

Cognitively SPEAKING

An update on Ability Measurement with CogAT®
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Dr. Lohman Honored at NAGC

Dr. David F. Lohman, lead author of the *Cognitive Abilities Test™ (CogAT®)* Form 6, was recently honored by the National Association for Gifted Children (NAGC).

At a special awards ceremony, Dr. Lohman received the 2006 NAGC *Gifted Child Quarterly* Paper of the Year Award. You can access his winning paper at www.cogat.com by clicking on *View papers by Dr. Lohman* and scrolling to “The Role of Nonverbal Ability Tests in Identifying Academically Gifted Students: An Aptitude Perspective.”

A different paper by Dr. Lohman will appear in a forthcoming NAGC book about nonverbal tests. You can access this paper by clicking on *View papers by Dr. Lohman* and scrolling to “Nonverbal Test Scores As One Component of an Identification System: Integrating Ability, Achievement, and Teacher Ratings.”

In this edition of *Cognitively Speaking*, Dr. Lohman discusses ideas from both of these papers.

Including Nonverbal Tests When Identifying Students for Acceleration

by David F. Lohman, The University of Iowa

Poor and minority children are underrepresented in programs designed for academically advanced students. School administrators continue to search for ways to identify the talented minority students who will succeed in these programs.

Nonverbal ability tests can help. The best ability tests have long included nonverbal (figural) subtests. However, test researchers classify them as supplementary because they tell us whether students can solve problems that make *only the most basic demands* on students’ verbal and quantitative abilities. This is useful information to have when we are trying

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to find out if a child suffers from a general cognitive impairment. But, as nonverbal tests attempt to eliminate language, they necessarily exclude much of the child’s *intelligent* thinking. Thus, nonverbal tests alone cannot tell us whether students will succeed in classes conducted in Spanish, English, or any other language.

Of the three major reasoning aptitudes (verbal, quantitative, and figural), nonverbal abilities are the *least likely* to predict success in the major academic fields—literacy, reading, math, science, and other content-rich domains. Screening students for accelerated programs using a nonverbal test will admit many students who are unlikely to profit from the instruction the program offers. Equally important, a nonverbal test *will not identify* most students who

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currently demonstrate high levels of academic accomplishment or students whose high verbal or quantitative reasoning ability make them *likely* to succeed in the accelerated program.

Clearly, we should never use nonverbal tests to screen all students. When used alone, figural reasoning tests actually increase bias by failing to identify the most academically talented students in all ethnic groups. *It is critical that school personnel not confuse the higher nonverbal scores of minority students with a fair assessment of their academic aptitudes.*

When, then, should we administer nonverbal tests? They are most helpful when administered with quantitative reasoning tests and used to predict success in mathematics, physical sciences, or technical domains such as computer programming. Nonverbal tests may also be included in a comprehensive screening approach that

- specifies the competencies the program hopes to develop
- compares a minority student's aptitude scores to those of other students who have had similar experiences and similar *opportunities* to develop the abilities and skills measured by the test
- uses *ability tests, achievement tests, and teacher ratings* to gather information about each student's likelihood of developing these competencies
- provides students in the accelerated program with instruction appropriate for their different levels of accomplishment, and
- expects different students to excel in school each year and so considers identification of academic talent an ongoing activity.

Measure the Right Aptitudes

Aptitude means readiness to learn and perform well in a particular situation. Aptitude can only be understood in terms of the kind of learning that must occur and the context in which it must take place. Is the goal to learn to write? Is it to conduct scientific research? Or is it to excel in math? Each kind of learning requires a somewhat different set of aptitudes, or personal resources.

In addition to understanding the *kinds* of learning that must take place, school personnel must understand *the context* in which student learning takes

place. Thriving in classes that require independent learning requires different personal resources than thriving in structured classes. Being the youngest student in a program, the only female, or the only minority student requires particular personal resources. Schools must attend to these characteristics when identifying those minority students who are most likely to succeed in the accelerated program.

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In spite of these differences, the predictors of academic excellence are generally the same for minority and majority students. In academic fields, the *best predictors* are (1) prior achievement in the area of study; (2) the ability to reason in the symbol systems (language, numbers, music notation, etc.) used to communicate knowledge; (3) interest in the subject area; and (4) the ability to persist in a given instructional context. Therefore, if the goal is to identify those minority students who show the most talent in mathematics, one would select students who currently display the highest achievement in math, who score the highest on tests of quantitative and nonverbal reasoning, who show an interest in math, and whom teachers rate as motivated and persistent. For success in verbal fields, one would look first at those minority students who have the highest achievement scores in language-related subjects, who have the highest scores in verbal reasoning abilities in the language of instruction, and who are rated as highly motivated by their teachers.

Some schools do not measure these characteristics. They rely instead on nonverbal tests such as the Nonverbal Battery of *CogAT* (*CogAT*; Lohman & Hagen, 2001). There are several reasons for this. First, higher scores on nonverbal tests result in more English Language Learners being admitted to the program *when all are compared to the same norm group*. Second, some have incorrectly asserted that nonverbal tests predict academic achievement as accurately as verbal or quantitative reasoning tests,

although the differences in predictive validity are actually quite substantial. Even seemingly small differences in correlations have substantial consequences when identifying students. Third, others believe nonverbal tests are interchangeable with verbal and/or quantitative tests because all are good measures of general ability. Fourth, some incorrectly believe that an unbiased ability test measures the innate potential of the learner. It is easier to believe this for tests that use spatial figures than for tests that use words, numbers, or other learned symbols. Fifth, some exaggerate the merits of nonverbal tests.

One of the most pervasive misunderstandings about ability testing is the belief that all measures of general ability are more or less interchangeable: if one cannot administer a *Binet* or a *Wechsler*, then the *Raven* will measure the same thing. But this is not true. Even though figural reasoning tests such as the *Progressive Matrices* (Raven, Court, & Raven, 1983) are good measures of general ability, they are not interchangeable with selection tests that use verbal and quantitative content. Scores on even the best nonverbal tests are as likely to be obtained from factors specific to the test and its format as from general ability. Unlike verbal and quantitative reasoning tests, the specific factors measured by nonverbal tests are *unrelated* to success in school.

Success in any school depends heavily on the students' abilities to (1) understand what others say and to (2) communicate their own thoughts. Therefore, verbal reasoning abilities are critical for success. In fact, how well ELL students reason in English is an excellent predictor of how they will do in school when English is the language of instruction.

Unlike verbal reasoning ability, figural reasoning is a relatively *poor* predictor of success in academic learning for *all* ethnic groups. The *CogAT* Verbal Battery is a much *better* predictor of success in reading than the Nonverbal Battery. Less than one-third of students who obtain scores above the

97th percentile on the Nonverbal Battery obtain similarly high scores on achievement tests in reading, math, science, or other academic domains. For this reason, *selecting students on the basis of figural reasoning tests eliminates the majority of academically high-achieving students in all ethnic groups.*

Finally, nonverbal test results show a *negative* relationship with success in school once we control for general ability. For example, students who score significantly higher on the *CogAT* Nonverbal Battery than on the Verbal and Quantitative batteries actually do *less* well in school than students who show a relative weakness on the Nonverbal Battery. The pattern of relatively higher verbal and quantitative scores with a relatively lower nonverbal score is particularly common among African-American students (Lohman, 2005). *This means that screening students on the basis of high nonverbal scores will eliminate many of the most academically capable African-American students.*

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The Importance of Multiple Norm Groups

While tests that use English put ELL students at a disadvantage, nonverbal tests identify greater numbers for inclusion in programs designed for gifted students. Even professionals who understand that figural tests exclude an enormous amount of thinking are tempted to resort to them. Administrators turn to figural tests because they believe they must select all students for these programs by comparing them to the national norm group. However, *using only national norms to interpret the scores of ELL students is neither necessary nor desirable.* Let me explain.

The surest indicator of aptitude is the observation that an individual learns in a few attempts something that most people learn with much practice. This means that we must compare students' aptitude test scores to a norm group that has had approximately the same *opportunity* to develop the skills tested. Ability

tests estimate the student’s opportunity to learn the skills by comparing each student’s scores to those of others who are the same age and have lived in the culture for the same amount of time. If students are a different age or have lived in the culture for less time, their opportunity to learn the skills was different from that of the norm group. For example, an ELL student’s proficiency in English might be at the class average, but because the student did not have the same opportunity as the norm group to learn English, the ELL student’s “average” scores may actually indicate a remarkable aptitude for languages. *The only way to assess an ELL student’s aptitude is to compare her/his performance to that of a subgroup of local students who are the same age and have had roughly similar opportunities to learn English.*

Why is this type of comparison not routinely made? There are several reasons. First, schools that assess each student individually have no easy way of creating norms for subgroups. However, when all students in a particular grade take the same test, districts can easily look at an individual’s rank using national norms, local norms, and subgroups within the local population. Second, some people still erroneously believe that ability tests measure innate ability. This makes any discussion of opportunity-to-learn irrelevant. Third, it is administratively convenient to use a single norm group.

Actually, the most sensible policy is to get *multiple perspectives* on minority students by comparing their test scores to three different norm groups: (1) the nation, (2) the district or school, and (3) the opportunity-to-learn subgroup (e.g., ELL students at a particular grade level). *A minority student’s rank within her/his ethnic group on the most relevant aptitude scores should guide efforts to identify academically promising minority students who could succeed in accelerated programs if first given appropriate preparation.*

A Method for Combining Ability, Achievement, and Teacher Ratings

How to combine different kinds of information is a critical issue when identifying children for accelerated instruction. Some districts prefer ability and/

or achievement scores that are unusually high (e.g., the 97th percentile or higher) compared to either a national or a local norm group. This could be on a single test score (e.g., an achievement test composite score) or a combination of ability and achievement test scores (e.g., the average of scaled scores on the achievement and ability tests). In addition, some admit students who display high scores in one of several areas (e.g., high verbal or high quantitative reasoning ability) whereas others look only at the composite ability or achievement scores. Other districts include students whose test scores are somewhat lower (e.g., the top 20 percent in the local group) but whom teachers believe exhibit unusual creativity, commitment to learning, or accomplishment in a particular subject (Renzulli, 2005).

The identification system shown in Figure 1 balances these perspectives. First, since neither ability nor achievement tests alone give the best prediction of learning, we put scale scores from both kinds of tests into an Excel® spreadsheet, convert each to a standard (or z) score, and then average them. Second, we distinguish between abilities and achievements in the verbal domain and abilities and achievements in the quantitative-spatial reasoning domain. Students who excel in either domain are identified. The verbal ability/achievement composite is obtained by averaging standard scores from the Verbal Battery of *CogAT* and the Reading Total score of the achievement test. The quantitative/spatial reasoning score is obtained by averaging standard scores from the Quantitative-Nonverbal Composite score of *CogAT* and the Mathematics Total score of the achievement test. Third, we then apply the Excel® “PercentRank” function to the two new ability/achievement composites. This gives local percentile ranks for each.

Figure 1: Combining Ability, Achievement, and Teacher Ratings

Verbal Ability/Achievement Composite	Teacher Rating on Renzulli Scales for Learning Ability, Motivation, or Creativity		
		Below Average	Above Average
or			
Quantitative + Nonverbal Ability/Achievement Composite	97 th Percentile rank and above	II Admit, but watch	I Admit
	80 th Percentile rank and above	IV Reconsider next year	III Provide enrichment

The identification system has *four categories* of students. Students in *Category I* show superior reasoning abilities on *either* the verbal or quantitative ability/achievement composites and are rated as highly capable, creative, or motivated by their teachers. Students in *Category II* also show superior abilities in either (or both) domains but are not rated as exceptional by their teachers. We advise that schools admit students in Categories I and II to the accelerated program. Students in *Category III* obtain somewhat lower scores on the aptitude tests but are rated as highly capable, motivated, or creative by their teachers. These students would be included in an enrichment program that aims to serve a broader range of children. Many talented minority students would fall in this group. Finally, students in *Category IV* show good reasoning abilities but are not rated as unusually capable, motivated, or creative by their teachers. Although good students, they would not be identified for enrichment or acceleration on the basis of either their aptitude scores or teacher ratings.

All students identified as talented may not be ready for the same kinds of instruction. Those whose achievement is well in advance of their peers will generally benefit from acceleration in those subjects where they show the most advanced performance. But other talented students, especially those whose achievement is not at these advanced levels, will need instruction that (1) is geared to their current level of achievement and (2) takes into consideration that they are likely to learn faster and to engage the subject more deeply than other children who show similar achievement. For these students, schools should consider special programs that enrich or compact the curriculum.

In the identification system we propose, high nonverbal scores would qualify students for acceleration or enrichment *only if* the scores are accompanied by (1) evidence of reasonably high accomplishment in the subject area taught in the program and (2) evidence that the student's verbal or quantitative reasoning abilities are also high *relative to other students who had similar opportunities to develop these abilities*. Most schools have this evidence for achievement. Schools that administer ability tests such as *CogAT* that appraise verbal, quantitative, and nonverbal reasoning have the evidence for ability as well. For these schools, procedures like those outlined here, combining evidence of current achievement, reasoning

abilities, and teacher ratings can help increase the diversity of students they serve while also identifying the students in all ethnic groups who are most likely to thrive in the accelerated program when given special instruction.

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