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Lessons Learned About Educating the Gifted and Talented:

A Synthesis of the Research on Educational Practice

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Abstract: This article discusses five reconsiderations (lessons) the research on the education of the gifted and talented suggests. Although several of the considerations derive from traditional practice in the field, some reconsideration is warranted because of more currently researched differences in how the gifted learner intellectually functions. It is argued that thinking of the gifted learner as idiosyncratic, not necessarily one of many classified as "the gifted," requires a reconceptualization of how to appropriately and fully serve this unique learner. The research synthesized here covers the period from 1861 to present and represents the entire body of published research studies and representative literature (theory, program descriptions, and persuasive essays). Implications for service development and implementation are also discussed.

Putting the Research to Use: This synthesis of the research covering instructional management options, instructional delivery techniques, and curriculum adaptation strategies is an attempt to aid school system administrators and educators to identify which practices will best fit their respective settings rather than see the research as a more generalized set of "best practices" that every school should implement. The research is objectively outlined, but more than any other lesson to be learned from this comprehensive research base is that there is no single practice or panacea that will work in every school setting and with every gifted or talented learner. If one reads the five lessons that can be learned from this study, one quickly comes to understand that there is a need to find some means to group gifted learners *at times* for their learning and socialization, along with a need to move them ahead *in some form* when their learning outstrips the curriculum they are offered. That these students need *some opportunities*, too, to work independently to fully develop their demonstrated talents is also clarified in the study. But the strongest lesson of all to be gained from the research base in gifted education is that there are many different ways in which these options for gifted learners can be offered in a school. It is completely up to the school to select those that will work best with its current philosophy, staff, and school community.

Keywords: *grouping; acceleration; instructional management; talent development*

In the past 2 years a large Midwestern school district decided to develop individual learning plans (ILPs) for every high ability student in the district. The resource teachers studiously and conscientiously toiled to get these plans written, such that by the end of the first year, they had only 50 more to go. Of note through this endeavor were the seeming patterns these teachers found among their students' needs for service. These patterns turned out to be very different from the need they felt they had been meeting through the previous pull-out program, a service that was still being delivered in addition to the ILP development. Using the evaluation grid ("solution finding") of the creative problem-solving model (Parnes, 1967), they were able to identify an array of services that would meet most of the needs of this large group of idiosyncratic learners. The revised array of services has been partially implemented at this point and will continue to be implemented over the next 3 years in incremental steps across the district, each step quite large in and of itself, so that no gifted child will leave the school system without having had his or her needs addressed to the best of the district's ability and resources.

What was it that turned this district "around" to the point where they were willing to consider a drastic

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change in program services? For one thing, they had received a fairly scathing evaluation of their previous pull-out program. This had sent them searching for solutions. Second, they were a district with built-in character, from the teaching staff on up and from the administration on down: They took the results of their evaluation and used it as an "opportunity" to restructure their program, rather than to eliminate gifted services altogether, a "strategy" quite commonly experienced across the country in this yet another time of diminishing resources and attention on gifted education (Council of State Directors of Programs for the Gifted, 2001; Karnes, 2003; Ohanian, 2004). Last, the district turned inward to look at the research on best practices to try to find a solution to their problem, namely in forming an online book study group to survey the literature in the field and identify these practices.

In the remainder of this article, the lessons this team learned, based on their study of the research, will be shared, and the implications of these lessons, as they apply to implementation, will be discussed. Representative studies, those of best design quality and most current, will be cited to illustrate what the synthesis of all the studies concerning each lesson reported. Table 1 lists the number of research studies located for each lesson and the number of articles that may be classified as "literature" for each lesson.

Lesson 1: Gifted and Talented Learners Need Daily Challenge in Their Specific Areas of Talent

In Bloom's (1985) longitudinal study of eminence in two academic, two athletic, and two artistic fields, a strong pattern was found in that talented children were provided with a continuous progression of more and more difficult expectations, set jointly by themselves and their current tutor, teacher, or mentor. The children, as they progressed in the knowledge and skills necessary in their talent areas, could reflect on their progress and based on these perceptions, develop new "benchmarks of progress." The extensive novice-expert or mentoring research (e.g., Boston, 1976; Ericcson & Smith, 1991; Larkin, McDermott, Simon, & Simon, 1980; Zukerman, 1977) has made it abundantly clear that consistent practice at progressively more difficult levels in skill, coupled with the talented learner's natural ability to link new knowledge to prior knowledge and skill, accounts for what ultimately is perceived as expert performance.

Csikszentmihalyi, Rathude, and Whalen's (1993) study of talented teenagers also noted the rise in psychological distress (existential depression), stress, and boredom when these individuals cannot "move forward"—either individually or in socialized situations—in their area of talent. Although much research has suggested the need for the talented individual to persevere and persist, often independently (e.g., Csikszentmihalyi et al., 1993; Feldman, 1991), it is clear that significantly greater development occurs when a concerted effort has been made at both school and in the home to provide the talented child with increasingly complex knowledge and skills. In a previous synthesis of research (Rogers, 2002), it was concluded that an average of one third to one half an additional year's achievement growth (effect size [ES] = .34 to .49)[1] should be possible within the school program of talent development when the child participates in the growth area on a daily basis. Less conservatively, if one uses Bloom's (1985) estimate of yearly growth, the expectation is closer to 3 years of growth in the specific talent area per year. The difference between these two sets of estimates most likely lies in the intensity of the daily challenge and supervision offered.

The management of this first lesson of daily talent development requires some form of regrouping for such instruction, whether that be for a whole class of high talent students, a like-performing cluster group, or a like-peer dyad or like-ability cooperative group, for which the students are provided with cooperative challenges to be completed with their peers. (To attain Bloom's outcome, it is more likely that an individual mentorship or one-on-one tutoring will be required for full talent development.)

If this grouping is not possible, then a structured program of independent learning supervised by a gifted resource teacher, media specialist, or talent-area mentor either within or outside of the schools must be developed. It also involves advanced exposure to content beyond expected age or grade level beginning at the point of the child's current level of functioning in the talent area, whether that be through early entry to school, early admission to university, dual enrollment across school building levels, or actual mentorships or tutoring. In looking at the ESs reported in previous studies, it is believed academic gains will continue year after year in the targeted talent area for so long as this daily challenge is provided (Kulik & Kulik, 1992; Slavin, 1987). For equally talented students not involved in this daily challenge,

Table 1
Number of Research Studies and Literature Located for Each Lesson

Lesson Element or Practice	Number of Research Studies	Number of Literature Articles
Daily challenge in talent area (Lesson 1)	3	9
Talent development	15	35
Challenge strategies	125	294
Consistent challenge in all academic areas (Lesson 1)	125	294
Science, mathematics	9	15
Literature, language, social sciences	6	12
Independent learning (Lesson 2)	67	217
Independent study	29	130
Individualized learning (Plans)	14	30
Need to work independently	24	11
Individual benchmark setting	4	2
Self-instructional materials, projects	13	17
Credit for prior learning	13	35
Compacting	12	23
Grade-based acceleration (Lesson 3)	161	355
Grade skipping	69	178
Credit by examination	10	10
Early admission to college	36	55
Grade telescoping or vertical acceleration	17	31
Nongraded or multiage classes	29	81
Subject-based acceleration (Lesson 3)	199	433
University-based programs	32	63
Dual enrollment	33	69
Mentorships	17	31
Early entrance to school	30	143
Subject acceleration	30	33
Distance or online learning	29	17
Cross-graded classes	16	20
Advanced Placement or International Baccalaureate	11	50
College in the schools	2	7
Grouping by like ability or performance (Lesson 4)	127	377
Full-time school, program, or track	48	91
Cluster grouping	8	17
Within-class grouping	14	27
Regrouping for specific instruction	31	110
Cooperative learning dyads	4	6
Cooperative learning teams or groups	10	5
Pull-out programs	12	121
Instructional differentiation (Lesson 5)	168	358
Fast-paced instruction	10	22
Mathematics	7	13
Science	1	6
Foreign languages	2	3
Limited drill and review	10	19
Mathematics	8	15
Science	2	4
Whole-to-part concept teaching	11	10
Abstraction and complexity in concepts	10	46
Interdisciplinary organization	7	29
Resequenced content	11	11
People, social issues	3	8
Methods of inquiry, problem-based learning	32	63
Higher-order analysis	10	32
Divergent, affective, or open-endedness	27	59
Conceptual discussion, lecture, simulations	12	18

their "gain" will be the 1 year's growth for attending school for a year, whereas the "challenged" group will be a full year ahead in 2 years, 3 years ahead in 4 years, and so on. It is clear that the capacity to make these gains exists.

Although the findings of Lesson 1 verify that daily challenge is important for full talent development, there is research to support that consistent, but not necessarily daily, challenge is important to gifted learners outside of their individual talent area. The corollary to Lesson 1, then, is that every identified gifted child must be given consistent, progressively more difficult curriculum that has been articulated across grade and building levels and has been consciously delivered. Across 40 studies that gifted students at various grades were provided with a challenging, articulated curriculum in a variety of curriculum areas, the results have indicated significantly higher test performance (e.g., Tieso, 2002; Tomlinson et al., 2002; Tyler-Wood, Mortenson, Putney, & Cass, 2000) and improved self-efficacy and motivation (e.g., Swiatek & Lupkowski-Shoplik, 2002). Kulik and Kulik (1984) calculated the ESs of motivation for subject studied when gifted children were grouped together for advanced instruction in specific curriculum areas and found that the effect on motivation was substantial (ES = .37). Hoekman, McCormick, and Gross (1999) extended the work of Csikszentmihalyi et al. (1993) with adolescent gifted learners in Australia, finding that their levels of stress were substantially higher when they were placed in unchallenging classroom settings; conversely, stress was considerably reduced for these students when they were subjected to high levels of challenge and rigor and subsequently were successful in meeting the challenge. Shigaki and Wolfe (1980) and Scruggs and Mastropieri (1984), among others, have studied the effects on gifted learners when they are trained in higher order thinking skills, an inherent part of almost any challenge. These learners tended spontaneously to transfer the skills learned to other areas of learning and curriculum, unlike other groups of learners at different ability levels.

The implications of this are that some form of structured regrouping by ability level (not necessarily performance level this time) or structured independent learning will be needed to ensure implementation of this consistency of challenge. The landmark study of Archambault et al. (1993) attests to the necessity of finding a structure outside of the mainstream classroom in which the challenging curriculum can be offered; if left for the regular classroom teacher to implement, there will be little chance for it to occur with the plethora of other responsibilities, the lack of training, and often, lack of motivation to provide the differentiation. The pull-out or send-out program can be a viable choice for implementation here, particularly if it brings gifted learners together for these challenges for a more substantial portion of the school week, rather than a 1- to 2-hr block per week. To be effective, the focus of the pull-out must be on specific extensions of the regular curriculum in the school or on specific skills and processes integrated within a curriculum area (Vaughn, Feldhusen, & Asher, 1991).

Lesson 2: Opportunities Should Be Provided on a Regular Basis for Gifted Learners to Be Unique and to Work Independently in Their Areas of Passion and Talent

A synthesis of the research on gifted learning styles (Rogers, 2002) showed that ahead of all other forms of instructional delivery, when compared to regular learners, gifted learners are significantly more likely to prefer independent study, independent project, and self-instructional materials. Furthermore, Haensley (1980) and Jeter and Chauvin (1982) found that gifted learners must already be task committed and prefer learning independently for programs of independent study to be successful.

The impact of independent learning on gifted learners appears to be somewhat checkered. In the elementary years, growth in self-reliance, ability to identify a clear topic focus, increased critical thinking, creative thinking, and conceptual discussion are positive outcomes, but no improvement in overall academic achievement is reported (Bernstein, 1969; Huber, 1978; Lapp, 1972; Pentelbury, 2000). Parke (1983) and Bishop (1999) suggest achievement gains occur for gifted independent learners when compared to high achieving comparison groups, provided there is broad-based classroom teacher and media specialist collaboration in the program. At the secondary level, Callahan and Smith (1990) and Gladstone (1987) found general improvements in achievement and improved motivation for learning, whereas Curtin and Shinall (1987) found specific improvements in the recognition of patterns in language structure and target cultural awareness during independent computer-based learning in foreign language training.

On the other hand, Rogers's (1998) synthesis found a zero ES for academic achievement when gifted learners engaged in independent study were compared on standardized tests of achievement with equally gifted learners not involved in independent learning. The measurement of achievement when engaged in a highly individual study project and the chances that even a single item on the achievement measure directly corresponded to what was learned may help to explain the lack of impact. Another explanation may have to do with the skills gifted learners possess to meaningfully engage in independent study.

It is suspected that being gifted or even wanting to do an independent study does not guarantee that one can be effective in an independent learning activity. Fortunately, the field offers several curriculum development models for setting up independent study provisions, such as Betts's (1986) autonomous learning model, Treffinger's (1986) self-directed learning model, and Renzulli and Reis's (1985) enrichment triad/schoolwide enrichment model with its focus on Type III activities. In summary, independent study does have an impact on motivation to learn, and it is possible that with appropriate structuring through the use of a curriculum model, well-trained teachers (Nasca & Davis, 1981), and collaboration between the teacher and the library (Bishop, 1999) that the independent skills learned through individual study will be transferable to other academic areas, ultimately affecting overall academic achievement. Although the lesson itself is clear, there is a need for further research to accurately measure the specific effects of independent learning on overall academic achievement in gifted learners.

As a part of allowing for individualized learning for gifted learners, it is clear that when students can show their mastery of what is about to be offered, substantial gains in achievement can take place when the time "bought" is used to extend the students' individual learning. There are several ways in which this credit can be given: credit by examination, curriculum compacting (preassessment, either formal or informal, of mastery and implementation of differentiated replacement activities when mastery is demonstrated), and credit for prior learning (allowing a student to forego a course or class because of previous formal or informal learning experiences in that content area).

The academic effects of compacting are powerful, especially in mathematics and science when the replacement activities have been accelerated and advanced in complexity (four fifths of a year's academic gain; e.g., Feldhusen, Check, & Klausmeier, 1961; Kulik, Kulik, & Smith, 1976; Weinstein, 1971); for the "softer" sciences (reading, social studies; J. J. Gallagher, Greenman, Karnes, & King, 1960; Parke, 1983; Wesson, 1963), the impact is moderate and positive (one fifth of a year's growth), probably so because of the deepening and broadening more likely to occur in those areas rather than picking up the pace or advancing the grade level of materials provided. A classic study of curriculum compacting was undertaken by Reis, Westberg, Kulikowich, and Purcell (1998) on 27 geographically distributed school districts in the United States. Findings suggested that when 36% to 54% of either the reading or mathematics curricula were eliminated through preassessment and replacement differentiation, gifted students performed as well as equally gifted students whose curriculum was not compacted. In replicating this work, Stamps (2004) found similar achievement results and strong affective effects: Parents of students who had been compacted reported their children to have more positive attitudes toward learning and toward the subjects that were compacted than did the parents of equally able students not compacted.

As Sternberg (1986) exhorted, we must give intellectually gifted and talented youngsters the chance to feel they are making "progress" in their learning; all kinds of problems begin to occur when they must sit year after year repeating what they have previously mastered—from reticence to cognitive risks (Rogers, 1986), to underachievement (Colangelo & Assouline, 1995), to lowered academic self-esteem (Hoekman et al., 1999), and to social and behavioral maladjustments (Peters, Grager-Loidl, & Supplee, 2000).

Lesson 3: Provide Various Forms of Subject-Based and Grade-Based Acceleration to Gifted Learners as Their Educational Needs Require

As argued most effectively in *A Nation Deceived: How Schools Hold Back America's Brightest Students* (Colangelo, Assouline & Gross, 2005), many subject-based acceleration options show substantial, positive academic effects in specific subject areas. In some cases, for example, in university-based programs (Enersen, 1996; Olszewski-Kubilius & Grant, 1994), mentorships (Rogers, 1992), and dual enrollment (Rogers, 1992), the social effects (i.e., peer interactions, assuming leadership roles, organization participation) or emotional effects (i.e., academic self-esteem, motivation to continue learning in talent area, perseverance, interest in talent area) have also been significantly positive.

Some of these subject-based accelerative options include early entrance to school (starting kindergarten or first grade at least a year earlier than "normal"), subject acceleration (exposing the talented learner to content in the talent area that is 1 or more years in advance of the learner's actual grade placement), university-based programs (residential, Saturday, summer, or commuter courses for middle and high school gifted learners held on college campuses), individualized distance or online learning (courses offered via television or Internet that offer advanced content set at an individualized pace and complexity), cross-graded classes (students cross grade lines within a school in a content area taught at the same time in all grade levels, to work at the level of curriculum they are currently in the process of mastering), advanced placement or international baccalaureate courses (provision of college-level content in specific content areas to high school learners, with college credit provided on successful performance on an external national or international examination, respectively), dual enrollment (allowing a student coursework at the next higher building level in his or her area of talent), college-in-the-schools (offering college courses on the high school campus for both high school and college credit), and mentorships (connecting the talented learner with a content expert who structures the learning experiences over a specific period of time). In previous syntheses, Rogers (1992, 2002, 2005) found the effects for these options to range from approximately one third of a year's additional growth (advanced placement or international baccalaureate) to three fifths of a year's academic gain (mentorship and subject acceleration).

At the elementary level, representative studies reporting the academic effects of early entrance to kindergarten or first grade show a consistent picture of high achievement, good social adjustment, and stability of self-esteem measures. Proctor, Black, and Feldhusen (1986) in a review of 21 studies of early entrants found that they kept pace with their classmates academically and in many cases surpassed them. More recently, McCluskey, Baker, and Massey (1996) found in a retrospective study of early entrants 24 years later that 80% had fared better or at least as well as their older classmates. Gagne and Gagnier's (2004) comparative study of early entrants and "regular" entrants in Quebec schools found no differences in academic maturity, academic achievement, conduct, or social integration, suggesting that social and emotional adjustment are not impacted when a child enters early.

Studies of subject acceleration, especially pertaining to science or mathematics, show dramatic achievement gains for gifted elementary students (Ivey, 1965; Mayne, 1961; Stanley, 1975) and secondary students (Lynch, 1992). Online, individualized learning has shown substantial academic effects when used in mathematics or science (Dimitrov, 1999; Nikolova & Taylor, 2003; Teh & Fraser, 1995). Cross-grading for gifted students shows extraordinary academic gains in mathematics and reading (Burns & Mason, 2002; Kulik & Kulik, 1992).

University-based courses and enrichment opportunities offered through the various national talent searches have shown remarkable affective (social and self-esteem) gains for gifted secondary students (Olszewski-Kubilius, 2005) and academic and affective predictive gains for elementary students (Lupkowski-Shoplik & Swiatek, 1999). Both advanced placement and international baccalaureate courses show improved grade averages in the specific course replacements at university level for gifted students (e.g., Burnham & Hewitt, 1971; Hanson, 1980; Willingham & Morris, 1986). Research on dual enrollment focuses more on actual achievement on tests but also shows a consistently positive picture of academic gain in the specific areas in which the dual enrollment has occurred (e.g., Bartkovitch & Meszynski, 1981; Peterson, Brounstein, & Kimble, 1987). Mentorship research has primarily focused on the later years of high school and been structured around year-long experiences with content experts. Not only are social adjustment and self-esteem gains reported, but also substantial academic gains in the specific area in which the mentorship takes place (e.g., Boston, 1976; Gray, 1982; Weiner, 1985).

The shortening of the actual years spent in the K-12 school system is often defined as grade-based academic acceleration (Rogers, 2005). The options thus defined include grade skipping, grade telescoping, nongraded or multigrade classes, credit by examination, and early admission to college. The academic effects for double promotion to a higher grade (grade skipping), completing 3 or 4 years of curriculum in 2 or 3 years (grade telescoping), progressing flexibility through 2 or more years of curriculum within a single classroom (nongraded or multigraded), being allowed to bypass curriculum when testing in that area demonstrates mastery (credit by examination), and entering university without formal completion of the high school diploma (early admission) are substantial, ranging from one-third year's growth for early admission to university (Holahan & Brounstein, 1986; Janos, Robinson, & Lunneborg, 1989; Swiatek & Benbow, 1991) to three fifths of a year's gain for credit by examination (e.g., Barnette, 1957; Caldwell, 1977; Pressey, 1945) to a full

Table 2
Effect Sizes (ESs) of Accelerative and Grouping Management Strategies

Option	Number of Studies	Academic ES	Social ES	Esteem ES
Early entrance to school	68	.49	.20	.16
Subject acceleration	21	.59	—	–.09
University-based programs	11	.23	.19	.11
Distance learning	3	.33	—	—
Cross-graded classes	15	.45 (.46)[a]	—	—
Advanced Placement or International Baccalaureate classes	22	.29	.24	.07
Dual enrollment	36	.32	.15	.47
College in the schools	4	.29	—	.10
Mentorships	15	.57	.47	.42
Grade skipping	32	1.00 (.56)[b]	.31	.10
Grade telescoping	28	.45	.05	—
Nongraded or multiage classes	20	.43	—	.05
Credit by examination	13	.59	—	—
Early admission to college	37	.35	.16	–.05
Full-time ability grouping	32	.49 (.33)[c]	.24	–.16
Performance grouping	16	.34	—	.11
Within-class grouping	9	.34	—	—
Cluster grouping	13	.62	—	—
Peer-tutored dyads	5	0.00	—	—
Like-ability cooperative groups	3	.26	—	—
Curriculum compacting	13	.83 (.26)[d]	—	—
Credit for prior learning	15	.56	—	—
Pull-out groups	7	.65 (.44, .32)[e]	.19	.13

a. Reading, math, respectively.
b. Same-age peers, average of same age and older age peer effects.
c. Elementary, secondary, respectively.
d. Math or science, language arts or social studies, respectively.
e. Academic, critical thinking, creative thinking, respectively.

year's additional growth for grade skipping (Klausmeier & Ripple, 1962; Rogers, 2005; Splaine, 1981). For grade telescoping, little is known about social and emotional effects, but the academic gains appear to be approximately two fifths of an additional year for each of the telescoped years of the experience (e.g., Justman, 1953; Mattin, 1965; Shouse, 1937).

Multiage classrooms have been extensively researched for the general population; for them, the structure does not necessarily result in a shortening of school time as it would for the gifted. Among the few studies that focus on gifted students in such classes, however, the research suggests that high ability learners seem to like school more, to be more advanced in their social interactions, and to have access to advanced content more frequently than do high ability students in "straight" classes (e.g., Anderson & Pavan, 1993; Lloyd, 1999). The single qualification for them, however, seems to be that the ceilings on learning remain "off" even when they are the oldest children in such classes (Hafenstein, Jordan, & Tucker, 1993).

Despite the many myths rampant about forms of grade-based acceleration, the evidence suggests that the social impacts are very positive for options such as grade skipping and slightly positive for the other forms of acceleration. Emotional impacts are small and positive throughout, when the self-esteem question itself has even been asked at all. Research is still needed to determine social and emotional effects on K-12 students for the credit by examination option, but chances are researchers will find similar small yet positive effects for academic self-esteem, as are found with most other forms of subject-based and grade-based acceleration (see Table 2).

Lesson 4: Provide Opportunities for Gifted Learners to Socialize and to Learn With Like-Ability Peers

The research on the ability grouping and performance grouping of gifted learners is extensive and substantially positive. Kulik and Kulik (e.g., 1984) have reported in several meta-analyses since 1984 the positive academic effects of such options as full-time ability grouping (providing all academic learning for gifted learners within a self-contained setting such as a special school or full-time gifted program), performance grouping for specific instruction (sorting and placing students in a classroom with others who are performing at the same level of difficulty in the curriculum), within-class grouping (individual teachers sorting children in their own classroom according to their current performance in the curriculum), cluster grouping (placing the top 5 to 8 students at a grade level in an otherwise heterogeneous class so that they become a “critical mass” for whom the teacher can find time to—and does—differentiate), and pull-out groups (gifted students removed for a consistent set time to a resource room for extended curriculum differentiation).

The effects reported by the Kuliks (1984, 1992), Gentry (1999), Gentry and Owen (1999), and Rogers (1998) range from one third of a year’s additional growth for full-time gifted classes at the secondary level (higher at the elementary level) to three fifths of an additional year’s growth for cluster grouping. The social effects are small and positive, as are effects on academic self-esteem. Rogers found more recent research on peer-tutored dyads (high ability student paired with lower achieving student for collaborative learning of set tasks) and like-ability cooperative learning (high ability students provided with cooperative learning tasks to complete jointly). Effects for these options were moderately positive for like-ability cooperative learning (Arneson & Hoff, 1992; Coleman, Gallagher, & Nelson, 1993; Hollingsworth & Harrison, 1995; Kenny, Archambault, & Hallmark, 1995; Neber, Finsterwald, & Urban, 2001), but null for peer-tutored dyads (Brush, 1997; Carter, Jones, & Rira, 2001; Elmore & Zenus, 1994; Hernandez-Garduno, 1997). Neither the gifted nor other member of the dyad made any academic gain, but the lower achieving dyad member did “act more like a student”—probably not enough of a change to consider this a viable strategy for gifted learners!

Within-class grouping has been studied throughout the time span covered in this research synthesis. More recent research has corroborated the original findings: Within-class grouping is superior to no grouping or mixed ability classrooms or groupings for high ability learners (Burnette, 1999; Delcourt, Loyd, Cornell, & Goldberg, 1994; Kulik & Kulik, 1992; Lou et al., 1996). Significant, however, is that the materials or curriculum tasks must be differentiated for these within-class groups according to their “readiness” for the learning outcomes planned. Differentiation of materials has been strongly emphasized in the studies on regrouping for specific instruction. For gifted learners who are grouped by performance level and provided with a documented, “appropriate” (fast-paced, compacted, beyond grade level) curriculum in mathematics and reading, for example, the ESs average approximately four fifths of an additional year’s academic achievement (Rogers, 2002; Slavin, 1987).

The time-honored grouping strategy in gifted education—the pull-out, send-out, or withdrawal program—has, perhaps, the most problematic research. In general, to measure achievement outcomes, the gifted children’s achievement in the pull-out program (when an extension of the regular curriculum) has been compared with mainstream classroom gifted children’s achievement on the same specific test of achievement (the mainstream teacher reported enrichment in the tested area). The ESs reported in 1991 by Vaughn et al. were substantial, approximating three fifths of a year’s additional gain, but questions were raised (Rogers, 1998) about the fairness of tests when one group has attained specific information and one has not. More recent research on pull-out programs suggests that teachers of pull-out programs are more extensively trained than are homogeneous classroom teachers, have more access to differentiated materials, and come to the program “excited” rather than burdened by daily responsibilities for differentiation (Campbell, 1993). Affectively, students in pull-out programs are more positive about school, have more positive perceptions of giftedness, and are more positive about their program of study at school than are gifted students not participating in pull-out programs (Delcourt et al., 1994; Kulik & Kulik, 1992; Lim, 1994; Shields, 2002; Zeidner & Schleyer, 1999).

In summary, the evidence is clear that powerful academic effects and small to moderate affective effects are produced when gifted children are grouped with like-ability or like-performing peers and exposed to differentiated learning tasks and expectations. It is also clear that the grouping has positive effects whether full-time or part-time, although logically the more time this occurs for gifted children, the more positive the effects on them, socially and emotionally.

Lesson 5: For Specific Curriculum Areas, Instructional Delivery Must Be Differentiated in Pace, Amount of Review and Practice, and Organization of Content Presentation

Pacing

Beginning with the illustrious history of the Study for Mathematically Precocious Youth (SMPY) in 1971 up to the present, the consistent conclusions for precocious mathematicians and scientists, whether very young or in the middle school years for which SMPY was established, are that they succeed in these fast-paced classes offered early at or above the rates documented for their older peers and tend to retain more accurately what they have learned in these accelerated situations (Bartkovitch & Meszynski, 1981; Brody & Stanley, 1991; Kolitch & Brody, 1992; Stanley & Stanley, 1986; Swiatek & Benbow, 1991). Year after year, students participating in SMPY or its replications (e.g., Northwestern, Duke, University of Washington, University of Minnesota) successfully complete 2 years of advanced mathematics in 1 year's time, with approximately 2 to 3 hours of teacher contact time per week during the year. Similar findings have been reported for Saturday and summer courses offered on university campuses in areas such as foreign language, science, history, and mathematics (e.g., Wisconsin Center for Academically Talented Youth, Northwestern Center for Talent Development, Duke Talent Identification Program). In every case, participating students successfully completed a full year of coursework in a small number of hours or weeks with content presented at a pace of presentation many times faster than encountered in their regular classrooms.

Start (1995) measured the learning rates of children for novel concepts at different standard deviations on IQ tests, determining that a child with an IQ of 130 (2 standard deviations above average) learns at a rate 8 times faster than a child with an IQ of 70 (2 standard deviations below average). Although the concepts used were comparatively simplistic and few conclusions can be drawn about the relationship between the complexity of a concept and the rate at which it is learned, Start's findings offer a rationale for attempting to pick up the pace of learning for gifted children. They also offer an alternative to the issues of boredom and perceived stress for gifted children as discussed in Lessons 1 and 2. There will be less "down" time in which these students will lose focus, become distracted, act out, and/or perhaps misencode the concepts presented because of their lack of attention on the presentation.

In general, then, if bright children are to retain what they have learned in mathematics and science, it must be presented at their actual learning rate, not considerably slower than that rate. Some research has suggested that this fast pace is also conducive in other educational areas and settings, such as foreign language (Van Tassel-Baska, 1987) and online distance learning (Ravaglia, Suppes, Stillinger, & Alper, 1995), but the research is not as extensive nor definitive. The implications are that there should be a qualitatively different presentation of content in areas such as mathematics, science, and foreign language for students who are extraordinary in these areas. This will require separate instruction, either individually or in a like-performing group, rather than delivery through the more traditional whole class concept presentation followed by individual practice and application.

Practice and Review

The research based on SMPY data over the past 30+ years (e.g., Brody & Stanley, 1991; Swiatek & Benbow, 1991) has revealed that students not only had the accelerated pace of instruction in their college classes at Johns Hopkins, but also did considerably less homework practice before moving on to the next level of difficulty or conceptual level. Yet their performance on national tests substantially showed their ability to accurately retain and apply what they had learned in these classes when compared to their older peers.

Cossey (1999) suggested that the higher Trends in International Mathematics and Science Study results of countries other than the United States may be correlated to more focused mathematics and science curriculum, to the coverage of math and science concepts in more depth, and with opportunities to apply these concepts, rather than the approach taken in U.S. mathematics texts to cover a wide variety of topics more superficially and with a spiraling approach to concepts and processes. Likewise, Usiskin (1987) and Sheffield (1999) have both argued that experiential learning in mathematics, using inquiry and problem-based strategies versus teaching for automaticity through drill and practice, leads to deeper mathematical understandings among gifted mathematicians.

The general work on distributed *versus* massed practice (e.g., Ausubel, 1966; Dempster, 1988) also applies to this differentiation in the amount of practice and review required of talented mathematicians and scientists, suggesting that practices or reviews, even though limited in number to 2 to 3 reviews for the gifted, be distributed across periods for successful re-encoding of the concept to occur. Lupkowski-Shoplik and Assouline (1993) have also suggested the correlation between spaced reviews of mathematics and greater retention and understanding.

Whole-to-Part Concept Teaching

In mathematics, the work of Krutetskii (1976) concluded that gifted students in mathematics were able to envision the class or problem category of even a single problem, identifying the hidden generality of what might be seemingly disparate elements to other learners. He believed that this kind of thinking was observable as young as 7 or 8 years of age. Sternberg (1985, 1986), among others, wrote about the difference between the "decontextualist" mind and the "constructivist" mind. He argued that gifted mathematicians and scientists tend to be decontextualist, acquiring information as a whole and storing it in long-term memory as a whole, whereas average learners tend to acquire and store information in small, disparate chunks, from which their teachers will need to help them make connections to ultimately see the whole of a concept. Shore's (2000) work has suggested that the relationship between giftedness and expertise is powerful: Gifted learners are more likely to switch to an alternative strategy when faced with a mathematics challenge they cannot resolve, than to resort to trial and error. Woodrum (1979) found similar results in experiments she ran using Mastermind Boards. Gifted learners tended to identify or at least search for a "rule" to make their guesses rather than just hit or miss.

In science, S. Gallagher, Stepien, and Rosenthal (1992) have shown that gifted students engaged in problem-based science learning were significantly higher than equally gifted groups in problem finding (recognition of the underlying principle or concept for a potential problem and its solution). Science curriculum, developed by the Center for Gifted Education, that used a strong conceptual reasoning and critical thinking process to help high ability students progress through a problem-based inquiry has shown significant gains in integrating science process skills beyond the problem in which they were engaged when compared to equally high ability students not involved in this curriculum (Van Tassel-Baska, Bass, Ries, Poland, & Avery, 1998). Research conducted with Bruner's *Man: A Course of Study* curriculum (Hanley, Whitla, Moo, & Walter, 1970) also found that it was gifted learners who ultimately apprehended the generalization of the curriculum ("What makes humans human?"), unlike the remaining groups of learners engaged in this powerful interdisciplinary, discovery-based curriculum.

The implications for instructional management become clear when one considers the diverse needs of the regular classroom in most U.S. schools. For a teacher to radically quicken the pace for gifted learners, eliminate most practice and review, and teach in a whole-to-part fashion by concepts, principles, issues, and generalizations rather than from the base of facts, terms, and parts of a whole idea is almost an impossibility without some form of at least temporary regrouping or clustering of the highest ability or highest performing learners in the classroom and a commitment to spending a proportionate amount of classroom time differentiating instruction accordingly. Winebrenner (1992) has been explicit in how such classrooms can be arranged, although her suggestions apply most readily to elementary classrooms. Little has been provided at the secondary level to help high school teachers find ways to reorganize their classes to make instructional differentiation a reality (Dixon & Moon, 2006).

Implications

The implications of these lessons are far reaching. Educators who wish to implement research-based "best practices" must reconsider many of their previously held perspectives and must commit in more than words to developing the "full potential" of all learners, including the gifted and talented. To provide for the different ways that gifted learners learn (consistent challenge, daily talent development, independent work, whole-to-part, fast paced, depth and complexity, limited drill and review), educators must reconsider whether (and how) they can manage increasingly heterogeneous and diverse classrooms. In most cases some form of grouping will need to take place to appropriately differentiate on a direct and daily basis. They must also reconsider how they will let these learners move on when they already know what is planned for instruction. There are a variety of ways in which these children can be grouped, which will not require major adjustments for all other groups of learners in the schools. Each school or district must identify the grouping options that best match (a) the learners they have, (b) the attitudes of teachers about gifted learners, and (c) the attitudes of administration and the community to the possible options. Usually at least two grouping options must be selected as possibilities so that individual schools without the population size or extremely unusual demographics will have a viable option to implement for management. Likewise, schools or districts will need to select at least two subject-based and two grade-based options for acceleration to meet the almost individualized needs of gifted learners across many contexts and settings.

As more and more options are selected, some reconsideration has to be given to how gifted services will be set up. The school or district may begin to move away from the role of identifier and gatekeeper for "the gifted program" toward a role of identifying an array of services that might be offered to students with the unique gifts and talents in evidence in its setting. Once that array is in place, the school takes on the role of matchmaker and monitor, making sure that a best fit (optimal match) has been made for each of the gifted learners in that setting and documenting the effects of those matches. This may also require that reconsideration be given to the kinds of services provided. The focus will be placed on the most frequent needs for potential or talent development in a specific setting and make those need areas the top priority. This would need to be communicated to the community, informing it when certain services cannot be provided because of limited resources and personnel. A program of services that focuses within these priorities such that 65% of all effort is spent on talent development or potential enhancement would be critical, with an additional 25% of the efforts directed toward social and emotional adjustment and programs, and 10% of GT program efforts focused on targeted remediation (Rogers, 2002).

How does this happen in a school or district? The obvious key to success lies in the comprehensiveness and efficacy of gifted education training provided to regular classroom and GT resource teachers (Hansen & Feldhusen, 1994). Research conducted by Borland (1978), among others, found that preservice and novice teachers are unclear about their professed belief in individual differences, have little idea of how to differentiate for such differences, and tend to rely on high ability children to help "teach" the struggling learners in their classes. The research on whether specific training at this stage in their development would actually be applied is fairly negative. In-service training research in gifted education, however, is consistent in showing the positive applications to classroom instruction (e.g., Hultgren & Seeley, 1982), and positive results are also found when the in-service training is very strategy specific (e.g., Reis & Westberg, 1994).

Can a school or district do all that is suggested (and implied) in this article? The answer is a qualified "yes." The case study of one district, which began this piece, is evidence that much can be put into place and systematically implemented. The outward signs of change are present at the end of the first year. Yet the underlying attitudes and covert behaviors of educators are still unknown, even as this district goes into its second year. There is no question that success will breed success, but will those successes stay in place long enough for the needed attitudinal and behavioral changes to take effect? Only time will tell, coupled with a stable administration and teaching force, consistent resources and funding, and no competing national crises on the horizon. We will wish the district well and hope for the best.

Note

1. Effect size (ES) is calculated by subtracting the achievement gain of the treatment group from the achievement gain of the control group and dividing the remainder by the pooled standard deviation of the two groups. The resultant number can be translated into grade-equivalent months of additional achievement (beyond the expected 1 year's gain by being in school 1 year) by moving the decimal point one place to the right. For example, an ES of .30 would suggest that the treatment group made 3 additional grade-equivalent months of achievement beyond 1 year, whereas the control group made only the 1 year's growth. One could also translate the .30 to suggest that the treatment group made 15 grade-equivalent months of progress in 1 school year's time.

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