CHALLENGING Middle

It is hard to address the needs of the estimated three million gifted middle level students who attend school in the United States (Clarenbach, 2007), and No Child Left Behind has made it even harder because school performance is determined by success on standardized tests—which often means that low performance is severely penalized and high-end success is minimally rewarded.

Principals can make a difference by recognizing the challenges of gifted students; preparing teachers to teach them; and ensuring that instruction is individualized and includes open-ended discussion, in-depth inquiry, and project-based learning.

Behavioral and Emotional Challenges

Along with the positive attributes—such as verbal expressiveness, a strong desire to explore and obtain information, creative problem solving, and excellent memory skills—frequently seen in gifted middle school students, there are challenges, including unhappiness, social isolation, and the behavioral maladaptations that result from boredom. Students may be subject to social exclusion and even ridicule during the high-peer pressure years of middle school. They may be persecuted by classmates and intimidated into intentionally limiting their participation in academics and becoming underachievers and behaviorally disruptive.

If gifted students are bored by the pace or become impatient with classmates who don't perform at their high levels, the resulting overconfidence or frustration can have a negative effect on their success. They may feel that their teachers know less than they really do because of the level to which the teachers must teach in mixed-ability classes.

When teachers understand that acting out and lack of focus may be the result of boredom, they realize that these students are not deliberately misbehaving and take a proactive approach. Principals, learning specialists, and teachers can work in teams to design individualized programs for gifted students—even in mixed-ability classes—using what I call "neuro-logical" strategies and activities

GIFTED School Students

By Judy Willis, MD

PREVIEW **Academic challenges for gifted students can be incorporated by preparing teachers to extend the regular curriculum.**

Many gifted adolescents also face social problems and need help with executive functions, such as judgment and analysis.

Individualized instruction, self assessment, and open-ended discussions are all successful strategies for students who need a faster pace.

to ensure the stimulation and engagement of gifted students.

Teacher Preparation

Teachers can better support gifted learners by individualizing instruction and enriching executive cognitive functions for students who demonstrate mastery of the regular classroom work. These strategies include in-class extensions of regular curriculum units; open-ended discussions at higher cognitive levels; multisensory independent instruction; and thematic units with options for interest-driven, higher-challenge learning. When teachers provide appropriate challenges, gifted students become engaged in what they are learning and are able to achieve goals that they value. They remain motivated and avoid the behavioral and emotional consequences of tuning out.

It is helpful for teachers to develop their own areas of academic expertise by taking courses and attending seminars in their specialties to become more confident and effective with their gifted students. With in-depth knowledge in specific areas, teachers can model how to delve into a given subject area and convey their enthusiasm for learning. Strong background expertise in one or more areas also keeps teachers from feeling threatened when gifted children disagree or challenge them and more likely to welcome different opinions and encourage gifted students to support their ideas, which promotes higher-level thinking.

Another way to support teachers is to provide extra prep time—for example, relieve teachers of nonacademic activities, such as lunch or detention duty—at the beginning of units so that they can prepare individualized lessons and activities for gifted students. Another is to ensure that records of previous adaptations are kept so that the files become resources for all teachers of gifted students when they come to those units.

Instructional Strategies

Some gifted middle school students "unwrap" their gifts without much supervision, but most

Brain Facts

Brain maturation (thickening of the myelin coating of nerve cell relays that speeds information transport) takes place from back to front in all children, but at different ages and rates in gifted children. Children with the highest IQs complete their frontal cortex maturation later than their peers and when their cortical pruning (elimination of unused neural pathways so the remaining pathways are more efficient) begins, it progresses more rapidly than in other children.

For example, a gifted 7-year-old tends to start out with a relatively thinner frontal cortex that thickens rapidly, peaking by age 11 or 12 before thinning. Children who are just slightly less bright reached that point at about age 9, and those with average intelligence at an even younger age. These findings are especially strong for cortex development in the frontal lobe where complex mental tasks and executive functioning are processed. (Shaw et al., 2006) This variation is not yet understood in relation to intelligence, and it remains to be seen if high intelligence causes the delayed maturation or the delayed maturation causes high intelligence.

Executive Functions

Gifted students benefit from work that activates their executive functions—such as judgment, critical analysis, prioritizing, organizing, separating fact from opinion, weighting the validity of information, deduction, induction, and recognizing relationships that reside in the prefrontal cortex. These regions of higher cognition may benefit from classroom experiences that allow gifted students to mentally manipulate information in such ways (Poldrack & Wagner 2004). Frontal lobe executive cognition can be stimulated through increased input, questioning, creative problem solving, recognizing relationships (analogies, graphic organizers), and connecting knowledge to real world possibilities (Draganski, Gaser, Busch, & Schuierer, 2004).

Sources: Draganski, B., Gaser, C., Busch, V., & Schuierer, G. (2004). Neuroplasticity: Changes in grey matter induced by training. *Nature, 427*(22), 311–312.

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will benefit from individualized homework, papers, projects, and even assessments that tap their interests, gifts, and talents and build their creativity and cognitive processing. Students may need other enrichments beyond independent projects, such as more-advanced reading material and primary sources and more-detailed homework questions that call upon their higher cognitive and executive functions, such as comparative analysis that calls on their prior knowledge or critical judgment and interpretation.

Individualized instruction. By assessing which students have achieved mastery of unit materials before teaching, teachers can offer individualized alternative activities. Individualized extensions of the curricula include opportunities for exploring and thinking, using advanced technology, and investigating disciplines outside the traditional curriculum that coincide with their interests and goals.

Although they are advanced intellectually, many gifted middle school students still need help developing resilience and strategies for using their gifts. Middle school may be the first time they encounter material that is difficult to master, and they may think they are no longer smart. Enrichment plus scaffolding support can build their resiliency and willingness to take risks—and even make mistakes. The strategies they develop through supported lesson extensions can then be applied by having them examine the current class unit topic; ask their own questions; find problems they want to solve; and pursue in-depth independent, supervised investigations or experimentation while their classmates receive the instruction and review they need to reach mastery.

Motivation is essential to the construction of extension activities. When students choose meaningful directions of independent study and learn how to evaluate their own progress,

they are more likely to follow through with their plans and feel more connected to the outcomes. Such experiences help gifted students develop self-regulation and independence. When independent enrichment incorporates highly abstract, complex, and in-depth concepts, students experience the joy of productive engagement and the sense of competence that comes from achieving goals they regard as valuable.

Resources, such as primary sources and contact with other teachers or community mentors who have relevant expertise, must be available for independent inquiry and extensions. Teachers will also need to support those students who still don't have fully developed executive functions, such as judgment and critical analysis, by showing them how to differentiate fact from biased opinion and how to organize, prioritize, and plan. With these tools, gifted students will be better equipped to analyze material, such as information they find on the Internet that is not clearly separated into fact and opinion, and stay on a planned schedule.

Self-assessment. Students can also work with teachers to develop rubrics to help define their goals, monitor their progress, and build organizational skills. Within the rubrics, there can be options for levels of challenge within individual categories. For example, a gifted student who has completed the current science unit may want to investigate potential real-world connections between industrial pollution and economics or investigate alternative scientific technologies that decrease the economic impact of "going green." If the student does not have writing skills that equal his or her science abilities, a written report could limit exploration. As an adaptation, the rubric for the written report could have slightly lower requirements for successful work and more emphasis could be incorporated in the rubric category for excellence in oral presentation or model making.

Open-ended discussions. Open-ended discussions encourage students to respond to questions with more elaborate, cognitively challenging answers. Teachers may need inservice demonstrations of how to construct discussions using questioning that gradually goes up the scale of Bloom's taxonomy and of how to build a classroom community that ensures that all students are respected and appreciated for their gifts. Such discussions can provide opportunities for gifted students to model higher order thinking for their classmates and to develop ideas for their own independent extensions of the class work. They also require communication skills that students will need in the work force.

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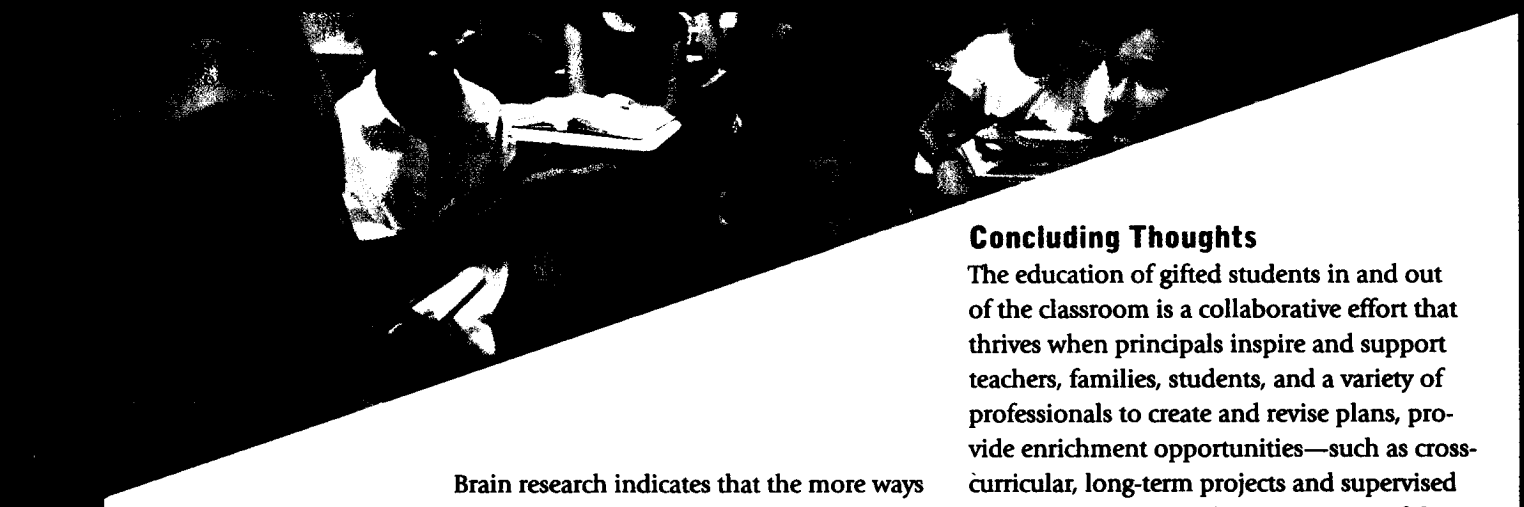
Thematic units. Processing activities that result in greater cross-brain neural stimulation are also desirable. For example, fMRI studies evaluating the brain activity in and between the left and right brain hemispheres during math pairing problems were conducted on middle school–age boys who demonstrated math proficiency (i.e., boys who received a score of 700 or greater on math SAT before age 13). The results suggested that the neural communication (information exchange or interhemispheric collaboration) between their brain hemispheres was more rapid and coordinated than their peers' (Singh & O'Boyle, 2004).

The brain's bihemispheric communication takes place through the cable of nerve connections between the hemispheres called the corpus callosum, which along with the prefrontal cortex is the last part of the brain to mature. Gifted students had greater bihemispheric communication during high-level reasoning tasks, which has been suggested to contribute to their cognitive precocity (Pennington et al., 2000). Corpus callosum activity is linked to intelligence, self-awareness, and the faster and greater exchange of information between the brain hemispheres in gifted adolescents, leading to the suggestion that multisensory learning is one way for their brains to construct more efficient cross-brain neural circuits (Fine, Semrud-Clikeman, Keith, Stapleton, & Hynd, 2007).



The goal is to encourage students to construct knowledge through active, authentic learning tasks to promote faster, more coordinated information processing and retrieval networks in the brain.

Brain research indicates that the more ways knowledge is received, practiced, and used, the more efficient that information storage and retrieval will be. Brain imaging demonstrates that when knowledge is learned through listening or reading, the neural networks that store the memory are found in the auditory or visual processing brain regions where the sensory input is initially perceived (Kandel, 2006). When the information is then processed by verbal communication, there is additional activation in a different language center of the cortex. Because of this duplication of data storage, students who clearly communicate the information they have learned are more likely to retain that information longer and retrieve it more quickly and accurately than those who do not have the opportunity to interact with the data through verbal communication (Eliassen, Souza, & Sanes, 2003).

When gifted students performed higher reasoning tasks and tasks that required the creation and manipulation of internal images, researchers reported that the regional brain activity in the cortex (i.e., the gray matter where the neurons that store information are located) of both hemispheres was significantly greater in the gifted students compared with the control group (Lee et al., 2004). Therefore, the goal is to encourage students to construct knowledge through active, authentic learning tasks to promote faster, more coordinated information processing and retrieval networks in the brain. Strategies that enhance this communication can mesh the curriculum with appropriately challenging learning activities in which students evaluate, analyze, and synthesize information for creative problem solving and mental manipulation using multiple sensory modalities.

Concluding Thoughts

The education of gifted students in and out of the classroom is a collaborative effort that thrives when principals inspire and support teachers, families, students, and a variety of professionals to create and revise plans, provide enrichment opportunities—such as cross-curricular, long-term projects and supervised in-class extensions and investigations of the topic of study—and develop extended goals to nurture gifted students' potential. **PL**

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