# *The Accurate Identification of Gifted Students*

STANDARDIZING TEST RESULTS ACROSS
DIVERSE MEASURES OF ABILITY AND ACHIEVEMENT

Sharon Ryan

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# PART I

# PROBLEMS WITH EXISTING IDENTIFICATION MATRICES

Best practice in gifted identification tells us to use as much information as possible when evaluating students for gifted programming. This includes using multiple assessments that measure diverse talents and strengths, enabling gifted coordinators and school administrators to find even those gifted students who may go unidentified because their gifts are not immediately evident.

Standardized testing has historically been a critical component in gifted identification, often conducted as a summative evaluation once per year. These annual exams, in the form of both aptitude and achievement tests, are used as a snapshot of student ability. In the past, both special education administrators and gifted coordinators used these tests to determine eligibility for services. More recently, testing has become a tool for formative instead of summative evaluation. As such, many school districts have abandoned annual testing in favor of administering multiple test cycles during the school year. Gifted coordinators must incorporate these multiple cycles of test data into their identification evaluations. The challenge, however, is how to evaluate multiple cycles and different types of data using gifted identification selection procedures that are statistically accurate.

## Matrix Points

Most school districts use an identification matrix to evaluate test data for gifted identification. Data are collected from different sources of testing, such as ability tests and achievement tests, and then "normalized" in an identification matrix by awarding matrix points. Matrix points are awarded separately for each test score based on the students' percentile ranking for each test. These points are then totaled, and gifted identification is assigned to the students with the greatest number of points.

Matrix points are used in an identification matrix for two reasons: (1) because percentiles cannot be used in mathematical operations, and (2) in order to "normalize" the data gathered from different tests. Percentiles cannot be used in mathematical operations because a *percentile* is not the same as a *percentage*. Teachers are adept at averaging *percentages* when they combine their students' scores—for example, for weekly spellings tests—but arithmetic *percentages* and standardized test score *percentiles* are very different measures. Percentages can be averaged because they are a standard, equal interval measure; *percentiles*, which are the format in which standardized test results are reported, are not the same as percentages and cannot be averaged because percentiles are not equal interval measures.

To "normalize" data means to put different types of data on the same scale. Ability and achievement test scores are not on the same scale because ability test scores are in a format that resembles an IQ score. Achievement test score formats will vary depending on the entity that has created the test. School districts use matrix points in an attempt to put these two different types of data on the same matrix scale.

There are serious problems inherent in using an identification matrix that awards points based on percentile rankings; they involve: (1) students accounting for the highest percentiles, (2) using a range of percentiles in an identification matrix, (3) including the $99^{th}$ percentile in a range of percentiles, (4) considering the lowest scores in a matrix, and (5) different school districts using different matrices.

## Accounting for Students with the Highest Percentiles

| Ability Test Score Percentile Rank | Matrix Points | Achievement Test Score Percentile Rank | Matrix Points |
|---|---|---|---|
| 99% | 5 | 99% | 5 |
| 98-97% | 4 | 98-97% | 4 |
| 96-95% | 3 | 96-95% | 3 |
| 94-91% | 2 | 94-91% | 2 |
| 90% | 1 | 90 | 1 |
| 89% and below | 0 | 89% and below | 0 |

Figure 1

| Student Name | Ability Score | Ability Test Percentile | Achievement Test Percentile | Total Points |
|---|---|---|---|---|
| Student 1 | 140 | 99% = 5 points | 95% = 3 points | 8 points |
| Student 2 | 131 | 97% = 4 points | 97% = 4 points | 8 points |
| Student 3 | 132 | 98% = 4 points | 98% = 4 points | 8 points |
| Student 4 | 127 | 95% = 3 points | 99% = 5 points | 8 points |
| Student 5 | 150 | 99% = 5 points | 95% = 3 points | 8 points |

Figure 2

Using Figure 1 as a sample matrix, we can see that points are awarded to those students who have scored above the 89th percentile. Students in the 90th percentile are awarded one point; students are awarded one additional point for each two-percentile increase in their test score. This matrix awards the highest-scoring students—those in the 99th percentile—five points. However, awarding matrix points in this way does not accurately account for differences in percentile rank because the further a percentile rank deviates from the mean, the more a student's score must increase for that student's percentile rank to increase.

Sample test data helps to clarify this point, as shown in Figure 2 by Students 1, 3, and 5. The percentile rank of students in the 99th percentile differs from students in the 98th percentile by only one percentile point, but the actual ability scores of these students may vary by as much as eighteen points, as illustrated by the ability score differences between Student 3 and Student 5.

More importantly, students with scores beyond the 99th percentile—scores approaching the test's ceiling of 150, as illustrated by Student 5, receive one additional matrix point for their 99th percentile ranking, yet the differences between a ceiling score of 150 and scores of students at the 98th percentile, as illustrated by Student 3, could be as significant as eighteen points.

Looking at a picture of a standard normal distribution of data helps to illustrate the problem of assigning matrix points to percentile values.

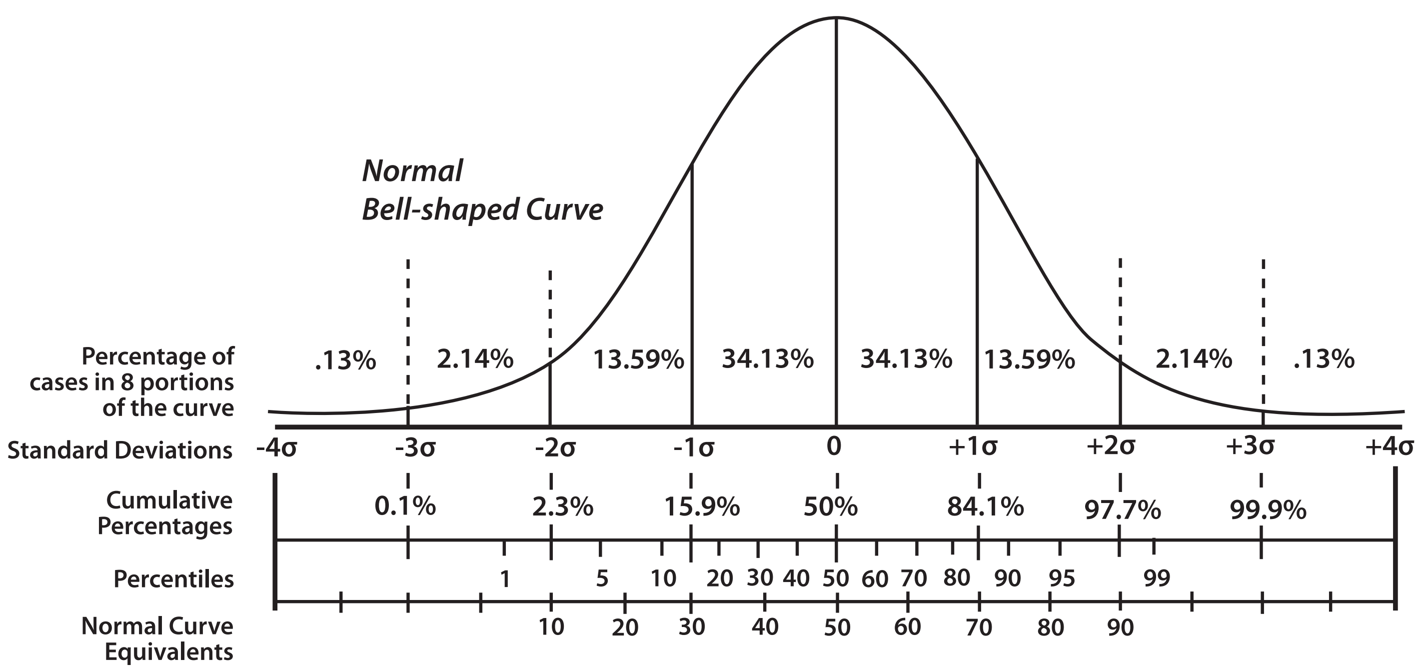


Figure 3

This image of a standard normal distribution of intelligence data illustrates a distribution of data in which results are clustered around the mean. Keep in mind, however, that the standard normal distribution is an ideal; no actual distribution of scores matches the standard normal distribution perfectly. That said, many distributions come close to the standard normal distribution, and it is this fact that makes the standard distribution useful.

Look at the percentiles in Figure 3, which is the second set of scores from the bottom, and observe the distances between the 90$^{th}$ and 95$^{th}$ and the 95$^{th}$ and 99$^{th}$ percentiles. It is easy to see that there is a greater distance between the 95$^{th}$ and 99$^{th}$ percentiles than between the 90$^{th}$ to 95$^{th}$ percentiles, which reveals that *percentile ranks are not equal interval measures and should not be awarded incremental values in an identification matrix*. The greater distance between the 95$^{th}$ and the 99$^{th}$ percentile illustrates the fact that a one-percentile point increase at the highest end of the curve, from the 98$^{th}$ percentile to the 99$^{th}$ percentile, is much more difficult to achieve than a one-percentile point increase lower in the curve, from the 90$^{th}$ percentile to the 91$^{st}$ percentile.

Going back to our sample matrix, Figure 1, and considering the increasing difficulty of moving up one percentile point at the higher end of the curve, we can see that it is not accurate to award one matrix point when a student moves from the 90$^{th}$ to the 91$^{st}$ percentile and to award the same value, one matrix point, for the movement from the 98$^{th}$ to the 99$^{th}$ percentile because it is more difficult to move one point at the highest end of the normal curve. In fact, using the identification matrix shown as Figure 1 puts our highest-achieving students—those who have the highest percentiles—at a disadvantage over lower-achieving students, which is exactly the opposite of what we should be doing when we're identifying students for gifted programming services.

## Using a Range of Percentiles

Clearly, the problem with an identification matrix that uses a range of percentile ranks, such as our sample matrix (Figure 1), is that students with lower scores in the range of percentiles are unfairly rewarded and receive too many matrix points, while students with higher scores in the range of percentiles do not receive full credit for their performance on the test.

| Ability Test Score Percentile Rank | Matrix Points | Achievement Test Score Percentile Rank | Matrix Points |
|---|---|---|---|
| 99% | 5 | 99% | 5 |
| 98-97% | 4 | 98-97% | 4 |
| 96-95% | 3 | 96-95% | 3 |
| 94-91% | 2 | 94-91% | 2 |
| 90% | 1 | 90% | 1 |
| 89% and below | 0 | 89% and below | 0 |

Figure 1

Using sample test data for a different set of students, but still using the Figure 1 identification matrix, students in the 98th and 97th percentiles, as well as students in the 96th and 95th percentiles, are ranked exactly the same when using an identification matrix that awards points based on a range of percentile values, although the students' actual test scores vary within this two-percentile range, as illustrated in Figure 5.

| Student Name | Ability Score | Ability Test Percentile | Achievement Test Percentile | Total Points |
|---|---|---|---|---|
| Student 1 | 132 | 98% = 4 points | 98% = 4 points | 8 points |
| Student 2 | 130 | 97% = 4 points | 97% = 4 points | 8 points |
| Student 3 | 129 | 96% = 3 points | 96% = 3 points | 6 points |
| Student 4 | 126 | 95% = 3 points | 95% = 3 points | 6 points |

Figure 5

## Including the 99% in a Range (Ceiling Scores)

More troubling are the matrices that include the 99th percentile in a top range. In a different sample matrix, shown as Figure 6, we see that students in the 99th percentile receive the same matrix points as students in the 95th percentile, which results in awarding the same matrix points to an even wider range of test scores. Additionally, when the range of percentiles includes the 99th percentile, ceiling scores receive the same matrix points as scores that are in the lower end of the 99th percentile. Using the identification matrix in Figure 6 and considering the sample student data shown in Figure 7, we can see that the students have markedly different ability test scores, ranging from 126 to 150, yet using the Figure 6 matrix, these students are awarded the same number of matrix points.