	Specialist Staff	Teachers	Specialist Staff
Intellectual	35.2	0	9.3	0
Leadership	33.3	0	5.6	0
Creative Thinking	29.6	0	1.9	0
Visual & Performing Arts	46.3	0	18.5	0
Psychomotor Abilities & Talents	61.1	0	40.7	0
Affective Abilities	35.2	0	14.8	0
Mean	34.8	0	15.1	0



Survey Questions

Q1: How are intellectual abilities measured?

Q2: Are there special classes which enrich academic subject areas?

Q3: Are high-ability students accelerated?

Q4: Are they provided with individualized goals to meet their academic needs?

Q5: Are opportunities given to pursue any advanced work?

Q6: Does your school program provide special options (e.g., honors classes, advanced placement, electives, research projects) for those who perform academically above grade level?

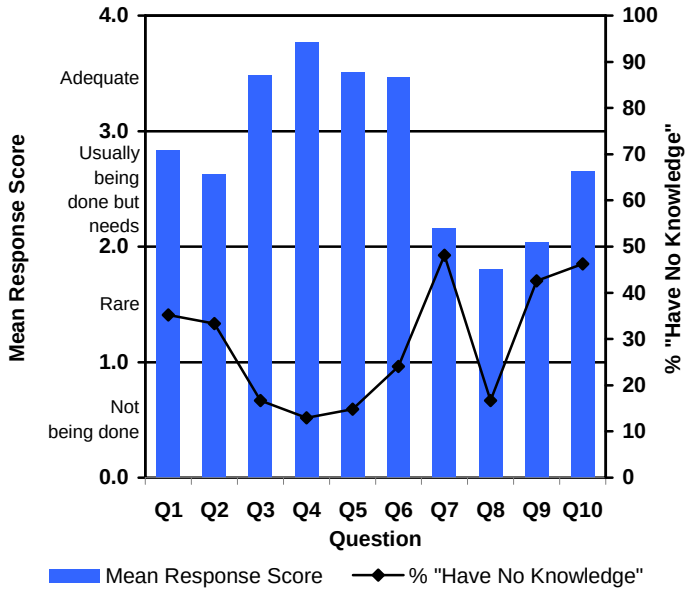
Q7: Do others from outside the school come to work with high-ability students?

Q8: Is professional development provided to teachers for planning special academic programs beyond those offered to regular classroom students?

Q9: Are students who have outstanding knowledge in an academic subject allowed to work with others less knowledgeable?

Q10: Does your school program permit academic achievers to be dismissed from regular classes for independent work away from the building?

Figure 3. Mean Response Scores for all Teachers: Intellectual Abilities



Survey Questions

Q1: How are leadership abilities measured?

Q2: Do you use students' leadership performance to select them for further leadership experiences?

Q3: Are potential class leaders—regardless of age, gender, grade, race, or color—given equal opportunities to perform as school leaders?

Q4: Do students choose their own leaders in your class or school? How?

Q5: Does your school provide recognition for those volunteering in leadership roles?

Q6: Are those who are identified as leaders given special opportunities to assume leadership roles in and out of classroom settings?

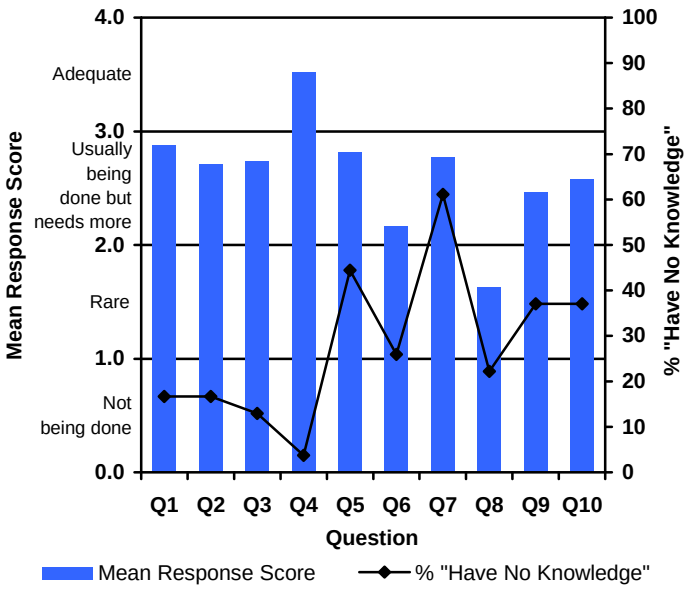
Q7: Do others from outside the school come to work on leadership training with potential student leaders?

Q8: Is professional development offered to teachers for observing, diagnosing, and developing leadership abilities in students?

Q9: Are school student leaders used to offer leadership training for other students?

Q10: Are identified student leaders excused from classes to participate in further leadership activities in or out of school?

Figure 4. Mean Response Scores for all Teachers: Leadership Abilities



Survey Questions

Q1: How do you measure creative thinking?

Q2: Do you use students' performance in creative thinking to select them for further experiences requiring such skills?

Q3: Are students who excel in creative thinking encouraged to work on hobbies, imaginative ideas, inventions, or extracurricular projects in class?

Q4: Do you provide lessons or group activities requiring creative thinking in your classroom?

Q5: Do you provide recognition or incentives for those who think creatively?

Q6: Do you have special activity centers in your class for students to work on their creative ideas?

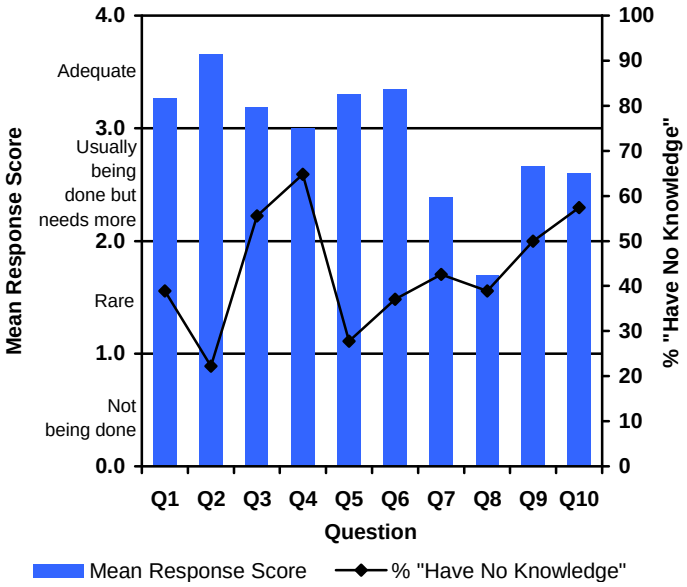
Q7: Do others from outside the school work on creative thinking skills with student groups?

Q8: Is professional development provided on how to teach creative thinking within the curriculum?

Q9: Are students who think divergently used around the school (as mentors or teacher helpers) to work on creative productions with others?

Q10: Does your school allow students to be dismissed from regular classes for independent or group work on creative activities?

Figure 5. Mean Response Scores for all Teachers: Creative Thinking



Survey Questions

Q1: How do you measure students' aesthetic expression in art, sculpture, music, dance, or drama?

Q2: Are talented students of the arts selected and actively involved in displaying, beautifying, decorating, or performing artistic activities in your school?

Q3: Does your class or school attempt to accelerate talented students through advanced work in the visual and performing arts beyond the regular curriculum?

Q4: Are selected students assigned to work with staff music and art teachers on artistic activities beyond those offered all students?

Q5: Does your school offer special recognition, awards, or incentives to those students who perform well in the arts?

Q6: Are there provisions in your school for special visual and performing arts experiences offered to talented students?

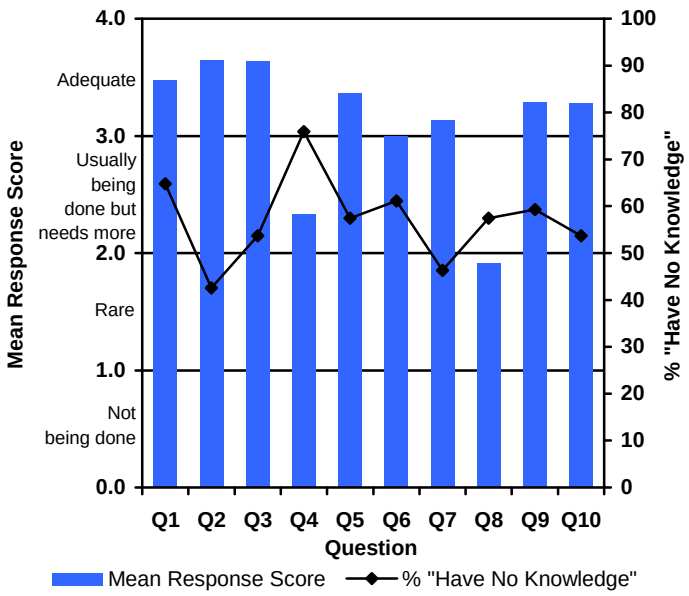
Q7: Are others from within or outside your school brought into the building to work with artistically talented students?

Q8: Is staff professional development provided to help encourage and develop students' visual and performing arts?

Q9: Are those who excel in some artistic endeavor provided opportunities to share their talents as student mentors or teacher helpers with other students?

Q10: Are artistically talented students allowed to leave class to work with mentors or advocates in or out of school?

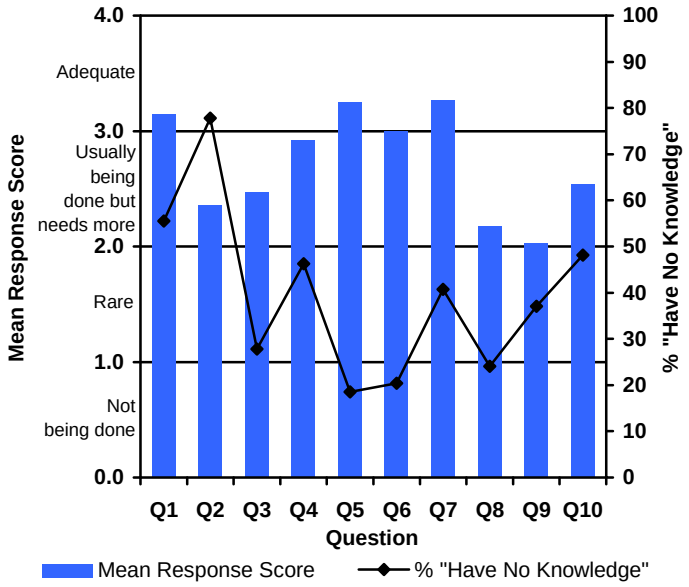
Figure 6. Mean Response Scores for all Teachers: Visual and Performing Arts



Survey Questions

Q1: How do you measure students' psychomotor development in school?
Q2: Are students who excel in movement skills, actively involved in physical activities in your school?
Q3: Are students who are advanced in movement and motor development selected for class or school activities requiring vigorous fine and gross motor skills?
Q4: Are students suspected to be physically or perceptually advanced recommended for observations or tests to further verify physical balance, agility, and endurance?
Q5: Do you offer special recognition or incentives to students who perform well on sensory motor tasks?
Q6: Does your school program integrate physical endurance, muscle tone, body control, and planned physical production activities into the total curriculum?
Q7: Are there provisions for parent and community involvement in physical education and health programs for students?
Q8: Is staff professional development provided on how to measure and nurture students' physical or motor development?
Q9: Are physically gifted students given opportunities to share their talents as mentors with other students not as physically inclined?
Q10: Are physically talented students allowed to work on perfecting their physical expertise during or outside of school time?

Figure 7. Mean Response Scores for all Teachers: Psychomotor Abilities



Survey Questions

Q1: How do you measure students' affective areas and emotional development in school?
Q2: Are students who indicate strong affective development selected for enriched experiences to nurture their emotional maturity further?
Q3: Do you provide time for students who feel good about themselves to continue strengthening their self-concept?
Q4: For students observed being emotionally stable, are records kept of critical incidents, anecdotes, or observed behaviors in an attempt to show positive growth?
Q5: Do you provide recognition or rewards for students who are self-disciplined, independent, and self-sufficient learners?
Q6: Do you provide specific lessons and class activities for students which would purposely integrate their emotional development along with their academic development?
Q7: Do other school staff or people from outside the school work on human development, motivation, or self-esteem programs with students?
Q8: Is professional development provided to teachers to train them on building positive student self concept, cooperative attitudes, motivating students to want to learn, and getting along with others?
Q9: Are students who demonstrate a positive self-concept given opportunities and encouraged to work with disruptive students or those who have behavior or discipline problems?
Q10: Are emotionally developed students allowed to leave class to work with a mentor or advocate on individual projects of interest to them?

Figure 8. Mean Response Scores for all Teachers: Affective Abilities

Table 4. *Means Scores on the Lowest-Scoring Questions 7, 8, and 9*

Domain	Mean Scores (1 to 4)[a]		
	Q7 Outside Expert	Q8 Professional Development	Q9 Students as Mentors to Peers
1. Intellectual	2.1	1.7	2.8
2. Leadership	2.2	1.8	2.0
3. Creative Thinking	2.8	1.6	2.5
4. Visual & Performing Arts	2.4	1.7	2.7
5. Psychomotor Abilities & Talents	3.1	1.9	3.3
6. Affective Abilities	3.3	2.2	2.0
Overall Means	2.6	1.8	2.5

[a] 1 = not being done
2 = rare
3 = usually being done, but needs more
4 = adequate; leave as is

Teachers versus Specialist-Staff Responses

Specialist staff (consisting of principal, psychologist, counselor, Optimal Match director, and teaching assistants who work with HP students) score the HP program more highly (with an overall composite mean score of 3.04) compared to regular classroom teachers (who score 2.80). Specialist teachers tend to be more informed about the HPS program and are more directly involved with various aspects of HPS service delivery, including identification, assessment, and programming. Teachers who have HP students in their classroom have higher overall mean scores (2.89) than those teachers who do not have any HP students (2.74), for similar reasons.

Common Concerns across all Domains

The lowest overall mean scores by *targeted question* across domains was consistently the need for more professional development (1.8), followed by the need to use HP students more often as mentors for other students in the school (2.5), and, finally, the need to bring in more outside experts to work with HP students (2.6). The lower the score, the less fully developed the area at the school (see Table 4). The range of mean scores for these three targeted questions, regardless of domain, fall between 1.7 ("rare") and 3.3 ("usually done, but needs more").

Discussion

This paper reports on the evaluation of the first year of the HPS Program at ACS Athens, an International Baccalaureate school in Greece. Assessment data were gathered through a survey, adapted from Williams (1979), which examined the school's performance in meeting students' needs in the areas of intellectual challenge, leadership, creative-thinking, visual and performing arts, psychomotor development, and affective abilities. These were assessed with respect to a number of areas, including teacher training and professional development, community involvement, and student-centered programming.

Despite its nascent stage of development, the HPS Program at ACS Athens clearly has numerous strengths; for example, the school has an outstanding physical education program (having won many international championships in basketball, track and field, and tennis). It has a vibrant visual- and performing-arts program, with annual theatre productions, like Plato's *The Apology of Socrates*, Moisés Kaufman's *The Laramie Project*, and Thornton Wilder's *Our Town*. It provides numerous leadership opportunities to both its teaching staff and students, including the in-house publication of a first-rate journal of effective teaching, leadership, and innovation, *Ethos*, to which both staff and students contribute. It also has a strong history of academic excellence, integrates community service within the curriculum for all students, and aspires to be

the centre for in-service teacher training for international school teachers, world-wide.

Despite these strengths, however, the survey points to a number of areas that require further development or improvement. These include the need for more frequent professional development for teachers in all areas of gifted education; the need for more outside experts like scientists, artists, engineers, musicians, poets, ecologists, geographers, entrepreneurs, politicians, and medical professionals, to be brought into the school to work with students; and, finally, the need to have HP students serve more frequently as mentors, in their own right, for other students in the school.

A closer examination of the survey results also reveals that there is a significant number of teachers at ACS Athens who have "no knowledge" of selected aspects of the HPS program. This underscores the need for better communication or sharing of information about the program among staff at all three school levels.

The following are recommendations to help consolidate the strengths of the HPS Program, having concluded its first year of implementation: provide extensive professional development or in-service training that reaches teachers throughout the school; establish a community mentorship program for HP students to enhance HPS Program; incorporate a gifted curricular model, such as the Renzulli Schoolwide Enrichment Model, to guide the program-implementation process; introduce an evaluation plan to assess the success of the program and to guide improvement as it evolves; consider a more comprehensive identification system for gifts and talents that is not limited to IQ scores; more fully develop various HPS curricular strategies, such as curriculum compacting, acceleration, differentiated instruction, pull-out enrichment, contracts, independent projects, and mentorships.

The usefulness of the survey, adapted from Williams (1979), also merits some attention. This instrument proved to be effective as an evaluation tool for assessing the HPS Program at ACS Athens. First, it is detailed and allows one to examine a variety of program dimensions simultaneously. Second, as a standard tool, it allows comparability across gifted programs. Third, it identifies specific strengths and gaps in programs under examination. Fourth, it provides direction for program improvement through pre- and post-surveying. Finally, it gauges the extent of change in gifted programs, over time, through annual assessments.

School administrators who may be contemplating the initiation of a gifted program at their school may wish to consider the following additional factors that influence successful implementation. Teachers must feel committed to all aspects of service delivery; they must believe in the program; they must be philosophically on board. There must be supportive school-board policies addressing gifted programs that provide educational, professional, and administrative assistance to staff and students. It is desirable to select a model of gifted education, like Renzulli's Schoolwide Enrichment Model, to provide structure and more efficient delivery of a program. A model of gifted education makes implementation easier, alignment of the curriculum more effective, and the articulation with the regular program more seamless. A director is needed to oversee and monitor the program and to serve as its leader and champion. Professional development is critical; it is the fuel that drives any program. Community mentors play an important role, an option that should be included in any enrichment program. To have a sustainable program, one must also have the funds, ways to support the program financially. Finally, one must have an evaluation plan to assess and monitor the success of the program over time. Once these are in place, the likelihood of success of any gifted program is greater, and the vital task of engaging the minds of youth becomes more meaningful and effortless.

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3. “Frühstudium” – Acceleration and Enrichment for Secondary-School Students at the University of Koblenz-Landau

Martina Endepohls-Ulpe

Abstract

“Frühstudium”[1] is an enrichment and acceleration program option offered at some German universities for students from secondary schools. Students participate in selected university courses while continuing their studies at school, thus saving time in their future studies, while enriching their knowledge in several fields. This paper focuses on an evaluation of “Frühstudium” at the University of Koblenz-Landau, Campus Koblenz, initiated in 2006. The program evaluation, consisting of a questionnaire administered to the student participants in the program, centered on three areas, namely, the benefits of the program, the promotion of the program at the school level, and the degree of support for the program by the secondary-school teachers. Results, based on the response rate of 20 students, indicated a number of strengths of the program, but also some of its limitations. The evaluation of two years of “Frühstudium” at the University of Koblenz reveals that this program is worthwhile as an enrichment measure for students.

Acceleration and enrichment are two basic principles of differentiation frequently applied in gifted education programs, as well as in measures for individualized instruction for gifted students. Paula Olszewski-Kubilius (2003) calls them the “cornerstones” of gifted education. Acceleration is a program intervention consisting of moving designated students through the normal curriculum at a faster pace or at younger ages than other students. Individualized organizational forms of acceleration are grade skipping or early admission to certain levels of schooling, for example, primary school, college, or university. In contrast, enrichment extends, supplements, or sometimes replaces aspects of a school’s existing program, as “[t]he emphasis in enrichment is generally to keep children with their age-peers and to foster the development of higher cognitive and affective processes” (Coleman & Cross, 2005, p. 270). The student works on problems or materials that are not part of the regular curriculum, or subjects in the regular curriculum are extended. Enrichment may happen as a part of the school program in the regular class or during special courses at allocated times in designated settings. There are also many opportunities for enrichment for gifted children outside of school, in activities such as weekend courses or summer camps (Endepohls-Ulpe, 2009, p. 868 – 870). Acceleration and enrichment are complementary measures since saving time by acceleration provides learning time to cater for the individual abilities and interests of the students, which may be accomplished through enrichment.

In spite of the demonstrated effectiveness of these two measures for improving the learning environment of gifted students, acceleration and enrichment both have their limitations, or even disadvantages. Acceleration may be disallowed on account of state regulations or laws. In Germany, for example, it is hardly

[1] “Frühstudium” means going to university early.

possible for a student to skip one of the last two grades of grammar school (Grades 12 and 13) because the performance during these two years, in the form of marks for written or oral exams, is considered for the final certificate—the "Abitur."[2] Grade skipping may also not be an option for students who are high-achieving in a designated area, for example, mathematics or language, but who are not generally gifted and, therefore, cannot skip an entire grade. Additionally, acceleration is not very popular among parents and schools (Rost, 1993, p. 204), despite the fact that the effects of acceleration for achievement and students' self-esteem, as determined by empirical studies, seem to be positive (Heinbokel, 2008, p. 84). There is, obviously, considerable concern about the adverse effects on children's social and emotional adjustment; parents, as well as teachers, also assume that accelerated pupils will have problems later in their schooling.

Enrichment is mostly preferred over acceleration by parents, but if it is to be provided over a longer period of time and to be of high quality, it is a measure that is time-consuming and expensive, especially if the extra courses are taken outside school (Heinbokel, 2008. p. 83). This is true for schools, too, if they organize and offer extra programs.

The Principle of "Frühstudium"

"Frühstudium" is a combination of acceleration and enrichment for secondary-school students taking selected university courses while still in school, circumventing some of the disadvantages associated with the implementation of each measure on its own.

This program was first established in Germany at the University of Karlsruhe in 1998, and in the following years, at the universities of Cologne (2000) and Bonn (2001). In 2004, the conferences of the German Ministries of Education and headmasters of German universities officially decided that students of secondary schools would be permitted to attend universities without formal admission and participate in regular courses. Achievement in university courses studied would be credited towards the student's future studies. By now, there are nearly 50 German universities offering different forms of participation in university courses for younger students (Deutsche Telekom Stiftung, 2008).

The main principle of "Frühstudium" is that students of grammar schools or, in exceptional cases, of modern secondary schools ("Realschulen"), who are highly motivated, interested, and performing very well are offered the opportunity to participate in university courses. The amount of time spent at university is not pre-determined or limited. Since the students miss part of their regular school lessons, schools have to give their permission, one condition for obtaining this permission, usually, being outstanding achievement at school.

The aims of this program are to deepen and enrich students' knowledge and to reduce the overall time spent at university upon completion of secondary school. Students can save time in the educational system without having to skip a grade. As an enrichment measure, "Frühstudium" orients students to possible fields of study and gives them opportunity to determine their interests in certain subjects (Ley, 2002). The courses are normal, high-quality university courses, provided at no additional cost for either the schools or universities.

The programs at different German universities vary with respect to the admission criteria and courses offered. Halbritter (2004) criticizes the common use of high-school grades as the basis for student entry, arguing that this criterion keeps underachievers away, as it is precisely the unmotivated and insufficiently challenged who could profit from the program. Some universities provide mentoring by older students, a support which helps prevent the school participants from dropping out prematurely (Halbritter, 2004).

Students who complete a semester and meet the requirements receive university credit for future studies in the same subject. If they meet all the university-course criteria, students can take the respective oral and written exams and obtain a university degree while still attending secondary school, but this seldom happens.

[2] In Germany, the "Abitur" is the final certificate issued to students, in all federal states, upon their successful completion of secondary school, based on their performance on oral and written exams over the two final years.

"Frühstudium" at the University of Koblenz

"Frühstudium" was established in the winter of 2006 as a mentor-supported acceleration and enrichment program at the University of Koblenz-Landau, Campus Koblenz. The possibility of younger students taking university courses had existed since 2004, but, in Koblenz, not a single student opted to do so, perhaps, due to ineffective communication about the program or various psychological and logistical barriers for the students.

While the university provided the teaching resources, funds were needed to establish the program financially, for example, designing an internet page (uni-koblenz.de/fruehstudium), printing and distributing flyers to recruit students at the various schools, and identifying, training, and paying mentors to work with students. The mentorship component of the program was made possible through the sponsorship of the German Telekom Foundation and a loan program of the Rhineland-Palatinate Ministry of Science.

In the initial year of the program, only courses in mathematics, natural sciences, and computer sciences were offered. In the second year, course options were extended to include other faculties and subjects, such as philosophy and musicology.

Participation of secondary-school students was based on school nomination and parental agreement. Mentors helped students build their individual timetables. Students were also able to communicate with their mentors by e-mail or phone when questions arose. In addition, an e-learning platform (WebCT-Blackboard) was established as a further communication tool for exchanging articles or course notes. Each student had to contact his or her personal mentor at least every two weeks.

Evaluation of the Program

In 2008, an evaluation of the "Frühstudium" program at the University of Koblenz was conducted. This evaluation consisted of a questionnaire administered to the student participants in the program, which centered on three areas, namely, the benefits of the program, the promotion of the program at the school level, and the degree of program support by the secondary-school teachers.

Method

The Questionnaire

After each of the two semesters[3] of study, students were given a questionnaire to gauge their satisfaction with the program. It included 4- to 6-point Likert-scale items and open questions on several aspects of the program, including organizational factors, travel time to university, number of missed lessons at secondary school, attitudes of others (peers, friends, parents, etc.) concerning the program; perceptions of success, support at school, problems encountered and possible solutions, and suggestions for program improvement. First-time students answered a longer version of the questionnaire, which requested information about how they got into the program, and their parents responded to a parallel questionnaire. The questionnaires were adapted from that used in Solzbacher's study (Deutsche Telekom Stiftung, 2008)—a tool created to evaluate all German "Frühstudium"-programs in the winter of 2006 - 2007. All data were analyzed using descriptive statistics.

Participants

A total of 31 individual students participated in the program between 2006 and 2008, some of whom took part in more than one semester. After the completion of the first semester, 20 of these returned their questionnaires. A total of 42 questionnaires were collected, representing, in some cases, multiple completions of the questionnaires by returning students; however, the data analysis is based on the discrete responses of the original 20 students (See Table 1).

In the winter of 2006, the program started with 12 students. In the summer of 2007, there were 14; in the winter of 2007, there were 9; and in the summer of 2008, there were 7. These participating students all came from grammar schools.

Eight of the 20 students who completed the questionnaire after their first semester were in Grade 11 when they started, 9 were in Grade 12, and 3 were in Grade 13. The ratio of male

[3] German universities run two semesters. The winter semester, during which most students start university, begins on October 1st and ends on March 31st. The summer semester begins on April 1st and ends on September 30th.

Table 1. *Number of Participants and Semesters Studied*

	Number of semesters				Total
	1*	2	3	4	
WS 2006/07 Winter semester	7	0	0	0	7 (12)
SS 2007 Summer semester	7	5	0	0	12 (14)
WS 2007/08 Winter semester	5	0	2	0	7 (9)
SS 2008 Summer semester	1	2	0	2	5 (7)
Total	20	7	2	2	31 (42)

*Only data for the group of students in the first semester were analyzed for the purpose of this study.

to female students was approximately 2:1 (13 male, seven female), which may have been due to the program's initial focus on mathematics and on natural and computer sciences, courses mostly selected by the male students. Four of the seven female students chose subjects like philosophy, musicology, or psychology. Table 2 shows that most of the students were between 16 and 18 years of age; one student was 15, and two were 19 years old when they started the program.

Twelve of the 20 students acquired certificates of performance (which now constitutes university-credit points) in one or more courses after their first semester. Of the seven students who continued their university studies in the second semester, four acquired certificates upon completion, and the two students who continued in the program for the third and fourth semester acquired certificates in each of these semesters. Students who attended the courses but did not write a final test or prepare a presentation did not acquire certificates or credits.

Most of the participants were high achievers, obtaining a mark of 1 or 2 (the best marks in the German school system) in the main subjects: mathematics, German, foreign languages, or natural sciences. Four students had skipped a grade, two of them in primary school and two of them in secondary school.

A disproportionate percentage of students came from families with higher-level education. Nine fathers had studied at a university, and only two fathers worked in non-middle-class jobs. Five of the mothers had had an academic apprenticeship (technical-vocational stream). These numbers are not representative of the general population. The Koblenz sample is not as academically distinguished as the total sample of students participating in similar programs elsewhere in Germany, as analyzed by Solzbacher (Deutsche Telekom Stiftung, 2008). In that study, 71% of the students had at least one parent with a university background, and 58% of these students had both parents with a university degree.

Table 2. *Age of Students at the Start of the Program*

Age	N	%
15	1	5
16	7	35
17	5	25
18	5	25
19	2	10
Total	20	100

Table 3. *Students' Source of Information on the Program*

	N	%
Secondary-school administration	1	5
Secondary-school subject teacher	6	30
Secondary-school guidance counsellor for gifted students	1	5
Media (newspaper / radio)	5	25
Parents	1	5
Friends	3	15
Other sources	3	15
Total	20	100

Results

Starting Conditions: Student Interest in the Program, Recruitment, and Expectations

Students obtained initial information about the "Frühstudium" program from varying sources: 40% were informed about the program by their schools, which, in turn, received their information from the university program administration twice a year, and 55% of the students received their initial information from the media, friends or parents, or other sources (universities, former teachers) (See Table 3).

Students rated their personal interest in the subject of study as the most important reason for participating in the program (See Table 4). An equally important reason was gaining an understanding for career options, that is, insight into the subject of study to determine their degree of interest in it.

Escaping uninteresting instruction at school was also a motivational factor. Factors not very important to the students were the study time redeemed or the money saved. Neither did the advice of teachers or parents play an important role in the students' decision to participate.

The reasons for participation matched students' expected program outcomes. Escaping from boredom at school was rated the most important outcome (M = 3.5), followed by securing information for a choice of career (M = 3.3), attending the courses regularly (M = 3.0), adding the program to their curriculum vitae (M = 2.9), and acquiring a certificate of performance (M = 2). The distances from secondary school or home to university differed for the participants: for 35%, it was 5 to 10 kilometers; for 30%, it was between 10 and 40 kilometers; and for 20%, it was more than 50 kilometers. The average amount of travel time between school and university was over 40 minutes. One student needed 90 minutes to reach the university.

Table 4. *Student Participation Factors*

	*M**
Interest in the subject of study	3.9
University experience	3.1
Subject-interest confirmation for career choice	3.0
A change from everyday school life	2.7
Boredom at school	2.6
Prospect of finishing university studies earlier	2.0
Parental encouragement	1.6
Saving university-tuition fees	1.6
Teacher or school encouragement	1.4

*Note: 1 = not important; 4 = very important

Table 5. *Reactions of Others to Students' Participation in the "Frühstudium" Program*

	*M**	Negative Reactions *N*
Parents	4.65	1
Friends	4.50	0
Teachers	3.65	4
Regular students at the university	3.65	0
Teachers at the university	3.45	0
Peers at school	3.20	6

*Note: 1 = negative; 3 = neutral; 5 = positive

The time that the students spent at the university each week ranged from 2 to 14 hours (*M* = 4); 75% spent 2 to 5 hours, 20% spent 6 to 8 hours, and one student spent 14 hours. The number of lessons missed at their school each week corresponded closely to the hours the students spent at university (1 to 14 hours): 75% of these students missed 1 to 5 hours, 20% missed 6 hours, and one student missed 14 school lessons.

Experiences During the Program: Supportive Conditions and Obstacles

Reactions of others (parents, friends, teachers, university students, university faculty, school peers) to their participation in the "Frühstudium" program were mostly positive, according to item means (See Table 5). School peers were the most discouraging group. Six students reported negative or slightly negative peer reactions. Overall, friends and parents were the most supportive. Four students reported negative reactions from their teachers at school. University students and faculty were mostly neutral, often not even noticing that the participants were not regular university students.

Students frequently indicated that they had established ties to regular university students or to fellow participants in the program. Four students commented on establishing close contact with university faculty, who were mostly very interested and supportive when they recognized the special status of the students.

Support at the secondary school for the participating students was mediocre. Only eight students reported getting any support in completing their missed work at school. Eight students reported getting information on missed subject matter, one student got support for post-processing the missed lessons, and one was given the opportunity to compensate for missed presentations with written or oral contributions. Four students were supported by teachers who taught the same subjects that the students were studying at university. Eight students obtained assistance from teachers whose lessons they had missed, and five students were supported by friends, peers, tutors, or the headmaster of the school. Most of the students were highly satisfied with the support of the university, for example, with being mentored by older students. Only two students reported that they were not completely satisfied with the university mentoring.

Table 6. *Satisfaction with the Program*

	N	%
Completely satisfied	8	40
Satisfied	7	35
Somewhat satisfied	3	15
Somewhat not satisfied	1	5
No response	1	5
Total	20	100

Success of the Program: Costs and Benefits

Most of the participating students were satisfied with the program. Only one student indicated being "somewhat not satisfied" (See Table 6).

Of the 20 students who completed the questionnaire, 17 students (85%) attended their courses until the end of the semester and three (15%) dropped out for a variety of reasons—the extensive distance from school to university, missing tests at their school, illness for several weeks, missing too many lessons in one subject at school, and teacher and headmaster concerns with regard to missed lessons. The total number of dropouts is likely higher than three, as it can be assumed that some of the students who did not fill out the questionnaire had dropped out.

Nine students reported that their marks at secondary school in their university-studied subject improved during the program. Nine students did not experience any change in marks, and two students reported a deteriorated performance at school. With respect to other subjects, 14 students (70%) reported no change, three reported a positive change, and three reported a negative effect on their school marks. Reasons given for a decline in school performance were negative attitudes and bullying by teachers of the studied subject, poorer marks for oral participation due to missed lessons, and a missed French test.

Most of the students (14 or 70%) declared that they still had enough leisure time; only six students (30%) reported a slight cutback of their leisure activities.

All students wanted to take up studies at a university after finishing school, but only six of them were convinced that they wanted to study the subject they had studied at university. Six students were sure that they would study a different subject. Only one student was sure that he or she would take up studies at the University of Koblenz. Seven were still unsure about staying, and 12 were certain that they would go to a different university.

The experience of real university life was mentioned by several students (N = 7) as something they enjoyed most in the program, followed by their being accepted by other students and university faculty (N = 4) and communicating with them, as well as gaining deeper insight into the studied subject (N = 4).

Suggestions for improving the university administration of the program included offering more courses in the afternoon in order to avoid students missing lessons at school[4] (N = 3). Two students would like to have received more mentoring.

Suggestions for an improvement on the part of the schools included providing adequate information for participating in "Frühstudium" (N = 3) and receiving more support and interest from their schools and teachers (N = 8).

Discussion

Target Group

The University of Koblenz-Landau, Campus Koblenz, is a small university with approximately 6000 students. As measured by numbers of participating students at larger universities (for example, Bonn with 30,000 students, approximately 70 participants and more than a 30% dropout rate per semester), the number of participants in the current study (*N* = 20) is representative, and the number of dropouts (15%) is within a regular range. The participating group, with respect to their social background, is representative of the population of grammar-school students in Germany, as a whole (see Baumert et. al., 2000), but it is less representative of the total population of participants in similar university programs for younger students throughout Germany (Deutsche Telekom Stiftung, 2008). Most of the students in this study are high achievers, which is due to the criteria set for the program.

Promotion of the Program

The secondary schools did not promote the program actively enough, as most of the students learned about the program through the media. Findings underscore the importance of the university's public relations and promotional efforts.

[4] Schools in Germany end in the early afternoon, allowing students time for completing homework and engaging in other activities.

Benefits

For students, the benefits of the program included escaping from boredom at school, obtaining a deeper insight into an interesting subject, and gaining information for making career and occupational choices. The option for acceleration was only a minor motivating factor for students, as indicated by their answers to the open-ended question on outstanding aspects of the program. Obtaining an insight into university life and being accepted by regular university students and faculty was more valuable for them.

Degree of School Support

A number of schools provided inadequate or little support for participating students. Students reported that most of their support came from friends or parents. Only eight students received assistance from teachers to compensate for missed school lessons. Others experienced negative reactions from teachers, for example, as reflected in the students' written statement, indicative of much of the oral communication with mentors: "I do not expect any support from my school. To me 'Frühstudium' is attractive because I can work independently. However, it would be nice if they did not permanently put additional obstacles in my way."

Nevertheless, most of the participants managed their work both at school and at university, as their school marks seldom dropped.

One can only speculate about the reasons for the lack of support, or even obstructive behavior, by some teachers. It is possible that the teachers have the same concerns regarding acceleration as are often expressed by opponents of acceleration. (Heinbokel, 2008). Teachers may also be uncertain about how to deal appropriately with the issue of missed lessons. Official guidelines formulated by the schools' supervisory board could be helpful for both teachers and students.

Can the program be evaluated as a success? The answer is tentative, as the data for the study are based on a small sample. The answer also depends on how one defines success. As an enrichment measure, "Frühstudium" is, clearly, successful. The participants enjoyed their stay at university. Some of them explicitly did not want to earn any certificates; they simply wanted to deepen their knowledge or determine the appropriateness of the subject studied for future pursuits. Most of them reported that they were satisfied with their university experience. One student, enrolled in chemistry courses, e-mailed his mentor, after one semester in the program, expressing certainty that chemistry was not the right subject for him and that medicine was his chosen field. While this might not be interpreted as a success, this realization can be seen as a positive outcome of the acceleration program, saving half a year of postgraduation studies by having to come to this conclusion early.

Even though the students' main objective in the program was not acceleration, more than half of them acquired certificates. Not a single student dropped out of the program because of difficulty with the subject matter.

Conclusion

The evaluation of two years of "Frühstudium" at the University of Koblenz reveals that this program is worthwhile as an enrichment measure for students who are insufficiently challenged at school. It also can serve as an acceleration strategy even if this is not the main goal of the participants in the program. Results show that the acceleration program is well received by the students. The findings, however, show that there is, evidently, a strong need for action concerning the way secondary schools manage the program. The data reveal that many schools did not inform their students properly about the program. Only a minority of students received support from their teachers in managing their double workload. Some even felt bullied or experienced obstructive reactions from their teachers. In view of these results and to ensure future success, the "Frühstudium" project managers should put more effort into their collaboration with the schools, provide timely and vital information about the program, and offer more guidance to the teachers so that they can better accommodate all participating students.

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4. Identification of Gifted Children Using Nonverbal Ability Tests Across Cultures and Languages

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Abstract

This paper addresses the development and use of the Naglieri Nonverbal Ability Test, Second Edition (NNAT2). It presents information about the standardization, reliability, validity, interpretation, and research findings on the test, which is available in both the paper and electronic form. This test measures general ability, using nonverbal questions, an approach which the research literature supports. The overarching goal of the NNAT is to ensure that educators assess children fairly, especially those from diverse cultural and linguistic backgrounds, so that they may be included in programs for the gifted.

Since IQ tests were initially formulated in 1905, with the publication of the Stanford-Binet (Binet & Simon, 1905), and in 1939, with the publication of the Wechsler-Bellevue Scales (Wechsler, 1939), IQ has been measured using verbal, quantitative, and nonverbal tests. These tests made a significant and long-lasting contribution to our understanding of how to measure and how to conceptualize intelligence. The results obtained from these tests have influenced the lives of countless children and adults in the United States and around the world. While intelligence tests represent one of the most influential contributions made by psychology to society, in general (Anastasi & Urbina, 1997), they also have become engrained in our culture as *the* way to measure ability.

Intelligence has been measured using tests that were organized into the now familiar verbal, quantitative, and nonverbal format, which have become idealized as measures of verbal, quantitative, and nonverbal "intelligences." There was no intention by the originators of these tests to measure three separate abilities. In fact, the division was a practical one, as noted by Yoakum and Yerkes (1920) when they wrote that the Army Beta (nonverbal) tests were used because it was known that a person could fail Alpha (verbal and quantitative) tests due to limited skills in English. To avoid "injustice by reason of relative unfamiliarity with English" (Yoakum & Yerkes, p. 19), these persons were then tested with the nonverbal tests. It was known from the beginning that general ability could be measured using verbal, nonverbal, and quantitative tests, but nonverbal tests were best for those with limited English language or limited educational skills.

It is important to note that Wechsler's view of intelligence was not that verbal and nonverbal were two types of intelligence, despite the fact that, for years, his tests yielded Verbal and Performance (nonverbal) IQ scores. Wechsler (1958) wrote, "[T]he subtests are different measures of intelligence, not measures of different kinds of intelligence" (1958, p. 64). Boake (2002) noted that Wechsler viewed verbal and performance tests as equally valid measures of intelligence. Similarly, Naglieri (2003) wrote that "the term nonverbal refers to

the content of the test, not a type of ability" (p. 2). Thus, tests may differ in their content or specific demands but still measure the concept of general intelligence. Moreover, Wechsler argued that nonverbal tests help to

> minimize the over-diagnosing of feeblemindedness that was, he believed, caused by intelligence tests that were too verbal in content... and he viewed verbal and performance tests as equally valid measures of intelligence and criticized the labeling of performance [nonverbal] tests as measures of special abilities. (Boake, 2002, p. 396)

Wechsler (1975) included all subtests in his test of intelligence under the term general ability (sometimes referred to as '*g*'). He wrote that "the attributes and factors of intelligence, like the elementary particles in physics, have at once collective and individual properties" (p. 138), saying that although his test, or other similar tests, has questions that are described as verbal, quantitative, or nonverbal, they can be combined under the concept of general ability. The origin of this idea was amply explained by Pintner (1923) when he wrote,

> [W]e did not start with a clear definition of general intelligence... [but] borrowed from every-day life a vague term implying all-round ability and... we [are] still attempting to define it more sharply and endow it with a stricter scientific connotation. (p. 53)

Identification of Gifted Children

There is considerable need for test administrators to examine carefully the content of tests used to identify children who are gifted across cultures and countries and to select those tests that provide all children an equal opportunity to perform. Bracken and Naglieri (2003) argue that traditional tests of intelligence with their verbal, nonverbal, and quantitative tests are best described as measures of general ability. They argue that "general intelligence tests with verbal content and nonverbal content measure essentially the same construct as general ability tests that are entirely nonverbal" (p. 247). Both types of tests measure general ability; however, one test measures general ability with varying content (verbal, quantitative, and nonverbal), and the other takes an exclusively nonverbal approach. It is important to recognize that the term "nonverbal assessment" describes the methods used to measure the construct of general intelligence and not a theoretical construct of "nonverbal ability" (Bracken & McCallun, 1998), that is, there is no assumption that nonverbal, as opposed to verbal or quantitative, *abilities* are being measured. Instead, general ability is measured using nonverbal tests so that a wide variety of individuals may be assessed, using the same set of questions.

The importance of distinguishing tests with verbal and quantitative (e.g., academic achievement) content from so-called nonverbal tests of ability is critical for the assessment of individuals with limited language skills or those from disadvantaged backgrounds. It is well known that high poverty is correlated with low test scores because of issues associated with educational opportunity at school and at home. Many students who live in poverty receive low test scores because of limited opportunity to learn. These students, who may be from any racial and cultural backgrounds and from any country, are penalized on traditional tests of intelligence and, subsequently, denied access to gifted-education programs and services.

Nonverbal measures of general ability are less influenced by limited language and quantitative skills, making them more appropriate for assessment of culturally and linguistically diverse children (Hayes, 1999; Naglieri & Ford, 2005; Naglieri & Yazzie, 1983; Suzuki & Valencia, 1997). For this and other reasons, nonverbal tests of ability are appropriate for a wide variety of persons, especially those with limited language skills and academic failure (Bracken & McCallum, 1998; Zurcher, 1998). Nonverbal tests can help identify children with high ability who may lack verbal and quantitative skills. The identification method, therefore, has considerable influence on who is served.

There is no consensus about how gifted children should be identified. Although standardized tests are often used as part of the identification process, there is considerable variability as to which tests should be used and what other information should be gathered. Some (e.g., Lohman, 2005) argue that verbal, quantitative, and nonverbal tests are absolutely necessary to identify "academically talented" students, but others (e.g., Naglieri & Ford, 2003, 2005) argue that limiting the definition of gifted to those who demonstrate high achievement and excluding children with high

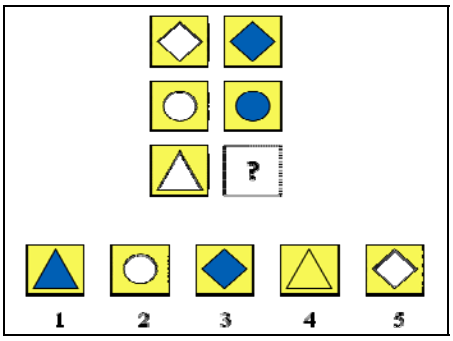

Figure 1. Illustration of a progressive matrices item from the Naglieri Nonverbal Ability Test – Second Edition

nonverbal scores but lower academic scores perpetuates the problem of under-representation of minority children in gifted programs. Naglieri and Ford (2003, 2005) suggest that nonverbal tests are necessary for a more equitable way of evaluating a wide variety of children and giving greater opportunity for those from culturally and linguistically diverse populations to participate in gifted programs.

General Ability Measured Using Nonverbal Tests

Naglieri, Brulles, and Lansdowne (2009) state that general ability is what allows people to solve a number of different types of problems that may involve words, pictures, sounds, or numbers. The tests used to measure general ability may include those that involve verbal, quantitative, or nonverbal reasoning, memory, sequencing, making inferences, problem solving, and so forth. What is important to recognize is that general ability is the foundation for all activities that we do in our daily lives. There is much scientific support for the concept of general ability as measured by tests, such as those developed by Wechsler and Binet (see Jensen, 1998, for a review), but general ability does not have to be measured using verbal, quantitative, and nonverbal tests. Nonverbal tests alone are sufficient.

The essence of a nonverbal test of general ability is that it does not contain verbal and quantitative test questions, although it may involve verbal solutions to the problem; for example, Figure 1 shows a nonverbal test question that could be included in a test described as a progressive matrix. The matrix varies across the horizontal and vertical dimensions. The difference between the top and bottom rows is that the shape inside that square changes (a diamond appears on the top row, a circle appears on the middle row, and a triangle on the bottom row). The difference between the first and second column is the color of the shapes in the boxes. The child needs to understand the interrelationships among these variables (shape and shading across the columns and rows) to arrive at the correct answer (option 1). The child may or may not use a verbal description (in any language) of the matrix, as just described, or the child may simply look at the shapes and understand which option is the answer with minimal verbal analysis. Most children and adults, however, do use verbal means to solve these problems.

Tests that measure general ability nonverbally may have different types of nonverbal questions, but the essential aspect of these tests is measuring ability nonverbally. Some nonverbal tests are made using blocks or puzzles; others may involve memory or sequencing, but the essence of these is that they measure general ability. The Naglieri Nonverbal Ability Tests, first (Naglieri, 1997) and second (Naglieri, 2008b) editions, for example, use nonverbal matrices exclusively and are group administered. Similarly, the Naglieri Nonverbal Ability Test - Individual version (Naglieri, 2003) also exclusively contains progressive matrices test items. The Wechsler Nonverbal Scale of Ability (Wechsler & Naglieri, 2006) uses a variety of subtests that vary in their nonverbal

content, but the goal is the same: to measure general ability nonverbally.

Nonverbal Measures of Ability

The NNAT-2

The Naglieri Nonverbal Ability Test – Second Edition (NNAT-2) (Naglieri, 2008b), is a group-administered nonverbal test of general ability organized into multiple levels of items composed of diagrams as illustrated in Figure 1. The NNAT-2 consists of seven separate booklets organized into levels, each of which is comprised of 48 items. The seven levels and corresponding grades for which they are intended are as follows: Level A - Kindergarten; Level B - Grade 1; Level C - Grade 2; Level D - Grades 3 and 4; Level E - Grades 5 and 6; Level F - Grades 7 to 9; and Level G - Grades 10 to 12. Each level contains items shared from both the adjacent higher and lower levels, as well as exclusive items. The shared items were used to develop a continuous scaled score across the entire standardization sample. These items yield a total raw score that is converted to a Nonverbal Ability Index standard score set at a mean of 100 with a standard deviation of 16 through an intermediate Rasch value called a Scaled Score. Thus, each child's raw score is converted to a scaled score (Rasch value), based upon the NNAT Level administered, and then the scaled score is converted to a standard score, based upon the age of the child. (For more information, see Naglieri, 2008a).

The NNAT-2 (Naglieri, 2008b) was standardized on a nationally representative sample of 52,053 children and adolescents from Kindergarten through Grade 12. All students were administered the NNAT-2 by their regular teachers or school personnel following standardized methods in their regular public schools. Sampling was conducted to obtain groups representative of the U.S. population according to sex, geographic region, socioeconomic status, urbanicity, and race or ethnicity (Naglieri, 2008b). The sample included children in special educational settings, such as those with emotional disturbances, learning disabilities, hearing and visual impairments, and mental handicaps. Children with limited English proficiency were also included in the standardization sample.

The NNAT-2 is different from the NNAT in several ways. First, the items are presented in the colors black, blue, white, and yellow (NNAT items were only blue, yellow, and white), but in both instances the colors are minimally influenced by color-impaired vision. Second, NNAT-2 uses a unique method for informing the examinee of the demands of the test called Pictorial Directions (patent pending), which are designed to provide a nonverbal and engaging method of communicating the task requirements to the examinee. Students are shown a series of pictures that illustrate what is required, along with gestures by the examiner, that draw attention to the correspondence between the pictured directions and the stimuli in front of the subject. Third, the NNAT-2 online version is also available.

NNAT-2 Online

There is little doubt that test administration is moving toward computer-based delivery, accompanied by the typical issues of reliability and validity related to traditional testing methods (Naglieri et al., 2004). The advantages of using online administration include the ease of administration (individually or in groups), an engaging testing environment, better control of materials, no storage of test protocols or booklets, automated scoring, immediate generation of test results, and multiple report options. (For more information, see Naglieri, 2008b).

Summary of NNAT Research

The validity of the NNAT and the NNAT-2, which has particular relevance to the assessment of gifted children across cultures and language groups, as well as a series of published research papers examining the tool, will be briefly described. This includes the examination of White and minority populations, bilingual children, gender differences, and relationships to achievement.

Naglieri and Ronning (2000a & b) studied mean score differences and correlations to achievement for matched samples of White (n = 2,306) and African-American (n = 2,306); White (n = 1,176) and Hispanic (n = 1,176); and White (n = 466) and Asian (n = 466) students in Kindergarten through Grade 12. The three pairs of groups were from the NNAT standardization sample and matched on the demographic characteristics of geographic re-

gion, socioeconomic status, ethnicity, and type of school setting (public or private). Only small differences were found between the NNAT scores for the White and African-American samples (Cohen's *d* ratio = .25 or about 4 standard score points). Minimal differences between the White and Hispanic (*d* -ratio = .17 or about 3 standard score points), as well as White and Asian (*d* -ratio = .02 less than one standard score point) groups were also reported. Additionally, they found that the correlations between NNAT and academic achievement were strong and consistent across the grades (Kindergarten through 12). It is notable that the NNAT correlated similarly for the White, African-American, and Hispanic samples. The small mean score differences and the significant correlations strongly suggest that the NNAT has utility for fair assessment of children who varied on the basis of race or ethnicity and that the scores the test yields are good for statistical prediction of academic achievement.

Naglieri, Booth and Winsler (2004) studied Hispanic children with (*n* = 148) and without (*n* = 148) limited English proficiency who were administered the Naglieri Nonverbal Ability Test (NNAT) (Naglieri, 1997) and the Stanford Achievement Test–Ninth Edition (SAT-[9], 1995). The two groups of Hispanic children were selected from 22,620 children included in the NNAT standardization sample and matched on geographic region, gender, socioeconomic status, urbanicity, and ethnicity. The results showed that there was only a small difference (*d* ratio = 0.1) between the NNAT standard scores for the Hispanic children with limited English proficiency (mean = 98.0) and those without limited English proficiency (mean = 96.7). In addition, the NNAT correlated similarly with achievement for the Hispanic children with and without limited English proficiency. The results suggested that the NNAT scores have utility for assessment of children regardless of their language proficiency and that these children earned scores that were close to average.

Naglieri and Ford (2003) studied rates of identification for gifted programs across race and ethnic groups and found that the NNAT may be particularly useful as a measure of general ability for gifted children from varying cultural and linguistic groups. They used a sample of 20,270 children from the NNAT standardization sample tested during the fall of 1995. These students were representative of the national school population according to socioeconomic status, urbanicity, and ethnicity; the characteristics of the separate Black, Hispanic, and White groups were also similar in composition. Naglieri and Ford (2003) found that 5.6% of the White (n = 14,141), 5.1% of the Black (n = 2,863), and 4.4% of the Hispanic (n = 1,991) children earned a NNAT standard score of 125 (95th percentile rank) or higher and 2.5% of White, 2.6 % of Black, and 2.3% of Hispanic children earned NNAT standard scores of 130 or higher (98th percentile). They concluded that this nonverbal measure of general ability could be helpful for identifying gifted children equitably across these race and ethnic groups.

More recently, Naglieri and Istrail (2010) compared the NNAT-2 mean scores, variances, and developmental changes across ages 5 to 17 years between males and females on a nonverbal measure of general ability, using a large U.S. sample. They found trivial mean score differences in general ability as measured by the NNAT-2 between the sexes, as Rojahn and Naglieri (2006) did with the first edition of the NNAT. Statistically significant but trivial differences in NNAT-2 standard scores were found for level A (males greater than females) and level F (females greater than males). Similarly, statistically significant but trivial differences in NNAT standard scores were previously found (Rojahn & Naglieri, 2006) for levels A and G (males greater than females) and levels B, E, and F (females greater than males). Naglieri and Istrail (2010) extended the examination to include differences in variance by sex, which were significant and meaningful (males evidenced significantly more variance at levels C, D, F, and G). Overall, the results indicate that there were minimal developmental disparities in the mean scores on *g*, as measured by the NNAT-2, but variances were greater for males than for females.

In summary, these data suggested that the percentages of children who would be identified as gifted if this nonverbal matrices test were used are similar across race and ethnic groups. There were trivial differences between the sexes. The results also suggest that the use of this nonverbal measure of ability was equitable across these culturally diverse populations, and, therefore, this instrument may help address the persistent problem of the un-

der-representation of diverse students in gifted education.

Wechsler Nonverbal Scale of Ability

When an individually administered nonverbal measure of general ability is appropriate, a test like the Universal Nonverbal Intelligence Test (UNIT) (Bracken & McCallum, 1997) or the more recently published Wechsler Nonverbal Scale of Ability (WNV) (Wechsler & Naglieri, 2006) could be considered. Rather than using one type of question (e.g., a progressive matrix), the UNIT and WNV use a multi-subtest format. The WNV, for example, is comprised of six subtests: Matrices, Coding, Object Assembly, Recognition, Spatial Span, and Picture Arrangement, all carefully selected to take into consideration developmental differences between the ages of 4:0 to 21:11 years. The age range was divided into two bands, ages 4:0 to 7:11 and ages 8:0 to 21:11 years, with each age band having different combinations of subtests comprising both a four- and two-subtest battery. The test yields a Full Scale standard score (mean of 100 and *SD* of 15) based on the combination of either 4- or 2-subtests which are scaled using a T-score metric (mean of 50 and *SD* of 10). This test was standardized on a large representative sample of children aged 4 through 21 years who closely represented the U.S. population on a number of important demographic variables. The WNV was also standardized on a large representative sample of Canadian children aged 4 through 21 years who closely represented the characteristics of that country. (For more details, see Wechsler & Naglieri, 2006).

The WNV, like the NNAT-2, uses pictorial directions which are designed to provide a nonverbal and engaging method of communicating the task requirements to the examinee. Pictorial directions are supplemented by simple verbal directions provided in English, French, Spanish, Chinese, German, and Dutch. The translated verbal directions are used only as needed and by a professional who is able to perform the testing in the examinee's preferred language. If the use of the pictorial directions and supplemental verbal directions proves ineffective for explaining the demands of the subtest, examiners are instructed to provide additional help as needed, assisting the examinee to ensure that he or she understands the requirements of the test.

The WNV is like other Wechsler tests in that it uses subtests that vary in content, but it differs from other Wechsler tests because it was designed to measure general ability using tests that do not have verbal content. The advantage of using nonverbal tests to measure general ability is that the influence of language skills is minimized, and requirements that the examinee have spoken or written language or mathematical skills are greatly reduced. While the nonverbal tests on the WNV are all alike in that they do not require language or arithmetic skills, some of the subtests have a strong visual-spatial requirement, others demand paper-and-pencil skills, and others require the recall of the sequence of information. This multidimensionality of task requirements distinguishes the WNV from tests that use one type of task requirement, such as the NNAT and NNAT-2 (Naglieri, 1997, 2008b). Despite the variability of subtest content and task demands, the WNV, like other nonverbal tests, have essentially the same goal of measuring general ability nonverbally.

Summary of WNV Research

Due to the recent publication of the WNV, there are comparatively fewer studies than on the NNAT, but there are important preliminary findings that bear on the assessment of gifted children that will be briefly described here. (See the test manual for more details.)

The WNV is strongly correlated with other Wechsler tests (see Wechsler & Naglieri, 2006), but, more important, it is an effective tool for measuring general ability for diverse populations. Gifted children earn high scores on the WNV, and the test yields Full Scale scores as high as 170 for both the 2- and 4-subtest versions. The WNV Manual provides a significant study of English language learners. The sample includes students whose native language was not English, the primary language they spoke was not English, a language other than English was spoken at home, and their parents had resided in the United States for less than six years. The 55 students, aged 8 to 21 years, were administered the WNV and compared to a group matched on basic demographics. The results showed that the students learning English earned, essentially, the same score (mean = 101.7) as the

matched control of English-speaking students group (mean =102.1). These results indicate that the WNV measures general ability effectively and fairly for those with limited English-language skills.

Wechsler and Naglieri (2006) provide evidence of the utility of the WNV for individuals who are learning English. The study involved examinees who speak English as a second language who were compared to a matched sample from the WNV standardization sample. This included 55 examinees aged 8:0 to 21:11 years whose "native language was not English, they spoke a language other than English at home, and the examinee's parents had resided in the United States less than 6 years" (Wechsler & Naglieri, 2006, p. 63). There were 27 Hispanics and 28 examinees who specified their primary language was Cantonese, Chinese (unspecified), Korean, Russian, Spanish, or Urdu. Additional information about this sample is available in the WNV Technical and Interpretive Manual (Wechsler & Naglieri, 2006). These examinees performed very similarly to their matched counterparts from the normative sample, with differences found between the mean scores.

Conclusions

Identification of high-ability and gifted students can be accomplished best using a nonverbal measure of general ability, particularly when assessing across cultural and linguistic groups. One of the most important obstacles to identifying children who may be very intelligent but with limited language and academic skills is the inclusion of academically and linguistically based questions in ability tests. Nonverbal measures of ability are more appropriate for identifying gifted children, especially those who come from disadvantaged environments in any country (Bracken & Naglieri, 2003; Naglieri & Ford, 2003, 2005). Recognition of the extraordinary value that highly intelligent children have for the future of any country cannot be overstated. The methods used and the assumptions made about who is gifted have influenced who has been selected to receive additional academic instruction. Administrators of gifted programs and teachers of the gifted around the world should ensure that high-ability children are fairly assessed so that they may be included in programs for the gifted even if they have needs in academic and linguistic skills. They will likely flourish and grow at a remarkable rate, especially given adequate instruction (see Naglieri, et al, 2009). The future depends upon finding and educating gifted students of all backgrounds and economic levels around the world.

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