A Historical Perspective on IQ tests and Underrepresentation of People of Color

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The Topics for Today

A Fundamental Weakness of Intelligence Tests

Historical Context

The American Psychological Association Apology

How to Interpret Intelligence Tests

Closing remarks

The BIG picture

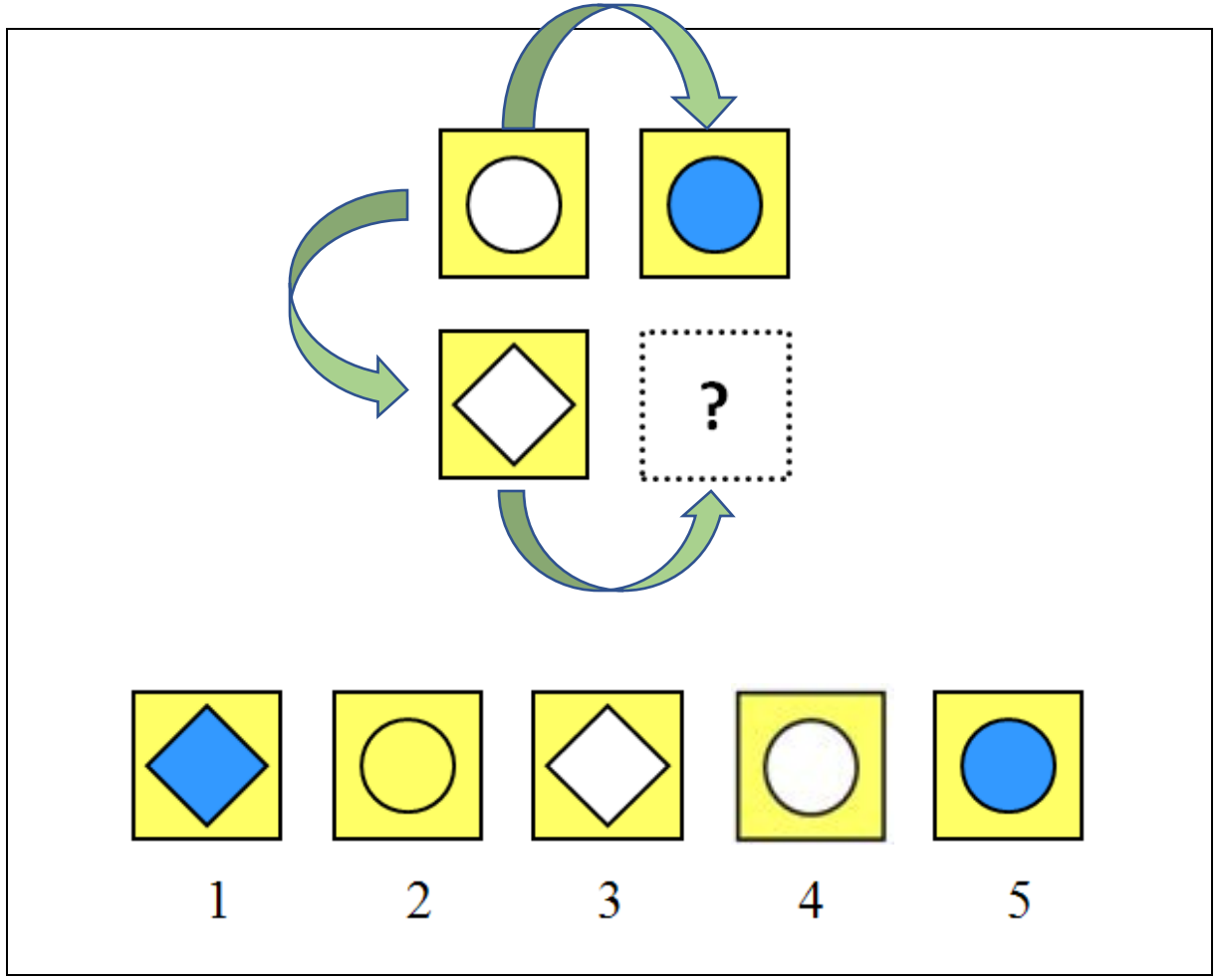
- **Equitable Identification of gifted students is a critical issue**
- **Intelligence tests have played an important and significant role in gifted identification and led to exclusion of students of color**
- **Understanding WHY we measure intelligence the way we do helps us understand what makes a test equitable**
- **It is important to differentiate test BIAS from test EQUITY**
- **Test EQUITY is about the CONTENT of the test questions**
- **Tests can be evaluated based on EQUITY**
- **The most equitable tests measure how well a student can THINK in a way that is not influenced by EXPERIENCE AND EXPOSURE - what they KNOW**

Traditional IQ and Achievement Tests

- Working as a school psychologist in 1975 noticed that some of the questions on the Wechsler intelligence tests were VERY similar to questions on the achievement tests (e.g., Vocabulary et al.,)
- **It seemed wrong to measure 'intelligence' using questions that clearly demanded knowledge and exposure/experience**
- **Shouldn't an intelligence test measure thinking rather than knowing?**

1975 Charles Champagne Elementary, Bethpage, NY

Tests that Measure Thinking or Knowing?



Girl is woman as
boy is to ____?

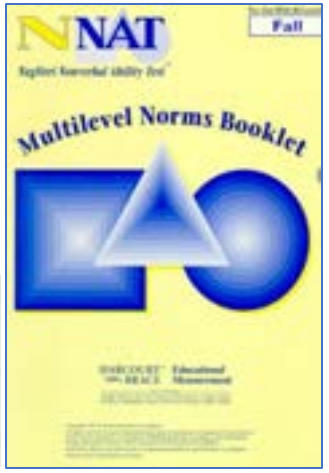
3 is to 6 as
4 is to ____?

C^7 is to F as
E^7 is to ____?

Naglieri's Nonverbal Tests: 1985 to Present

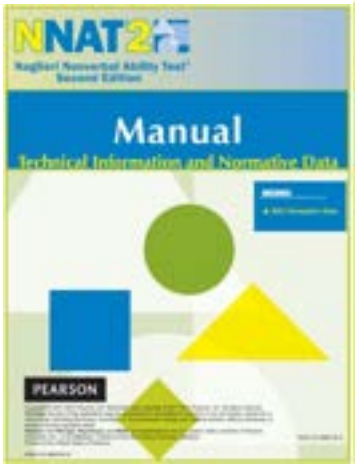
- **Research on Six Versions of the Naglieri Nonverbal Tests**

MAT Short and Expanded Forms 1985



Naglieri Nonverbal Ability Test 1997

NNAT –Individual, 2003



NNAT-2 2008

NNAT3 2016

Each of these versions of the NNAT showed similar scores by RACE, ETHNICITY, & SEX and had strong correlation with achievement

This research convinced me that measuring intelligence using test questions that measured how well a student can think was a valid and equitable way to measure general intelligence 'g'.

Tests with Equity as a Goal 1985-Present

Traditional Tests

1. Naglieri, J. A. (1985). Matrix *Analogies Test - Expanded Form*. San Antonio: The Psychological Corporation.
2. Naglieri, J. A. (1985). Matrix *Analogies Test - Short Form*. San Antonio: The Psychological Corporation.
3. Naglieri, J. A. (1997). Naglieri *Nonverbal Ability Test.* San Antonio, TX: The Psychological Corporation.
4. Naglieri, J. A., & Bardos, A. N. (1997). General *Ability Scale for Adults.* San Antonio, TX: Pearson.
5. Naglieri, J. A. (2003). Naglieri *Nonverbal Ability Test - Individual Form.* San Antonio, TX: Pearson.
6. Wechsler, D., & Naglieri, J. A. (2006). *Wechsler Nonverbal Scale of Ability*. San Antonio, TX: Pearson.
7. Naglieri, J. A. (2008). *Naglieri Nonverbal Ability Test – 2nd Edition.* San Antonio, TX: Pearson.
8. Naglieri, J. A. (2016). *Naglieri Nonverbal Ability Test – Third Edition*. San Antonio, TX: Pearson.

Second Generation

9. Naglieri, J. A., & Das, J. P. (1997). Cognitive *Assessment System*. *Austin: ProEd*
10. Naglieri, J. A., Das, J. P., Goldstein, S. (2014). *Cognitive Assessment System Second Edition*. Austin, ProEd.
11. Naglieri, J. A., Das, J. P., & Goldstein, S. (2014). *Cognitive Assessment System Second Edition - Brief*. Austin, ProEd.
12. Naglieri, J. A., Moreno, M. A., & Otero, T. M. (2017). *Cognitive Assessment System – Español*. Austin, ProEd.

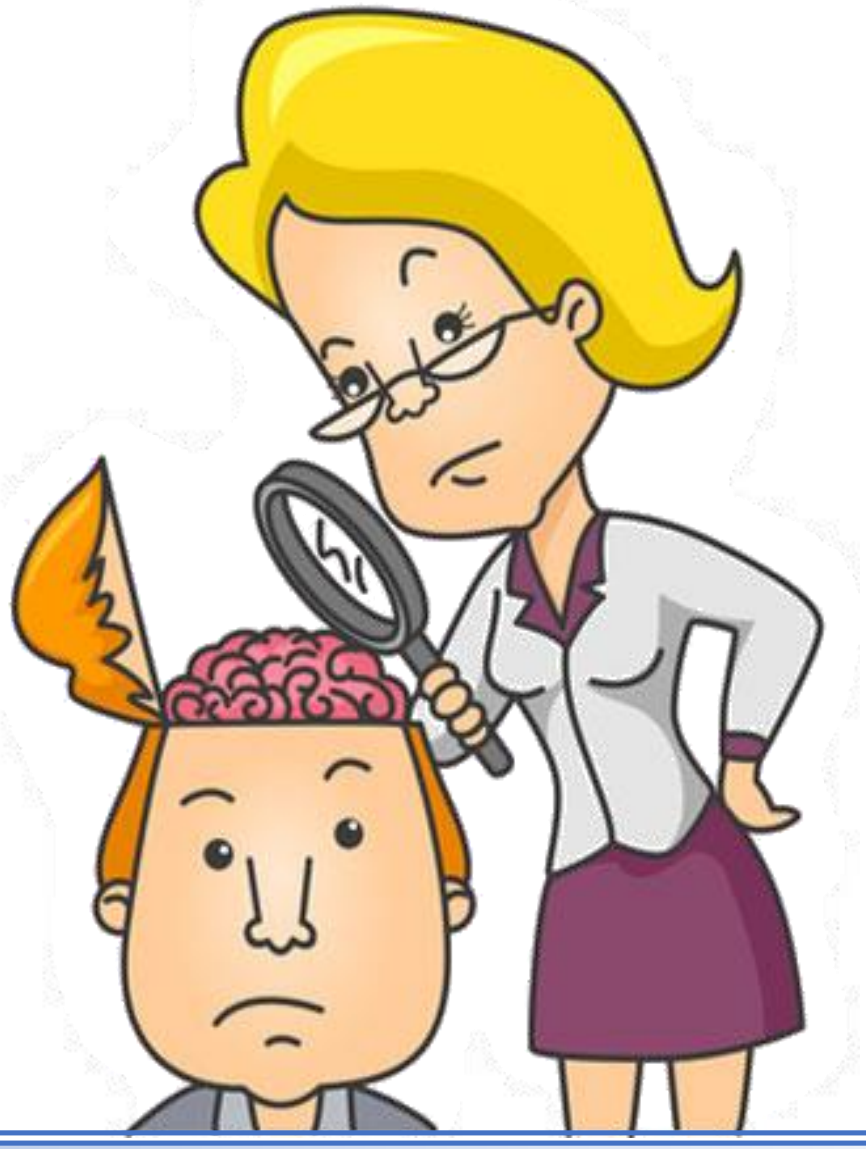
13. Naglieri, J. A. (2022). *Naglieri General Ability Test: Nonverbal*. Markham, Canada: MHS.
14. Naglieri, J. A. & Brulles, D. (2022). *Naglieri Ability Test: Verbal*. Markham, Canada: MHS.
15. Naglieri, J. A. & Lansdowne, K. (2022). *Naglieri Ability Test: Quantitative*. Markham, Canada: MHS.

Two Questions:

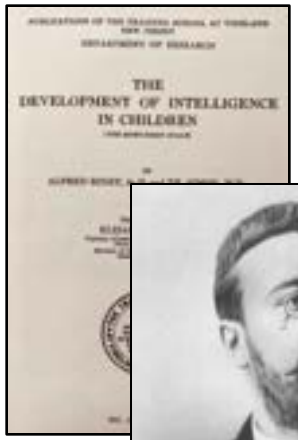
1. Why do we measure ability the way we do?

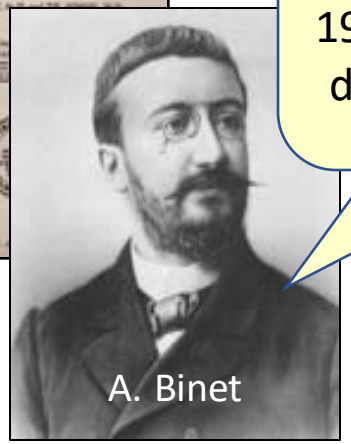
2. Do the tests measure thinking or knowing?

The early history of IQ tests provides the answers.

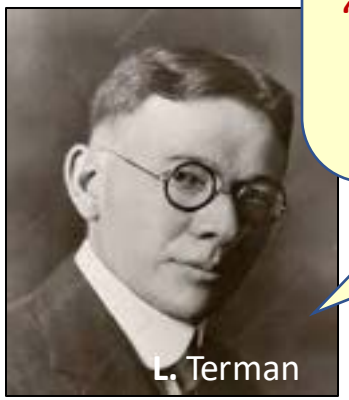


Binet→ Stanford-Binet → Army Mental Tests → WISC, CogAT, Olsat



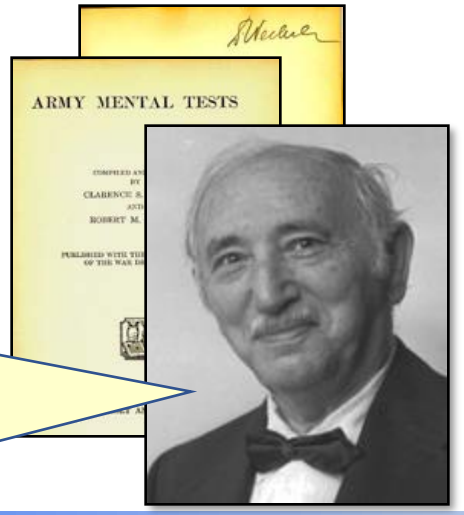


When working on the 1911 scale, Binet removed items from 1908 scale because 'they depended too much on school learning'



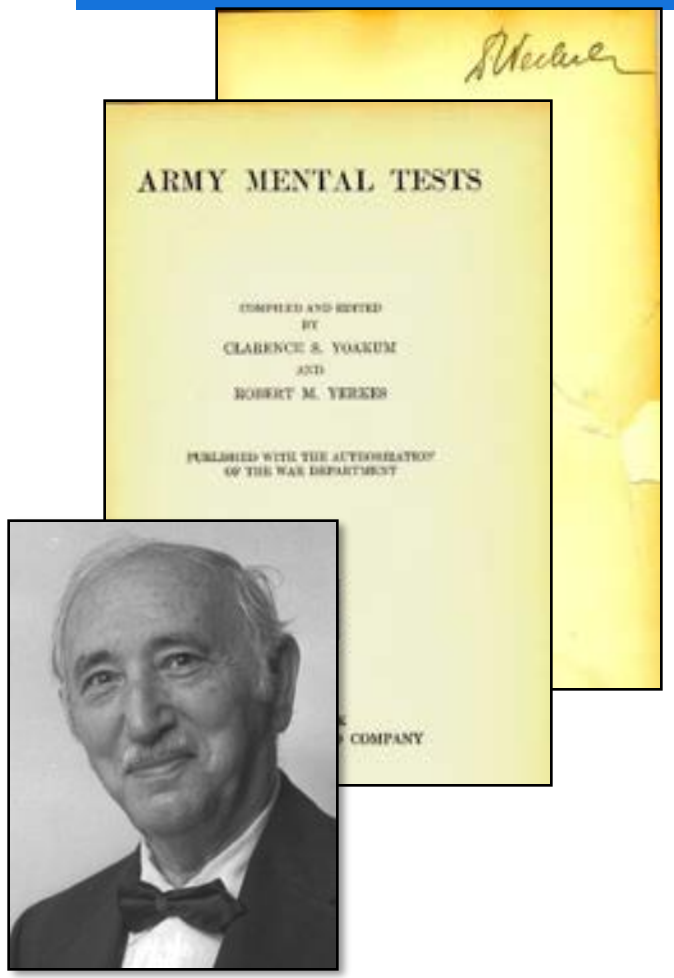
Terman added items dependent upon school learning in the 1916 Stanford-Binet because he believed 'intelligence at the verbal and abstract levels is the highest form of mental ability'.

Arthur Otis (Terman's student) was instrumental in the development of the U.S. Army Alpha (Verbal & Quantitative) and Beta (Nonverbal) and the Otis-Lennon Ability Test



Wechsler based his intelligence test on the U.S. Army Mental Tests (Verbal, Quantitative & Nonverbal)

Alpha & Beta → Wechsler Included Knowledge



- **Army Alpha**
  - Synonym- Antonym
  - Disarranged Sentences
  - Number Series
  - Arithmetic Problems
  - Analogies
  - Information

- **Army Beta**
  - Maze
  - Cube Imitation
  - Cube Construction
  - Digit Symbol
  - Pictorial Completion
  - Geometrical Construction

Verbal & Quant IQ (Knowledge)

Nonverbal IQ (Thinking)

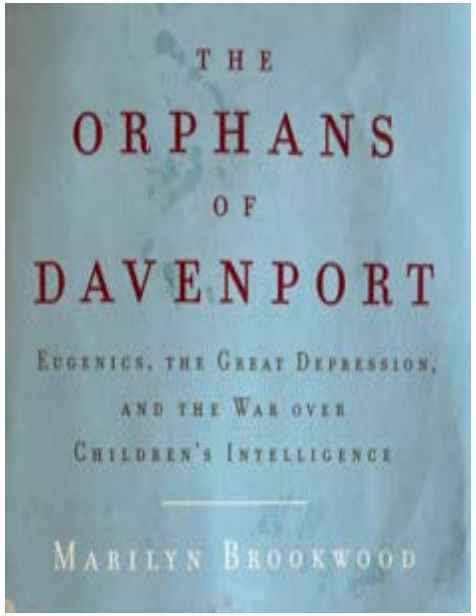
WISC, WJ CogAT & Otis-Lennon

Including *Knowledge* in "Ability" Tests & Equity

Stanford-Binet-5	WISC-V	WJ-IV	KABC-II	OLSAT	CogAT
• Verbal • Knowledge • Quantitative Reasoning • Vocabulary • Verbal Analogies	• Verbal Comprehension Vocabulary, Similarities, Information & Comprehension • Fluid Reasoning Figure Weights, Arithmetic	• Comprehension Knowledge: Vocabulary & General Information • Fluid Reasoning: Number Series & Concept Formation • Auditory Processing: Phonological Processing	• Knowledge / GC • Riddles, • Expressive Vocabulary, • Verbal Knowledge	• Verbal • Following directions • Verbal Reasoning • Quantitative • Verbal Arithmetic Reasoning	• Verbal Scale • Analogies • Sentence Completion • Verbal Classification • Quantitative • **45 pages of oral instructions**

IQ Tests Role in Promoting Racism

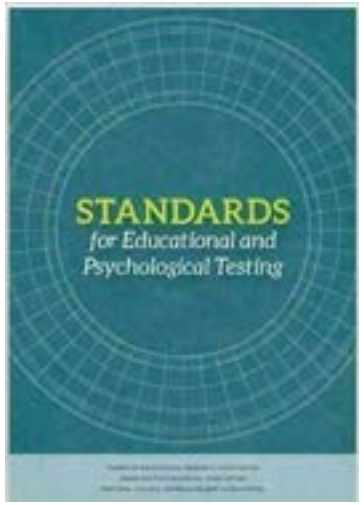
- Lewis Terman – promoter of eugenics (Greek for good birth) and Stanford-Binet (1916) author wrote that his test would reveal "significant racial differences in general intelligence…which cannot be wiped out by any culture"
- He advocated that identification of low-intelligence children and adults who would be involuntarily institutionalized and *sterilized would improve society*. (p. 68, Brookwood, 2021)
- His emphasis on VERBAL as the highest form of intelligence distorted the evaluation of intelligence for countless numbers of people



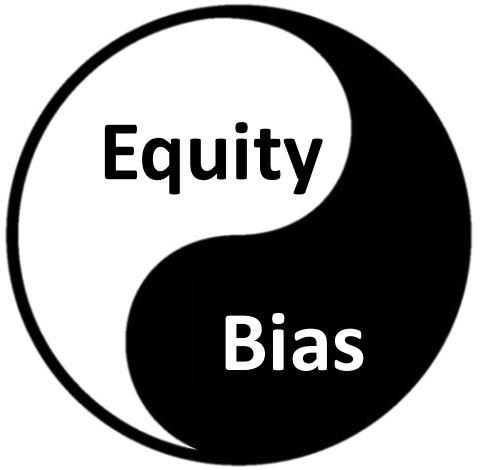
- ‘APA recognizes the roles of psychology in promoting…racism, and the harms that have been inflicted on communities of color … and the ways measurement of intelligence has been systemically used to create the ideology of White supremacy.’
  - Throughout the 1900s prominent psychologists involved in IQ test development supported eugenics
  - In 1916 Lewis Terman *Stanford-Binet* author advocated an educational system which separated white children from Blacks, Mexicans and Native Americans
  - 1933 Raymond Cattell (CHC & WJ) spoke out against race mixing and he lobbied to overturn the 1954 Brown v. Board Education
- What impact has this had on identification of GIFTED STUDENTS?

Test Content, Test Bias, and Test Equity

According to the *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 2014) Psychometric TEST BIAS and EQUITY are two different ways of measuring test fairness.



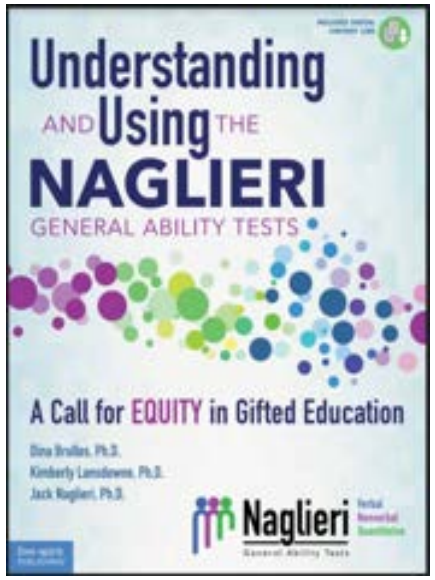
- **… if a person has had limited opportunities to learn the content in a test of intelligence, *that test may be considered unfair* … even if there is no evidence of psychometric test bias.**
- **Evidence of EQUITY is examined by test content and mean score differences.**



The test you choose determines the results you receive, the decisions you make, *and the future of that student.*

That is the *Practical Impact* of test selection.

Race and Ethnic Average Score Differences by Ability Test



Traditional tests that include knowledge and *2nd-Generation* Ability Tests that minimize knowing

See Brulles, D., Lansdowne, K. & Naglieri, J. A. (2022). Understanding and Using the Naglieri General Ability Tests: A Call to Equity in Gifted Education. Minneapolis, MN: Free Spirit Publishing for more details.

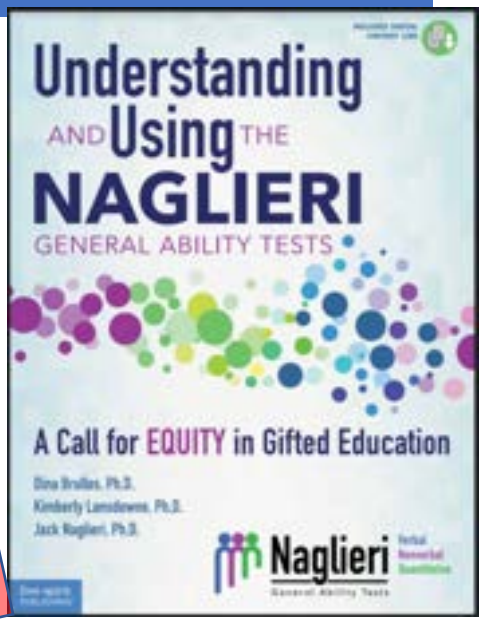
Note: Even though a test may not show psychometric bias those tests with academic content that show large mean score differences are not equitable and are unfair.

	By Race	By Ethnicity
Tests that require knowledge	**Mn = 9.5**	**Mn = 5.2**
Otis-Lennon School Ability Test (distric wide)	13.6	
Stanford-Binet IV (normative sample)	12.6	
WISC-V (normative sample)	11.6	
WJ- III (normative sample)	10.9	10.7
CogAT7 (Nonverbal scale)	11.8	7.6
CogAT7 - Verbal	6.6	5.3
CogAT7-Quantitative	5.6	3.6
CogAT- Nonverbal	6.4	2.9
CogAT-Total (V, Q & NV)	7.0	4.5
WISC-V (statistical controls normative sample)	8.7	
Tests that require minimal knowledge	**Mn = 4.3**	**Mn = 2.9**
K-ABC (normative sample)	7.0	
K-ABC (matched samples)	6.1	
KABC-II (adjusted for gender & SES)	6.7	5.4
CAS-2 (normative sample)	6.3	4.5
CAS (statistical controls normative sample)	4.8	4.8
CAS-2 (statistical controls normative sample)	4.3	1.8
CAS-2 Brief (normative samples)	2.0	2.8
NNAT (matched samples)	4.2	2.8
Naglieri General Ability Test-Verbal	2.2	1.6
Naglieri General Ability Test-Nonverbal	1.0	1.1
Naglieri General Ability Test-Quantitative	3.2	1.3

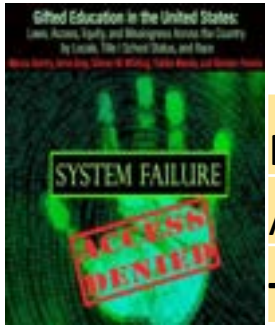
Note: The results summarized here were reported for the Otis-Lennon School Ability Test by Avant and O'Neal (1986); Stanford-Binet IV by Wasserman (2000); Woodcock-Johnson III race differences by Edwards and Oakland (2006) and ethnic differences by Sotelo-Dynega, Ortiz, Flanagan, and Chaplin (2013); CogAT7 by Carman, Walther and Bartsch (2018) and Lohman (2016), WISC-V by Kaufman, Raiford, and Coalson (2016); Kaufman Assessment Battery for Children-II by Lichtenberger, Volker, Kaufman & Kaufman, (2006); CAS by Naglieri, Rojahn, Matto, and Aquilino (2005); CAS-2 and CAS2:Brief by Naglieri, Das, and Goldstein, 2014a and 2014b; Naglieri Nonverbal Ability Test by Naglieri and Ronning (2000), and Naglieri General Ability Tests by Naglieri, Brulles, and Lansdowne (2022).

Numbers of Gifted Students Missed = 1,235,434

Total Enrollments by Race and Ethnicity as of 2020.				
	N in Public Education K-12 in 2020	N Potentially Gifted (8%; 92 %tile)	N Students in gifted programs	Difference Between Potential and Identified
White	23,834,458	1,906,757	1,937,350	30,593
Black	7,754,506	620,360	330,774	-289,586
Hispanic	14,337,467	1,146,997	600,498	-546,499
Native American/ Alaska Native	484,766	38,781	27,712	-11,069
Two or More Races	1,641,817	131,345	105,371	-25,974
Total Non-Whites	24,218,556	1,937,484	1,064,355	-873,129



873,129 +



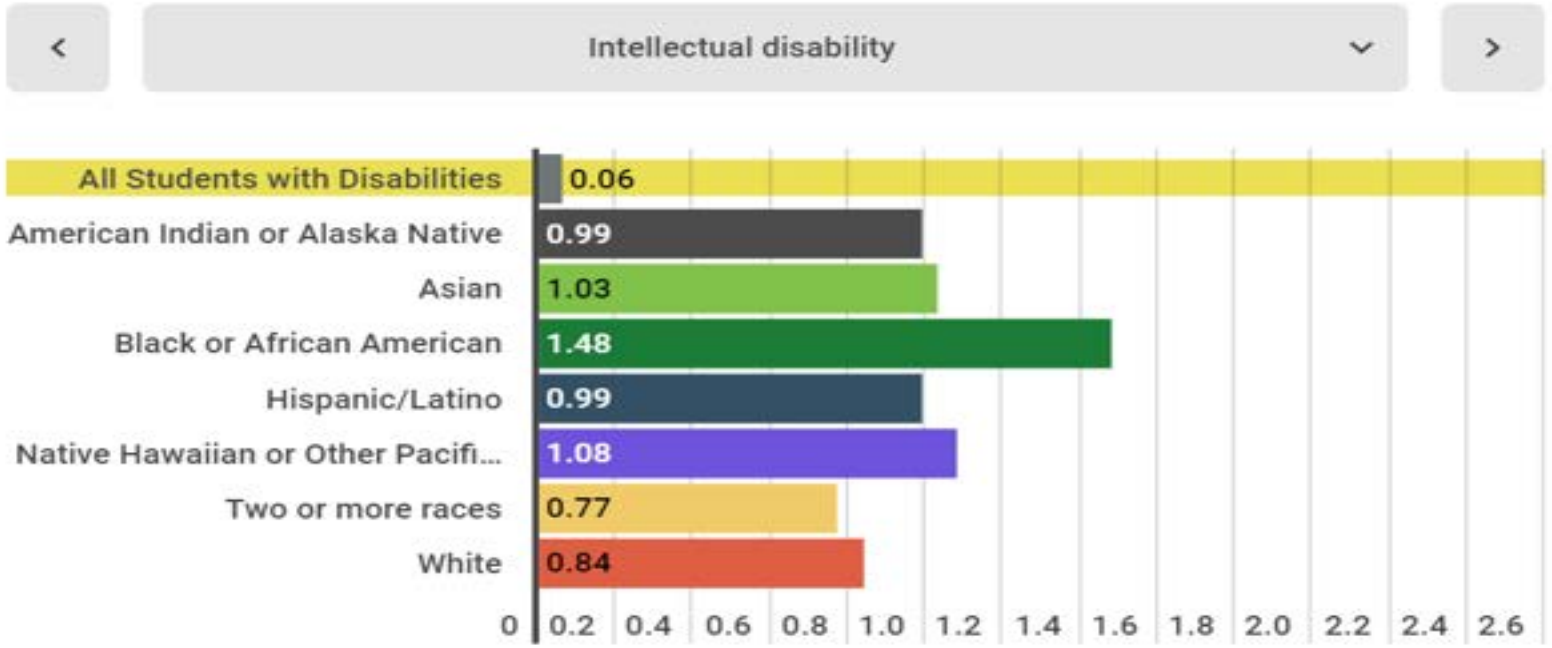
Percent of Schools that do not Identify	41.5%
Additional non-white gifted students = 41.5% of 873,129	N = 362,305
Total non-white gifted students missed	**N = 1,235,434**

OSEP Office of Special Education Programs
Office of Special Education and Rehabilitative Services

OSEP Fast Facts: Race and Ethnicity of Children with Disabilities Served under IDEA Part B

For the purposes of this fact sheet, racial ethnic groups are defined in the IDEA Part B Child Count and Educational Environments for School Year 2019-2020, OSEP Data Documentation. https://www2.ed.gov/programs/osepidea/618-data/collection-documentation/data-documentation-files/part-b/child-count-and-educational-environment/idea-partb-childcountandedenvironment-2019-20.pdf

Risk Ratio of Students with Disabilities by Disability Category and by Specific Race and Ethnicity, Ages 5 (in kindergarten) through 21: SY 2019-20



The relative risk ratio of students with disabilities under IDEA by race and Ethnicity is the probability of a student with a disability being identified for intellectual disability. The higher the number, the larger the probability. Nationally, **Black Students are 1.48 times more likely to be identified with intellectual disability** compared to all students with disabilities.

https://sites.ed.gov/idea/osep-fast-facts-race-and-ethnicity-of-children-with-disabilities-served-under-idea-part-b/

https://ldaamerica.org/lda_today/disproportionate-identification-of-students-of-color-in-special-education/

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

DANIEL, DINAH and DEANNA MCFADDEN, minors, by their parent and next friend, Tracy McFadden; KAREN, RODOLFO and KIARA TAPIA, minors, by their parent and next friend, Mariela Montoya; JOCELYN BURCIAGA, minor, by her parent and next friend, Griselda Burciaga; and KASHMIR IVY, minors, by their parent and next friend, Beverly Ivy; KRISTIANNE SIFUENTES, minors, by her parent and next friend, Irma Sifuentes,

Plaintiffs,

v.

BOARD OF EDUCATION FOR ILLINOIS SCHOOL DISTRICT U-46,

Defendant.

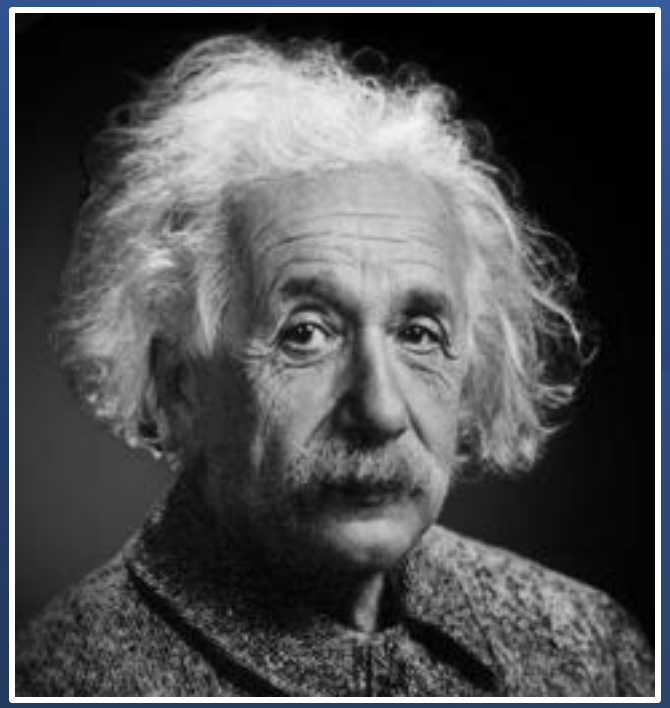
No. 05 C 0760

Judge Robert W. Gettleman

Illinois School District U-46

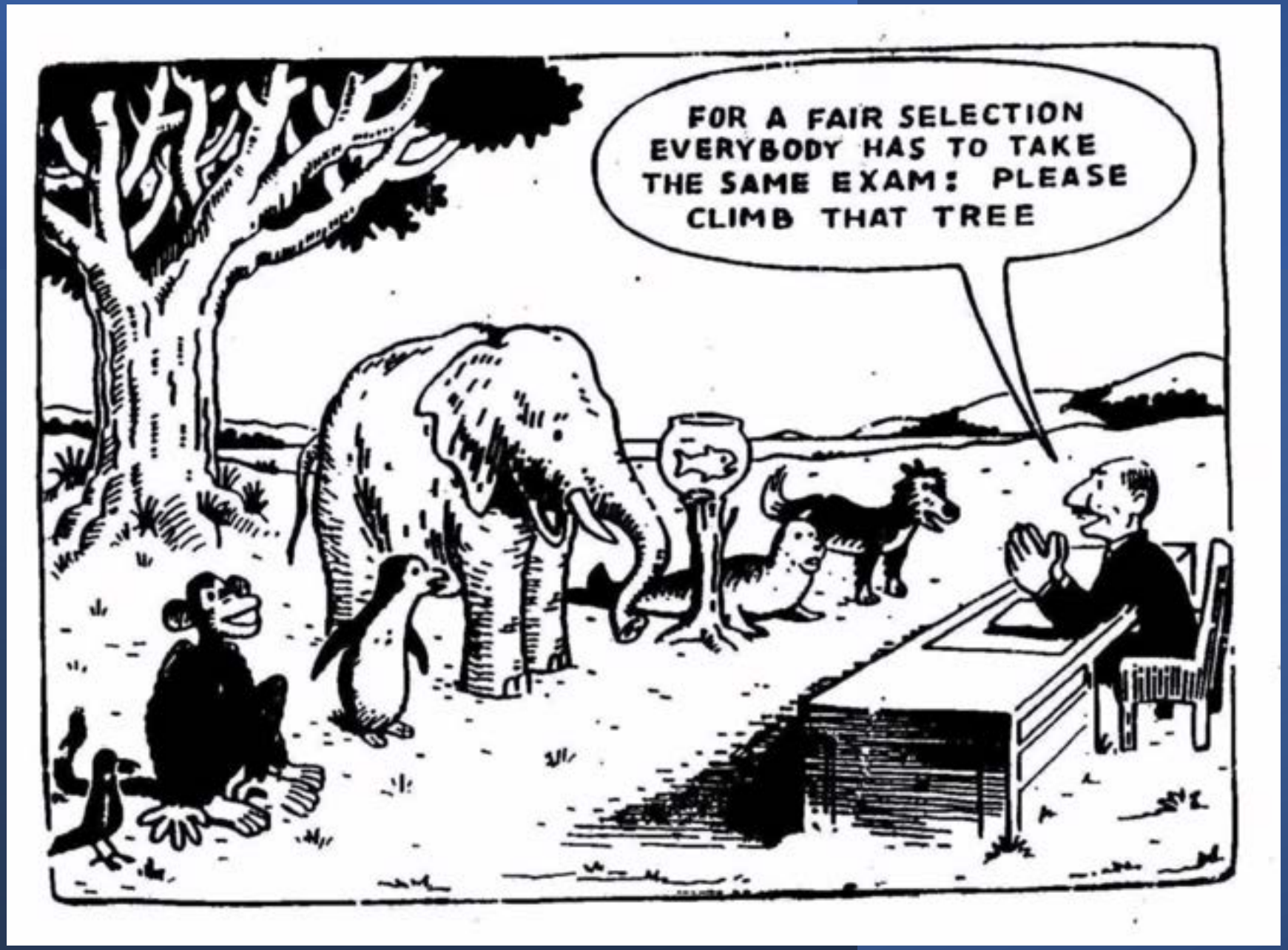
Are There Any Questions or Thoughts?

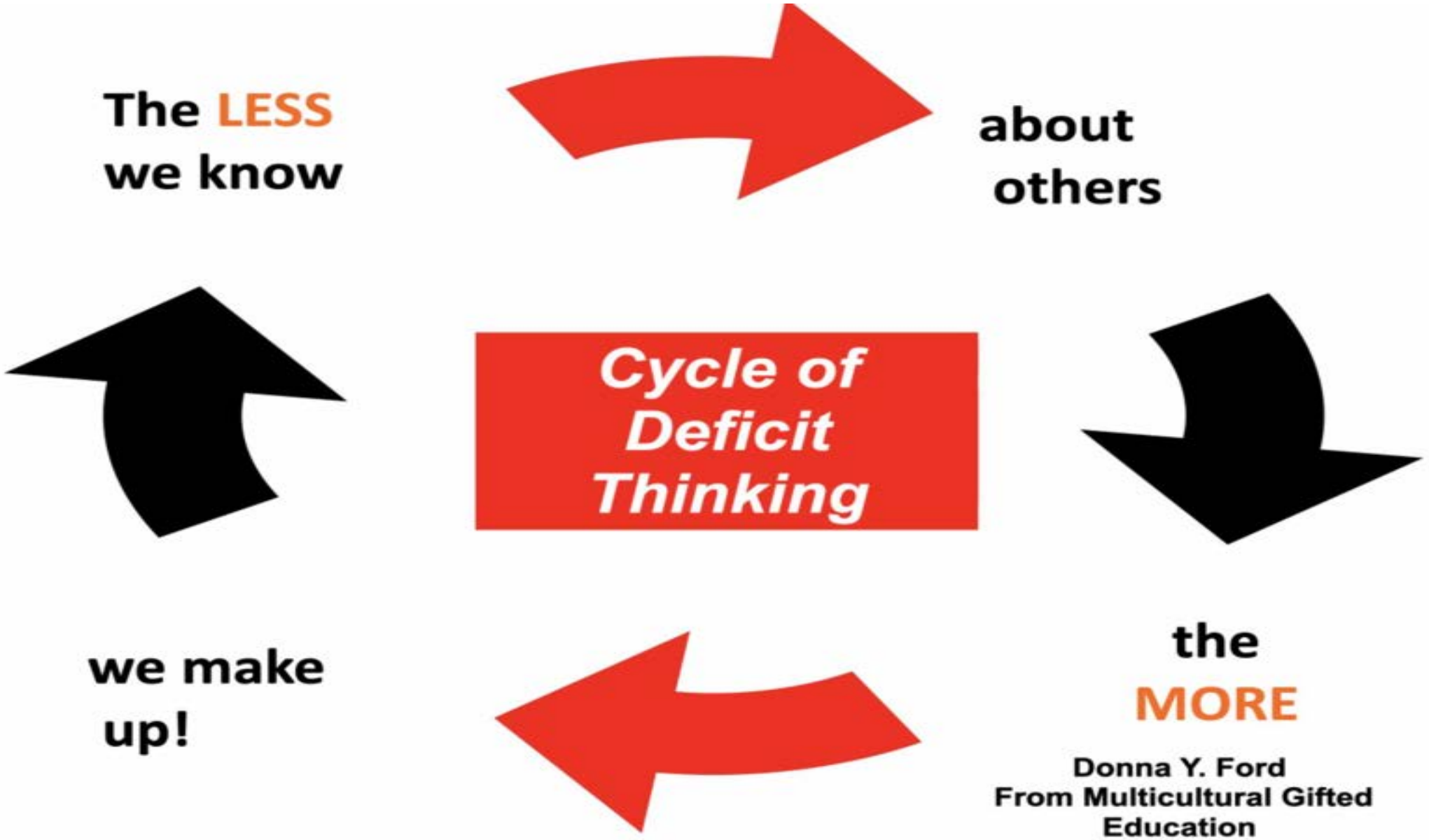
Change Demands Courage to Think Differently



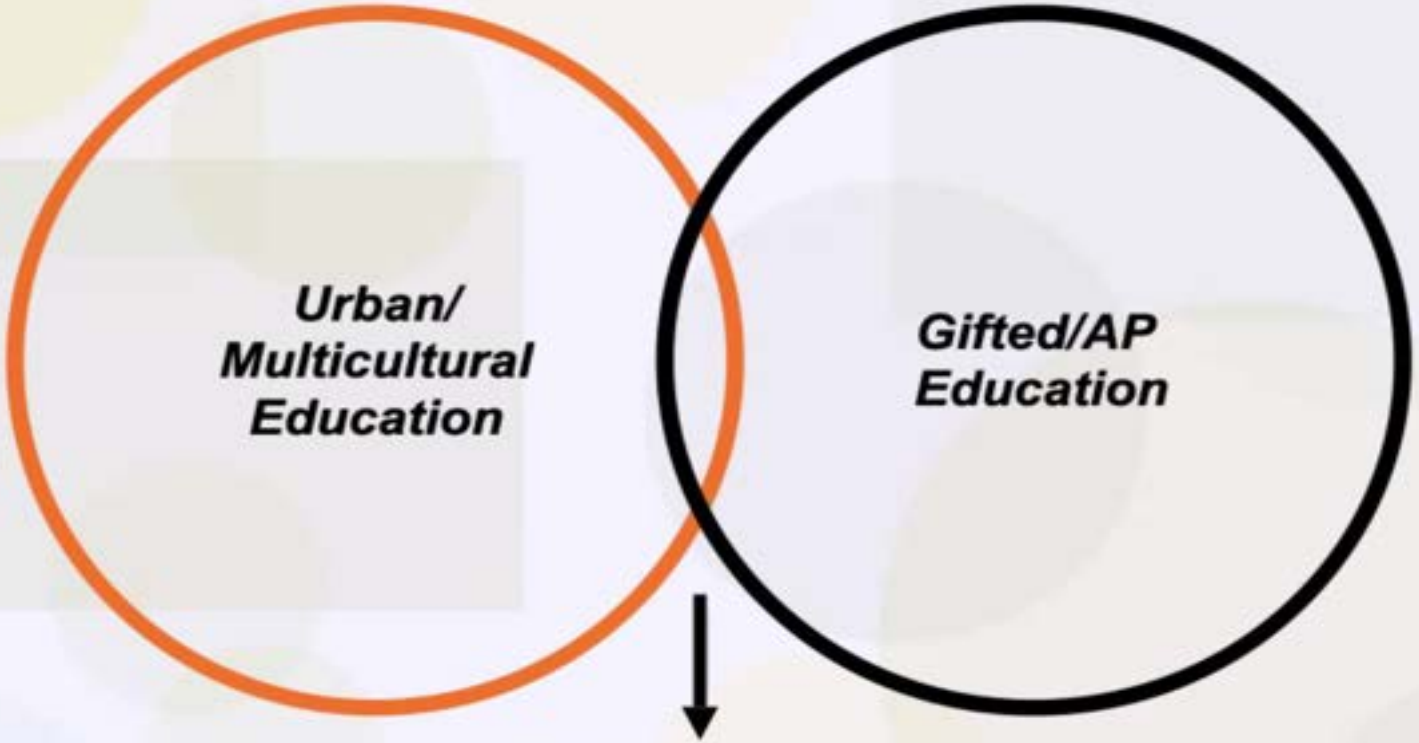
If you ask a fish to climb a tree, it will spend its entire life thinking it is stupid.

-Albert Einstein



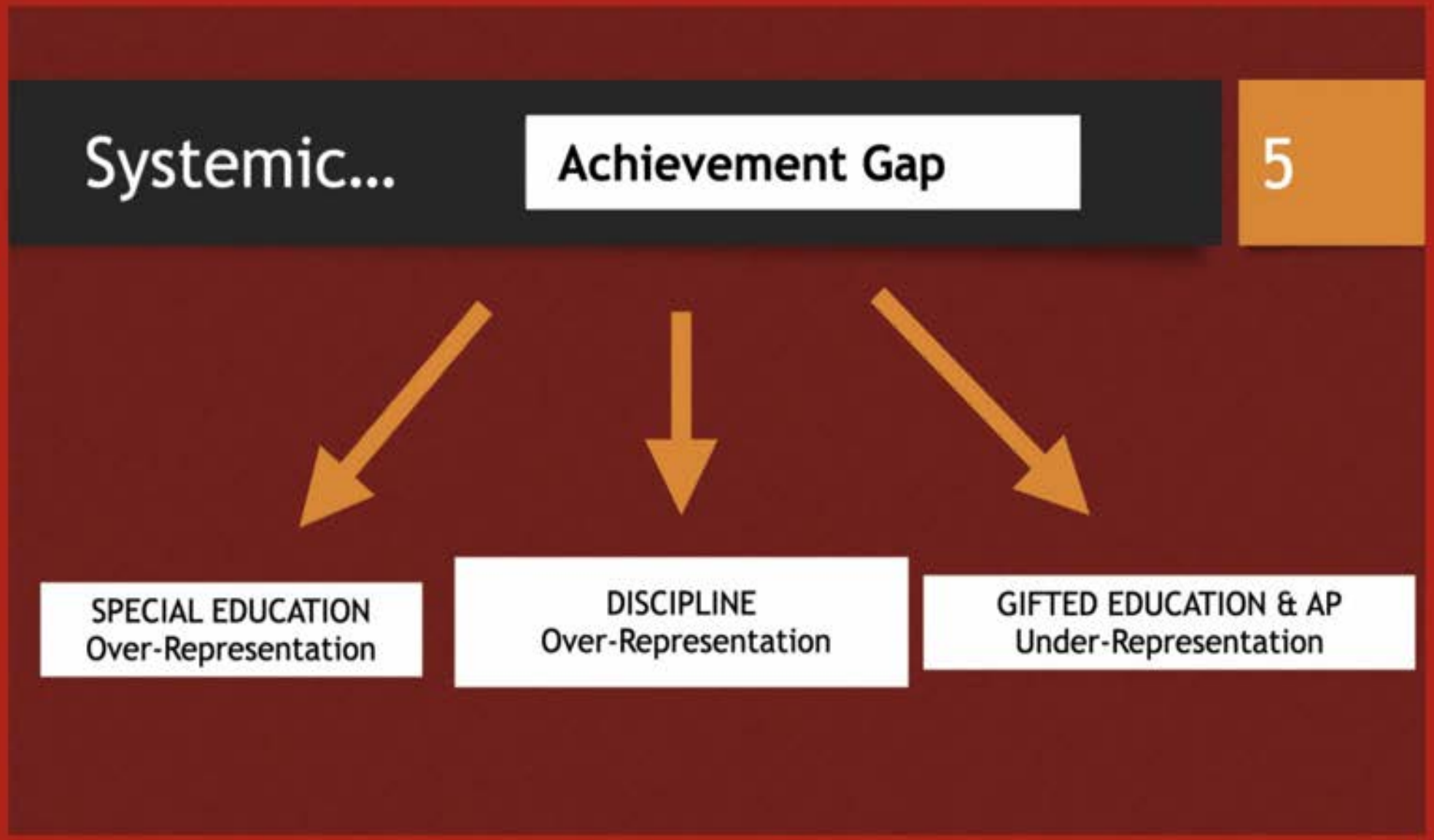

The LESS we know
about others
Cycle of Deficit Thinking
we make up!
the MORE
Donna Y. Ford
From Multicultural Gifted Education

Bridging Two Fields

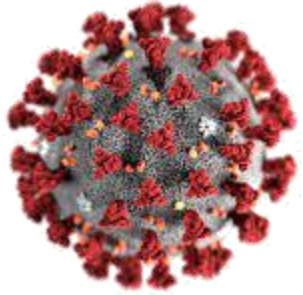


Needs and Development
Academic and Cognitive
Affective and Psychological
Social and Cultural

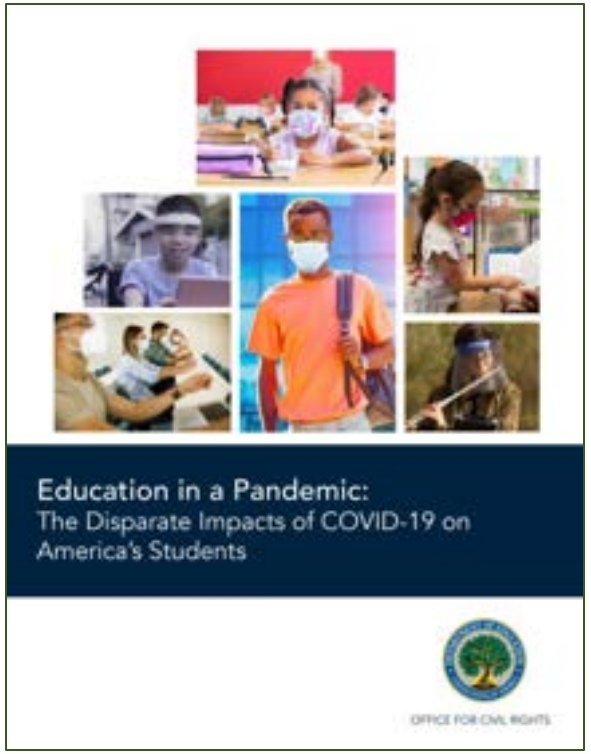
Donna Y. Ford


Systemic...
Achievement Gap
5
SPECIAL EDUCATION
Over-Representation
DISCIPLINE
Over-Representation
GIFTED EDUCATION & AP
Under-Representation

Academic Learning Loss & COVID



- COVID-19 has increased the impact of disparities in access and opportunity for students of color and they are even further behind than they were before.
- Their **scores on traditional intelligence tests** which demand knowledge **are even more inaccurate.**
- **Solutions**:
  - For traditional tests, **use post-COVID norms only**.
  - Use intelligence tests that are not dependent upon knowledge



Education in a Pandemic: The Disparate Impacts of COVID-19 on America's Students. US Dept. of Ed- Office of Civil Rights. June, 21, 2021. https://www2.ed.gov/about/offices/list/ocr/docs/20210608-impacts-of-covid19.p

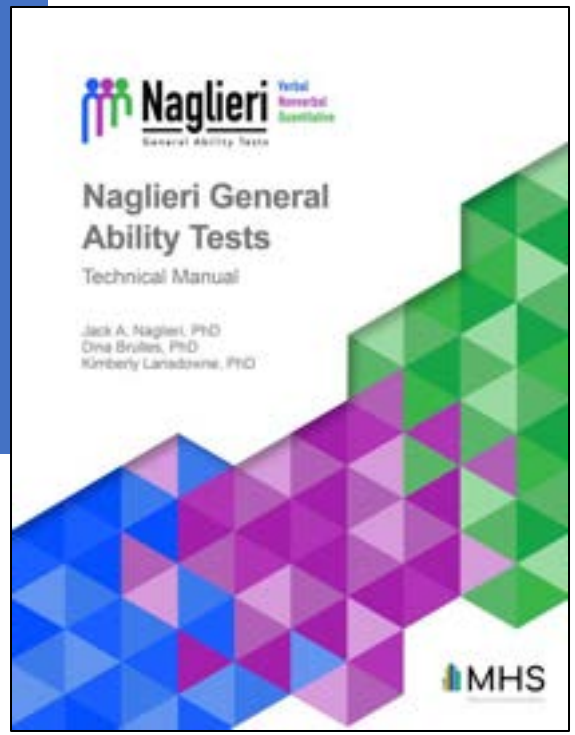
Psychologists who studied race and ethnic differences attributed IQ test results to the people instead of the tests.

That is the Practical Impact of flawed intelligence tests.

To be responsive is to address a NEED!

Can a Traditional Intelligence Test of General Ability be Equitable?

Measure ‘Thinking’ with minimal influence of ‘Knowing’.



The *Naglieri General Ability Tests: Verbal, Nonverbal and Quantitative*

VERBAL - Dina Brulles, Ph.D. dbrulles@gmail.com

NONVEBAL - Jack A. Naglieri, Ph.D. jnaglieri@gmail.com

QUANTITATIVE - Kim Lansdowne, Ph.D. Kimberly.Lansdowne@asu.edu

Naglieri General Ability Tests

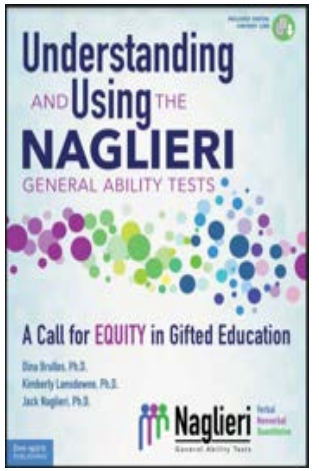
Naglieri Verbal Nonverbal Quantitative
General Ability Tests

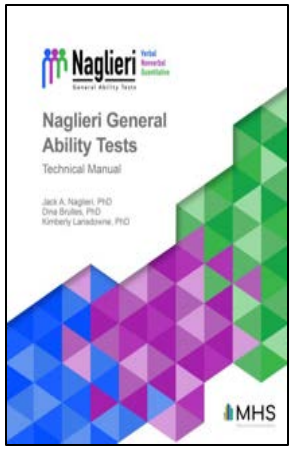
Jack A. Naglieri, Dina Brulles & Kimerly Lansdowne (2022)

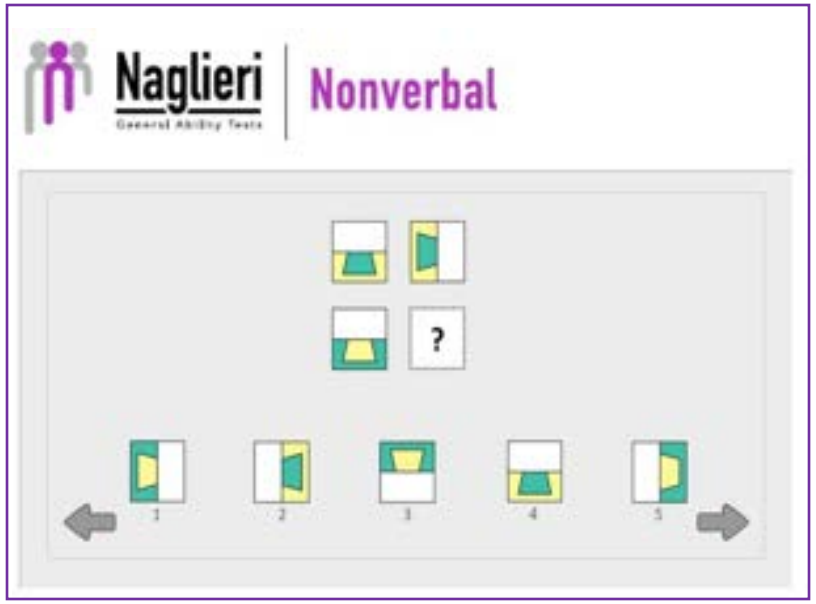
- We **explicitly made tests for equitable identification** of students from diverse cultural, linguistic, or socioeconomic backgrounds using the traditional Verbal, Nonverbal and Quantitative formats to **measure general ability**:
  - Animated instructions remove the need for verbal comprehension of directions,
  - Test questions that do not require academic knowledge,
  - Verbal and Quantitative test questions that can be solved using any language,
  - A multiple-choice response removes the need for verbal expression.

Naglieri General Ability Tests

Three tests of general ability that measure how well a student can ***think*** to arrive at the answer rather than what they ***know***.







Three Research Studies

Selvamenan, M., Paolozza, A., Solomon, J., Naglieri, J. A., & Schmidt, M. T. (submitted for publication, 2022). Race, Ethnic, Gender, and Parental Education Level Differences on Verbal, Nonverbal, and Quantitative Naglieri General Ability Tests: Achieving Equity.

- **VERBAL SAMPLE**
  - 2,482 That closely matches the US population on key demographics
- **GENDER**
  - No differences between **males** and **females** for raw score across all forms
- **RACE/ETHNICITY**
  - No differences among **White, Black, & Hispanic** for raw score across all forms
- **PARENTAL EDUCATION LEVEL**
  - No differences among five education levels (**No high school diploma; High School graduate; Some college/Associate's degree; Bachelor's degree; Graduate/professional degree**) for raw score across all forms

- **NONVERBAL SAMPLE**
  - 3,630 That closely matches the US population on key demographics
- **GENDER**
  - No differences between **males** and **females** for raw score across all forms
- **RACE/ETHNICITY**
  - No differences among **White, Black, & Hispanic** for raw score across all forms
- **PARENTAL EDUCATION LEVEL**
  - No differences among five education levels (**No high school diploma; High School graduate; Some college/Associate's degree; Bachelor's degree; Graduate/professional degree**) for raw score across all forms

- **QUANTITATIVE SAMPLE**
  - 2,841 That closely matches the US population on key demographics
- **GENDER**
  - No differences between **males** and **females** for raw score across all forms
- **RACE/ETHNICITY**
  - No differences among **White, Black, & Hispanic** for raw score across all forms
- **PARENTAL EDUCATION LEVEL**
  - No differences among five education levels (**No high school diploma; High School graduate; Some college/Associate's degree; Bachelor's degree; Graduate/professional degree**) for raw score across all forms

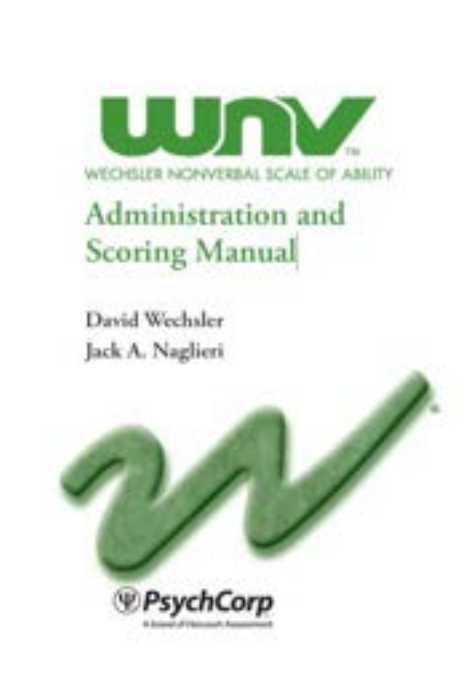
General Ability Tests

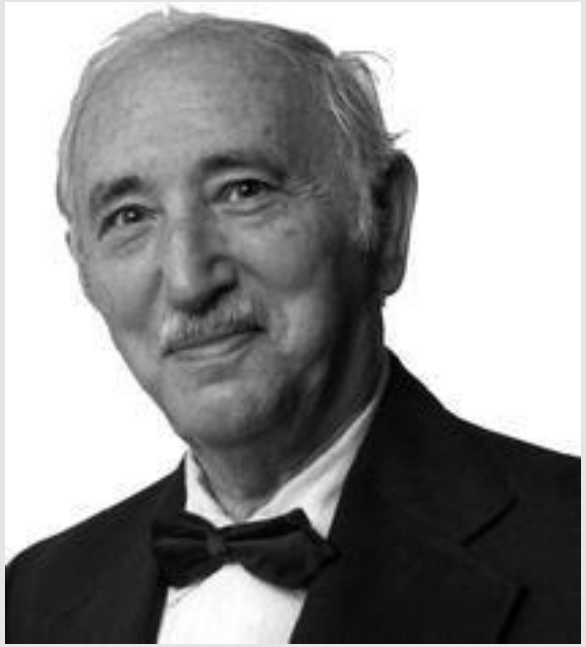
”We did not start with a clear definition of general intelligence… [but] borrowed from every-day life a vague term implying all-round ability and… we [are] still attempting to define it more sharply and endow it with a stricter scientific connotation (Pintner, 1923 p. 53)”.

“The aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment. (1939)”

General Ability not verbal or nonverbal intelligences !

The emphasis in the *WNV Manual* that the Full Scale measures *general ability nonverbally*—and *not* nonverbal ability—ties the WNV to Dr. Wechsler





Dr. Wechsler remained a firm believer in Spearman's g theory ... He believed that his Verbal and Performance Scales represented different ways to access g, but he never believed in nonverbal intelligence as being separate from g.

He saw the Performance Scale as the most sensible way to measure the general intelligence of people with ... limited proficiency in English.

Quotes from Alan S. Kaufman in the Wechsler Nonverbal Manual; Wechsler & Naglieri (2006)

Support for ‘g’

Journal Information
Journal TOC

PsycARTICLES: Journal Article

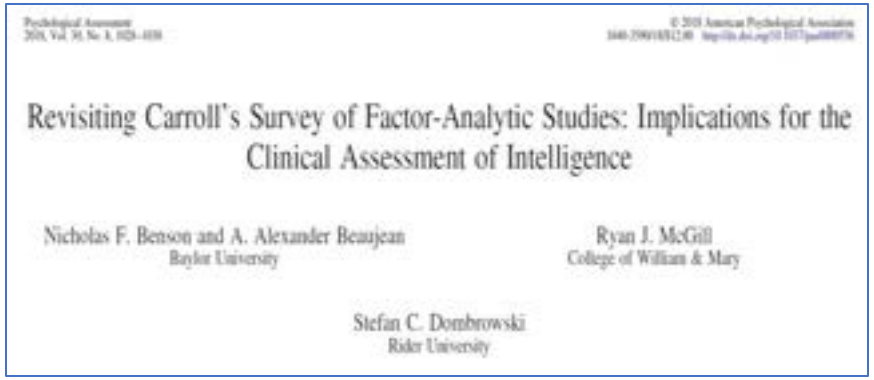
Structural validity of the Wechsler Intelligence Scale for Children–Fifth Edition: Confirmatory factor analyses with the 16 primary and secondary subtests.

© Request Permissions

Canivez, Gary L.,Watkins, Marley W.,Dombrowski, Stefan C.

Canivez, G. L., Watkins, M. W., & Dombrowski, S. C. (2017). Structural validity of the Wechsler Intelligence Scale for Children–Fifth Edition: Confirmatory factor analyses with the 16 primary and secondary subtests. *Psychological Assessment*, 29(4), 458–472.
https://doi.org/10.1037/pas0000358

- …The small portions of variance uniquely captured by [subtests]… render the group factors [scales]of questionable interpretive value independent of g (FSIQ general intelligence)
- Present CFA results confirm the EFA results (Canivez, Watkins, & Dombrowski, 2015); Dombrowski, Canivez, Watkins, & Beaujean (2015); and Canivez, Dombrowski, & Watkins (2015).



Revisiting Carroll's Survey of Factor-Analytic Studies: Implications for the Clinical Assessment of Intelligence

Nicholas F. Benson and A. Alexander Beaujean
Baylor University

Ryan J. McGill
College of William & Mary

Stefan C. Dombrowski
Rider University

- **The results of this study indicate that most cognitive abilities specified in** John Carroll’s **three-stratum theory have little-to-no interpretive relevance above and beyond that of general intelligence.**

Research Supports 'g' But Little More…

Watkins, M. W., & Canivez, G. L. (2021). Assessing the psychometric utility of IQ scores: A tutorial using the Wechsler intelligence scale for children–fifth edition. School Psychology Review, 1-15.

Benson, N. F., Beaujean, A. A., McGill, R. J, & Dombrowski, S. C. (2018). Revisiting Carroll's Survey of Factor-Analytic Studies: Implications for the Clinical Assessment of Intelligence. *Psychological Assessment,* 30, 8, 1028–1038.

Canivez, G. L., Watkins, M. W., & Dombrowski, S. C. (2017). Structural validity of the Wechsler Intelligence Scale for Children–Fifth **Edition:** Confirmatory factor analyses with the 16 primary and secondary subtests. *Psychological Assessment, 29,* 458-472.

Canivez, G. L., & McGill, R. J. (2016). Factor structure of the Differential Ability Scales–Second Edition: Exploratory and hierarchical factor analyses with the core subtests. *Psychological Assessment, 28,* 1475-1488. http://dx.doi.org/10.1037/pas0000279

Canivez, G. L. (2008). Orthogonal higher order factor structure of the Stanford-Binet Intelligence Scales-Fifth Edition for children and adolescents. School Psychology Quarterly, 23, 533–541.

Dombrowski, S. C., **Canivez, G. L.,** & Watkins, M. W. (2017, May). Factor structure of the 10 WISC–V primary subtests across four standardization age groups. *Contemporary School Psychology.* Advance online publication.

Dombrowski, S. C., McGill, R. J., & Canivez, G. L. (2017). Exploratory and hierarchical factor analysis of the WJ IV Cognitive at school age. *Psychological Assessment, 29,* 394-407.

McGill, R. J., & **Canivez, G. L.** (2017, October). Confirmatory factor analyses of the WISC–IV Spanish core and supplemental Subtests: Validation evidence of the Wechsler and CHC models. *International Journal of School and Educational Psychology*. Advance online publication.

Watkins, M. W., Dombrowski, S. C., & **Canivez, G. L.** (2017, October). Reliability and factorial validity of the Canadian Wechsler Intelligence Scale for Children–Fifth Edition. *International Journal of School and Educational Psychology*.

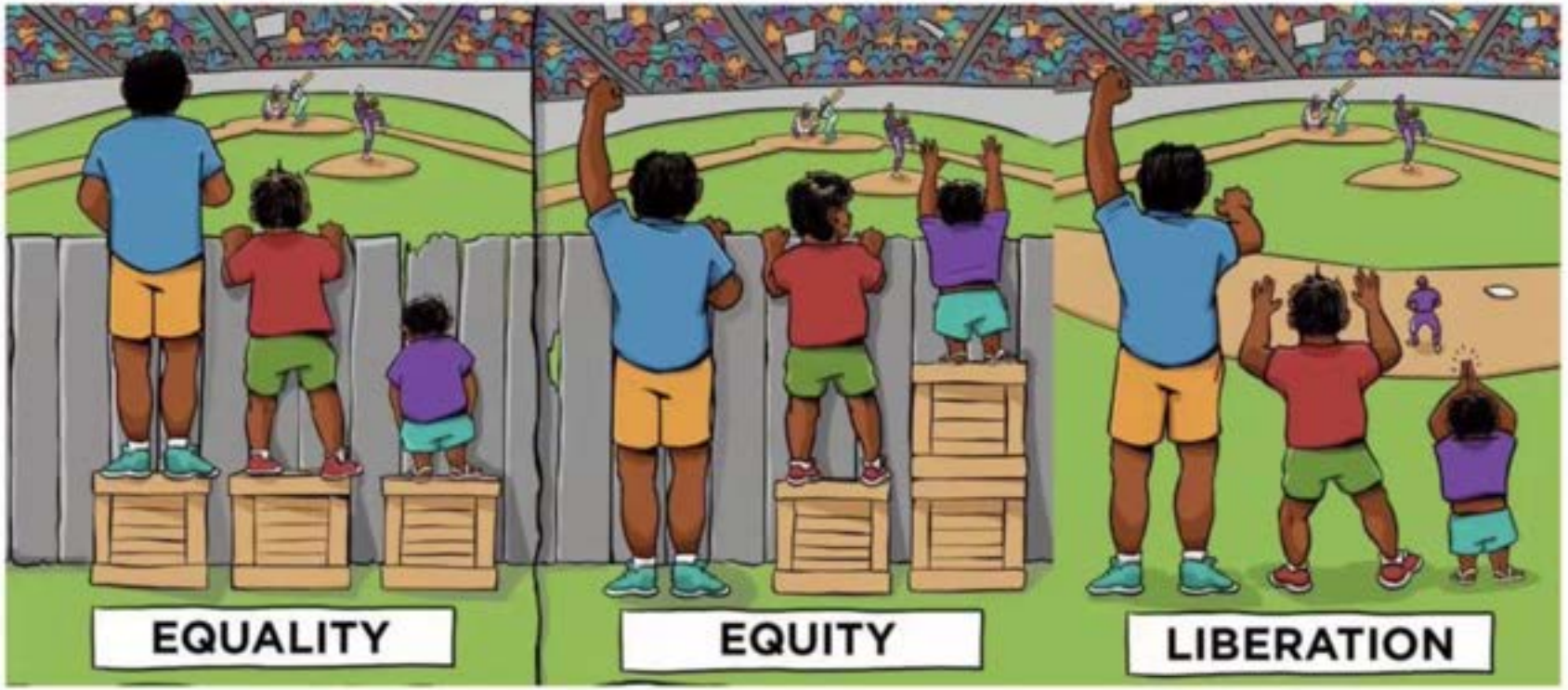
What is the Practical Impact?

Verbal, Nonverbal, and Quantitative scales are NOT different types of intelligence; these terms describe the *content of the test questions*

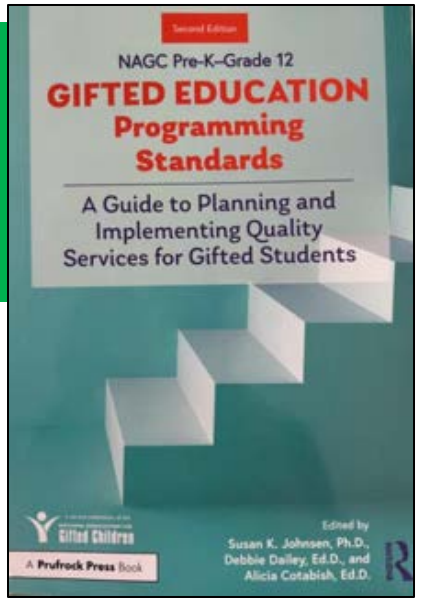
CENTER FOR STORY-BASED STRATEGY

Don't just tell a different version of the same story.

Change The Story!



NAGC Professional Standards



2.2. *Identification*. Students with gifts and talents are identified for services that match their interests, strengths, and needs.

2.2.5. Educators select assessments that minimize bias by including information in the technical manual that describes content in terms of potential bias, includes norms that match national census information or local populations, shows how items discriminate equally well for each group, and provides separate reliability and validity information for each group.

2.3. *Identification*. Students with identified gifts and talents represent diverse backgrounds.

2.3.1. Educators select and use equitable approaches and assessments that minimize bias for referring and identifying students with gifts and talents, attending to segments of the population that are frequently hidden or underidentified. Approaches and tools may include front-loading talent development activities, universal screening, using locally developed norms, assuring assessment tools are in the child's preferred language for communication, or nonverbal formats.

Summary: Equitable Assessment of Intelligence

- **Equitable evaluation of intelligence** demands test questions that can be solved regardless of the amount of academic knowledge and facility with language a student has
- We have shown that
  - General ability (*g*) **can be measured equitably** across Verbal, Quantitative and Nonverbal content if the tests do not require academic knowledge
- Verbal, Quantitative and Nonverbal are **a description of the content of the tests**' questions **NOT** different types of intelligence
- Equitable tests measure THINKING in a manner that is minimally influenced by KNOWING

WE CAN DO BETTER

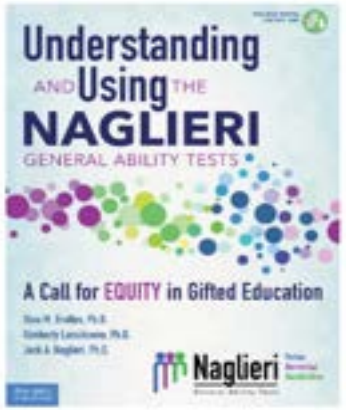
We Must do Better

To repeat…

We do the best we can with what we know, and when we know better, we do better.

Change Demands Courage to Think Differently!

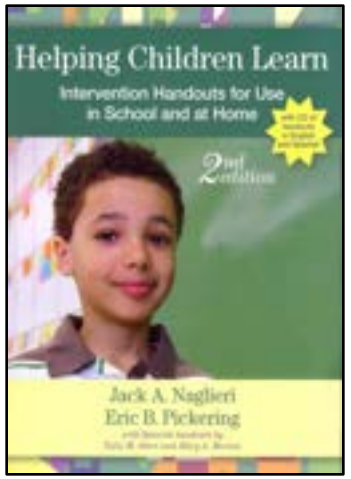
Socially just identification of gifted students requires self-reflection and self-correction in response to current research.

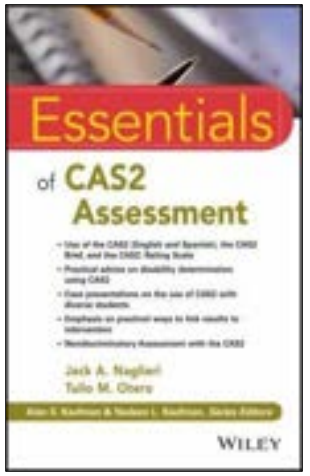


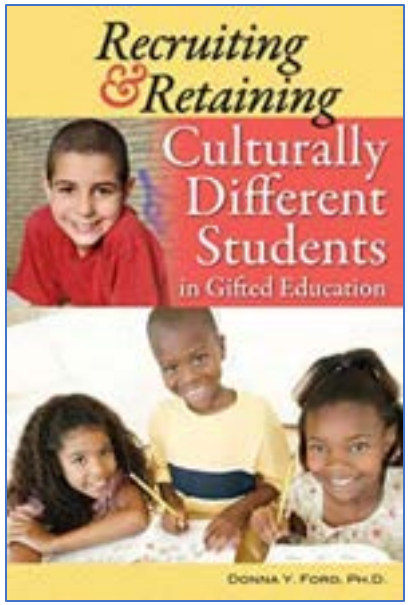
Understanding and Using the Naglieri General Ability Tests

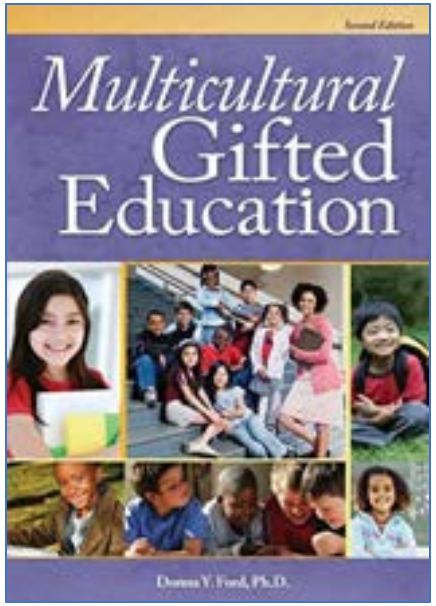
Dina Brulles, Ph.D. / Kimberly Lansdowne, Ph.D. / Jack A. Naglieri, Ph.D.

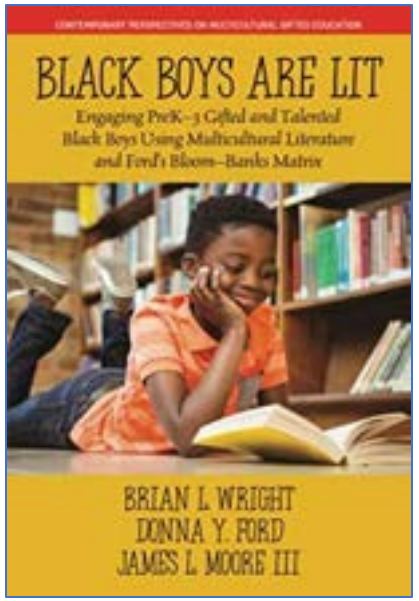
An accessible guide to identifying gifted students and creating equity and inclusion within gifted programs.











FINAL
THOUGHTS!