# Using Neuroscience to Understand and Teach All Gifted Students

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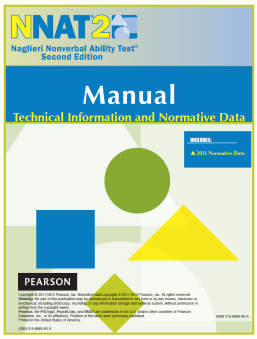
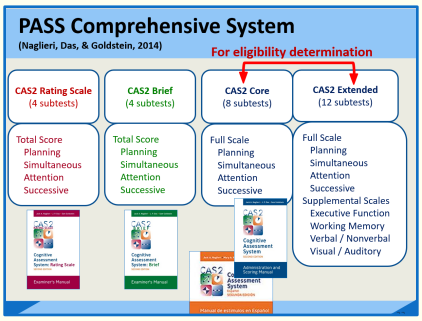
## Relevant Disclosures

- For Universal Screening
- Author of the Naglieri Nonverbal Ability Test
- For Individual Assessment
- Author of the Cognitive Assessment System

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# Additional Information

- See www.jacknaglieri.com for free copies of my research, handouts on PASS theory, Executive Function, Specific Learning Disabilities, Autism, identification of Gifted, etc.




# Topical Outline

- Conclusions
- IQ's dirty little secret
- Improving IQ using neuroscience
  - A "basic psychological processing" approach to understanding learning and learning problems
    - Processing and SLD
      - Gifted and high ability students PASS processing, relevance to instructional planning and SLD eligibility determination

## Conclusions

- Traditional IQ has limited our understanding of intelligence (aka – ability) which in turn has greatly limited what school psychologists can say to improve classroom instruction
- A neuroscience approach to defining intelligence as neurocognitive abilities is much more powerful, relevant to instruction and fair to diverse students (i.e. more socially just)
- Changing the way we conceptualize and measure intelligence will impact all students, including those in Gifted education
- I will show you that *gifted students can have* strengths and weaknesses in neurocognitive abilities which warrant instructional modifications and in some cases SLD designation

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# Traditional IQ and Achievement Tests

- 1975 Charles Champagne Elementary, Bethpage, NY
- Typical assessment
  - Draw A Person
  - Bender-Gestalt
  - WISC
  - Peabody Individual Achievement Test
  - Sentence Completion Test
  - Developmental history
  - other measures as needed



# Traditional IQ and Achievement Tests

- When I conducted my comprehensive evaluations I noticed that parts of the WISC were VERY similar to parts of the achievement test I was giving
  - In fact the Peabody Individual Achievement Test (1970) had a General Information and Arithmetic subtests JUST LIKE THE WISC!
- That is still true today…

# Thinking vs Knowing

We should NOT measure intelligence with tests that demand knowledge!

- Scales on IQ tests that are confounded by knowledge
  - WISC-V
    - Verbal Comprehension: Vocabulary, Similarities, Information & Comprehension
    - Fluid Reasoning: Figure Weights, Picture Concepts, Arithmetic
  - WJ-IV
    - Comprehension Knowledge: Vocabulary & General Information
    - Fluid Reasoning: Number Series & Concept Formation
    - Auditory Processing: Phonological Processing

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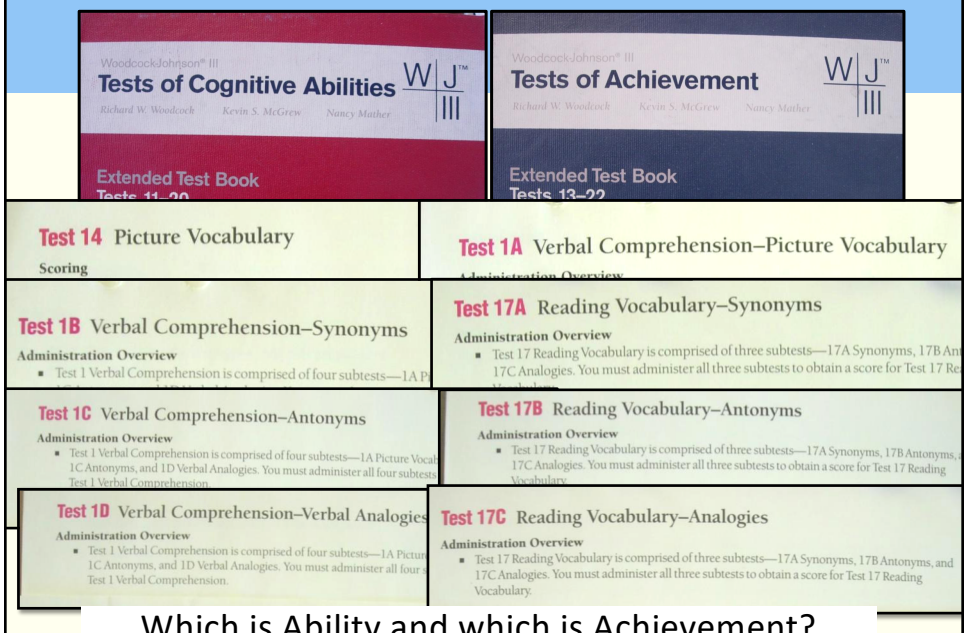


Which is Ability and which is Achievement?

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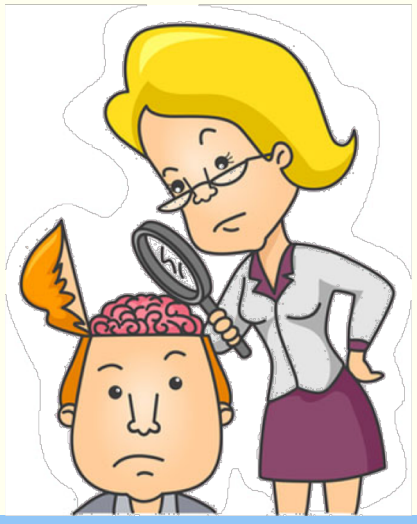
## WHY DO WE MEASURE IQ THE WAY WE DO?

## THE HISTORY OF IQ TESTS



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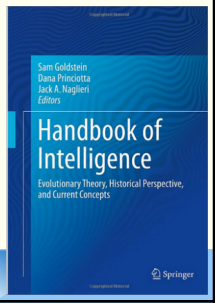
## Evolution of IQ

**http://www.jacknaglieri.com/cas2.html**




### Hundred Years of Intelligence Testing: Moving from Traditional IQ to Second-Generation Intelligence Tests

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Jack A. Naglieri

*"Do not go where the path may lead, go instead where there is no path and leave a trail."*

–Ralph Waldo Emerson

**Context**

April 6, 1917, is remembered as the day the United States entered World War I. On that same day a group of psychologists held a meeting in Harvard University's Emerson Hall to discuss the possible role they could play with the war effort (Yerkes 1921). The group agreed that psychological knowledge and methods could be of importance to the military and utilized to increase the efficiency of the Army and Navy personnel. The group included Robert Yerkes, Training School in Vineland, New Jersey, on May 28. The committee considered many types of group tests and several that Arthur S. Otis developed when working on his doctorate under Lewis Terman at Stanford University. The goal was to find tests that could efficiently evaluate a wide variety of men, be easy to administer in the group format, and be easy to score. By June 9, 1917, the materials were ready for an initial trial. Men who had some educational background and could speak English were administered the verbal and quantitative (Alpha) tests and those that could not read the newspaper or speak English were given

# Origins of Traditional IQ

April 6, 1917 was the day the United States entered World War I.

On that same day a group of psychologists held a meeting in **Harvard University's Emerson Hall** to discuss the possible role psychologists could play with the war effort (Yerkes, 1921). Some of the members: Yerkes, Thorndike, Seashore, Terman, Otis and others…

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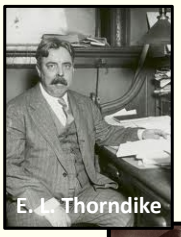
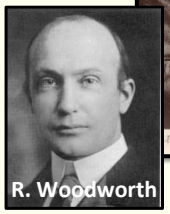
# Origins of Traditional IQ

- They met at the Training School in Vineland, New Jersey in May of 1917 to construct an ability test
- By July of 1917 they concluded that the Army Alpha and Beta tests could
  - "aid in segregating and eliminating the mentally incompetent, classify men according to their mental ability; and assist in selecting competent men for responsible positions" (p. 19, Yerkes, 1921).
- What did these test look like?



E. L. Thorndike



R. Woodworth

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## From Alpha/Beta to Wechsler IQ

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

Verbal & Quantitative

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

Nonverbal

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## The First IQ TEST: Alpha (Verbal)

1. Bull Durham is the name of **tobacco**
2. The Mackintosh Red is a kind of **fruit**
3. The Oliver is a **typewriter**
4. A passenger locomotive type is the **Mogul**
5. Stone & Webster are well know **engineers**
6. The Brooklyn Nationals are called **Superbas**
7. Pongee is a **fabric**
8. Country Gentleman is a kind of **corn**
9. The President during the Spanish War was **Mckinley**
10. Fatima is a make of **cigarette**

From: Psychological Examining the United States Army (Yerkes, 1921, p. 213)

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# The First IQ Test: Beta (Nonverbal)

Why Beta?



Men who fail in alpha are sent to beta in order that injustice by reason of relative unfamiliarity with English may be avoided. Men who fail in beta are referred for individual examination by means of what may appear to be the most suitable and altogether appropriate procedure among the varied methods available. This reference for careful individual examination is yet another attempt to avoid injustice either by reason of linguistic handicap or accidents incident to group examining.

- There is no mention of measuring verbal and nonverbal intelligences
- Verbal tests posed a **social justice issue**

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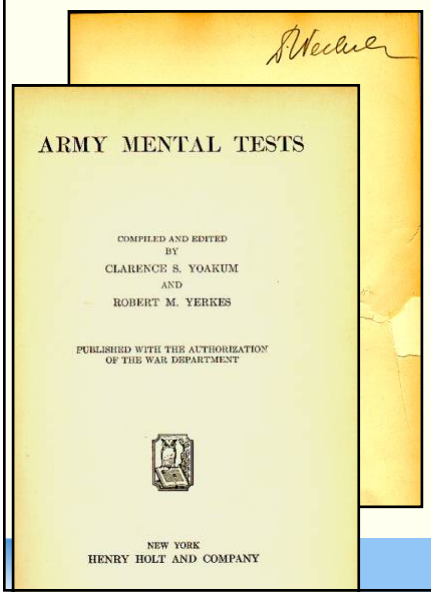
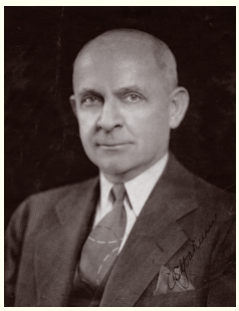
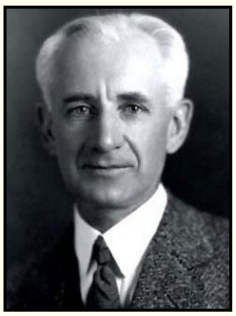
# From Alpha/Beta to Wechsler IQ





- Yoakum & Yerkes (1920) summarized the methods used by the military to

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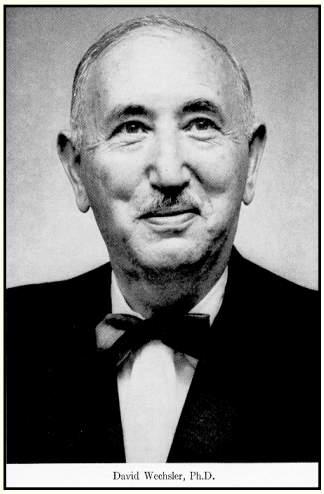
## Wechsler's Definition

- Definition of intelligence does not mention verbal or nonverbal *abilities*:

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


David Wechsler, Ph.D.

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## What a Nonverbal Test Measures
**(Naglieri, Brulles, & Lansdown, 2008)**

wrote: "the subtests are *different measures of intelligence*, not *measures of different kinds of intelligence*" (p. 64). Similarly, Naglieri (2003) further clarified that "the term nonverbal refers to the content of the test, not a type of ability" (p. 2). Thus, tests may differ in their content or specific demands, but still measure the concept of general intelligence.

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# Myth of Verbal IQ - Conclusions

- The lack of a clear distinction between ability and achievement tests has corrupted the very concept of IQ
  - Students with limited education are disadvantaged when assessed with Verbal and Quantitative "ability" tests
- The result is
  - over-representation of minorities in special education is a significant problem (Naglieri & Rojahn, 2000).
  - under-representation Black, Hispanic, and Native American students by 50% to 70% (U.S. Dept of Education, 1993)
  - What do the percentages mean in terms of real ***numbers***?

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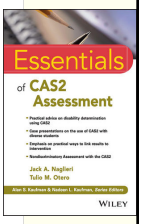
# Gifted Students Missed

Number and Percentage of Students in US Public Schools Grades K-12 in 2015.

| Race/Ethnic | % in US | N | 8 % GT | N Missed |
|---|---|---|---|---|
| White | 49% | 24,700,000 | 1,976,000 | |
| Black | 15% | 7,700,000 | 616,000 | 308,000 |
| Hispanic | 26% | 13,100,000 | 1,048,000 | 419,200 |
| Other | 9% | 4,600,000 | 368,000 | |
| Total | 100% | 50,100,000 | 4,008,000 | 727,200 |

Note: N Missed is based on 50% of Black and 40% of Hispanics




- From: Naglieri, J. A. & Otero, T. M. (2017). *Essentials of CAS2 Assessment*. New York: Wiley.

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# Neurocognitive Tests are Less Biased

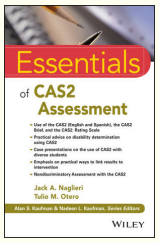


**Table 1.6 Standard Score Mean Differences by Race on Traditional and Nontraditional Intelligence Tests**

| Test | Difference |
|---|---|
| **Traditional IQ Tests** | |
| SB-IV (matched samples) | 12.6 |
| WISC-IV (normative sample) | 11.5 |
| WJ-III (normative sample) | 10.9 |
| WISC-IV (matched samples) | 10.0 |
| **Nontraditional Tests** | |
| K-ABC (normative sample) | 7.0 |
| K-ABC (matched samples) | 6.1 |
| KABC-II (matched samples) | 5.0 |
| CAS2 (normative sample) | 6.3 |
| CAS (demographic controls of normative sample) | 4.8 |
| CAS2 (demographic controls of normative sample) | 4.3 |

Note: The data for these results are reported for the Stanford-Binet IV from Wasserman (2000); Woodcock-Johnson III from Edwards and Oakland (2006); Kaufman Assessment Battery for Children from Naglieri (1986); Kaufman Assessment Battery for Children II from Lichenberger, Sotelo-Dynega, and Kaufman (2009); CAS from Naglieri, Rojahn, Matto, and Aquilino (2005); CAS2 from Naglieri, Das, and Goldstein (2014a); and Wechsler Intelligence Scale for Children IV (WISC-IV) from O'Donnell (2009).

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## Intelligence in the 21st Century Conceptualized as brain function

Neuroscience gives us a road map!

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## Intelligence as Neurocognitive Abilities

- Sternberg (2015) has stated that
  - "the field of intelligence [has been] lost in a theoretical swamp. Researchers were falling over each other to compete either in determining which of various psychometric theories (e.g., Spearman, Thurstone, Cattell, Guilford, Guttman) had the most support; or … they were trying to synthesize these theories (e.g., John Carroll)"

Sternberg (2015) in *Cognition, Intelligence and Achievement* (Eds. Papadopoulos, Parrila & Kirby)

## From IQ to Brain Function (PASS)

**Learning is based on BRAIN function.**

- Wechsler, WJ, Binet (traditional IQ) was not based on the brain
- We can redefine intelligence as neurocognitive processes based on brain function (A. R. Luria)

**Reinvent understanding of intelligence based on the brain.**

- Measure brain function, not IQ
- Do not include achievement test questions
- Measure ***thinking*** not ***knowledge (less cultural bias)***

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## Cognition or Knowledge?

- What does the student have to **know** to complete a task?
  - This is dependent on *instruction*
- How does the student have to **think** to complete a task?
  - This is dependent on the *brain* – ***PASS***
- We must assess ability and achievement separately


# Intelligence as Neurocognitive Abilities

- In Das and Naglieri's first meeting (February 11, 1984) they proposed that intelligence was better defined as PASS processes and began development of the **C**ognitive **A**ssessment **S**ystem (Naglieri & Das, 1997).
- The CAS was the first intelligence *test* to be built on a specific *theory* of intelligence.


# PASS Theory based on A. R. Luria

- **P**lanning = THINKING ABOUT HOW YOU DO WHAT YOU DECIDE TO DO
- **A**ttention = BEING ALERT AND RESISTING DISTRACTIONS
- **S**imultaneous = GETTING THE BIG PICTURE
- **S**uccessive = FOLLOWING A SEQUENCE

**PASS** = 'basic psychological processes'

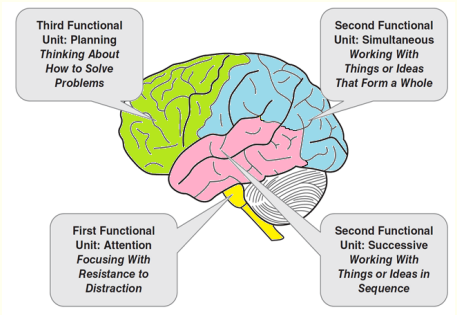


Figure 1.2 Three Functional Units and Associated Brain Structures

From: *Essentials of CAS2 Assessment*. Naglieri & Otero, 2017

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# PASS neurocognitive theory

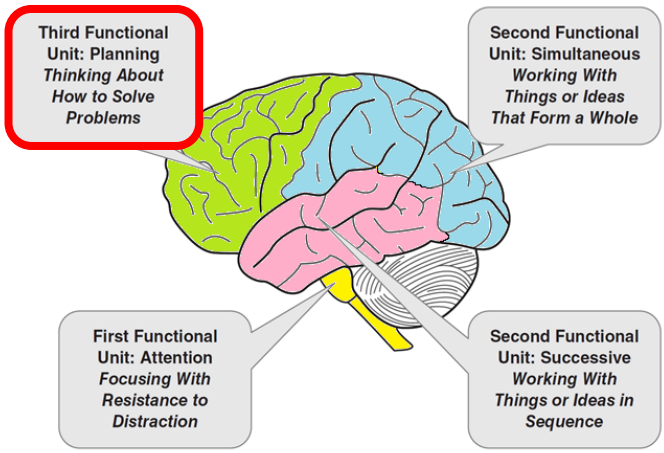


**Figure 1.2 Three Functional Units and Associated Brain Structures**

From: *Essentials of CAS2 Assessment*. Naglieri & Otero, 2017

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# PASS Theory: Planning

- **Planning** is a neurocognitive process that a person uses to determine, select, and use efficient solutions to problems
  - problem solving
  - developing plans and using strategies
  - retrieval of knowledge
  - impulse control and self-control
- These can also be described as executive function, metacognition, strategy use

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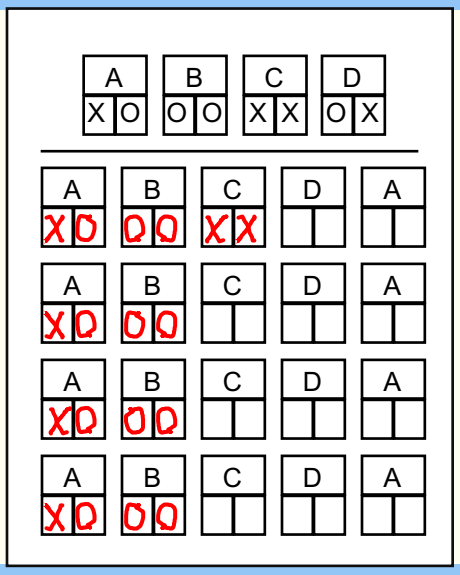
## Planned Codes

- Child fills in the codes in the empty boxes
- Children are encouraged to think of a good way to complete the page

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## CAS2: Rating Scale Planning

**Directions for Items 1–10.** These questions ask how well the child or adolescent decides how to do things to achieve a goal. They also ask how well a child or adolescent thinks before acting and avoids impulsivity. Please rate how well the child or adolescent creates plans and strategies to solve problems.

| During the past month, how often did the child or adolescent . . . | Never | Rarely | Sometimes | Frequently | Always |
|---|---|---|---|---|---|
| 1. produce a well-written sentence or a story? | 0 | 1 | 2 | 3 | 4 |
| 2. evaluate his or her own actions? | 0 | 1 | 2 | 3 | 4 |
| 3. produce several ways to solve a problem? | 0 | 1 | 2 | 3 | 4 |
| 4. have many ideas about how to do things? | 0 | 1 | 2 | 3 | 4 |
| 5. have a good idea about how to complete a task? | 0 | 1 | 2 | 3 | 4 |
| 6. solve a problem with a new solution when the old one did not work? | 0 | 1 | 2 | 3 | 4 |
| 7. use information from many sources when doing work? | 0 | 1 | 2 | 3 | 4 |
| 8. effectively solve new problems? | 0 | 1 | 2 | 3 | 4 |
| 9. have well-described goals? | 0 | 1 | 2 | 3 | 4 |
| 10. consider new ways to finish a task? | 0 | 1 | 2 | 3 | 4 |

___ + ___ + ___ + ___ + ___ = ☐

Planning Raw Score

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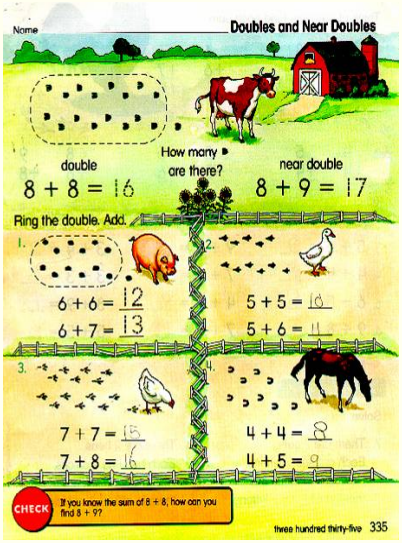
# Math Strategies

**Note to the Teacher:**
When we teach children skills by helping them use strategies and plans for learning, we are teaching both knowledge and processing. Both are important.

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# PASS neurocognitive theory

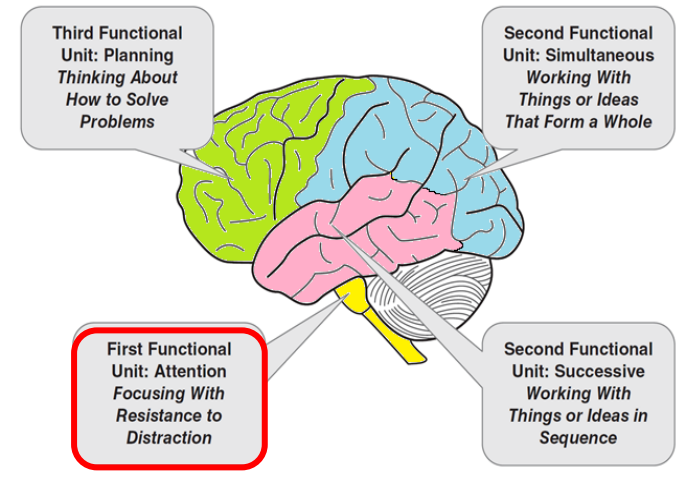


**Figure 1.2 Three Functional Units and Associated Brain Structures**

From: *Essentials of CAS2 Assessment*. Naglieri & Otero, 2017

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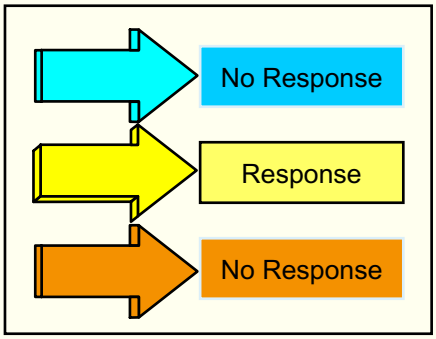
## PASS Theory

- **Attention** is a basic psychological process we use to selectively attend to some stimuli and ignores others
  - focused cognitive activity
  - selective attention
  - resistance to distraction

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## CAS2 Expressive Attention

- The child says the color not the word

| | | | |
|---|---|---|---|
| RED | BLUE | GREEN | YELLOW |
| YELLOW | GREEN | RED | BLUE |
| RED | YELLOW | YELLOW | GREEN |
| BLUE | GREEN | RED | BLUE |
| GREEN | YELLOW | RED | YELLOW |

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# CAS2: Rating Scale Attention

**Directions for Items 21–30.** These questions ask how well the child or adolescent pays attention and resists distractions. The questions also ask about how well someone attends to one thing at a time. Please rate how well the child or adolescent pays attention.

| During the past month, how often did the child or adolescent . . . | Never | Rarely | Sometimes | Frequently | Always |
|---|---|---|---|---|---|
| 21. work well in a noisy area? | 0 | 1 | 2 | 3 | 4 |
| 22. stay with one task long enough to complete it? | 0 | 1 | 2 | 3 | 4 |
| 23. not allow the actions or conversations of others to interrupt his or her work? | 0 | 1 | 2 | 3 | 4 |
| 24. stay on task easily? | 0 | 1 | 2 | 3 | 4 |
| 25. concentrate on a task until it was done? | 0 | 1 | 2 | 3 | 4 |
| 26. listen carefully? | 0 | 1 | 2 | 3 | 4 |
| 27. work without getting distracted? | 0 | 1 | 2 | 3 | 4 |
| 28. have a good attention span? | 0 | 1 | 2 | 3 | 4 |
| 29. listen to instructions or directions without getting off task? | 0 | 1 | 2 | 3 | 4 |
| 30. pay attention in class? | 0 | 1 | 2 | 3 | 4 |

___ + ___ + ___ + ___ + ___ = ☐
Attention Raw Score

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# Attention

11. **A** 3:15 A.M.
**B** 3:30 P.M.
**C** 3:15 P.M.
**D** 3:15 A.M.


leave school

11. 3:15 p.m.

12. Trent began studying at 5:00 P.M. and finished 1 hour and 22 minutes later. What time did he finish?
**A** 6:22 A.M. **B** 5:22 P.M. **C** 6:10 P.M. **D** 6:22 P.M.

12. 6:22 p.m.

13. Maura began basketball practice at 3:00 P.M. and finished 50 minutes later. What time did she finish?
**A** 3:50 P.M. **B** 3:05 A.M. **C** 4:05 P.M. **D** 4:50 A.M.

13. 3:50 p.m.

Reading comprehension is difficult because of the increased attentional demands of the similar options

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# PASS neurocognitive theory

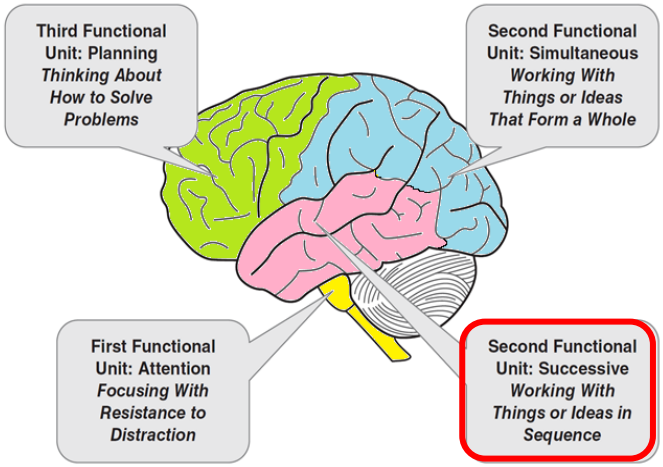


**Figure 1.2 Three Functional Units and Associated Brain Structures**

From: *Essentials of CAS2 Assessment*. Naglieri & Otero, 2017

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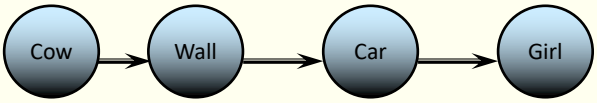
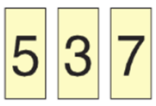
# PASS: Successive

- **Successive** processing is used whenever we do something in a specific serial order
  - Anything we comprehend, speak, or do in a sequence requires successive processing
- Measure Successive processing with
  - recall of the sequence of words stated by the examiner




  - Examiner shows a page with numbers on it for 3 seconds and the subject responds by saying the numbers in order

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# CAS2: Rating Scale Successive

**Directions for Items 31–40.** These questions ask how well the child or adolescent remembers things in order. The questions ask about working with numbers, words, or ideas in a series. The questions also ask about doing things in a certain order. Please rate how well the child or adolescent works with things in a specific order.

| During the past month, how often did the child or adolescent . . . | Never | Rarely | Sometimes | Frequently | Always |
|---|---|---|---|---|---|
| 31. recall a phone number after hearing it? | 0 | 1 | 2 | 3 | 4 |
| 32. remember a list of words? | 0 | 1 | 2 | 3 | 4 |
| 33. sound out hard words? | 0 | 1 | 2 | 3 | 4 |
| 34. correctly repeat long, new words? | 0 | 1 | 2 | 3 | 4 |
| 35. remember how to spell long words after seeing them once? | 0 | 1 | 2 | 3 | 4 |
| 36. imitate a long sequence of sounds? | 0 | 1 | 2 | 3 | 4 |
| 37. recall a summary of ideas word for word? | 0 | 1 | 2 | 3 | 4 |
| 38. repeat long words easily? | 0 | 1 | 2 | 3 | 4 |
| 39. repeat sentences easily, even if unsure of their meaning? | 0 | 1 | 2 | 3 | 4 |
| 40. follow three to four directions given in order? | 0 | 1 | 2 | 3 | 4 |

___ + ___ + ___ + ___ + ___ = ___

Successive Raw Score

43

# PASS Theory: Successive

- **Successive** processing is used when information is in a specific serial order
  - Decoding words
  - Letter-sound correspondence
  - Phonological tasks
  - Understanding the syntax of sentences
  - Comprehension of written instructions
  - Sequence of words, sentences, paragraphs
  - Remembering the sequence of events in a story that was read

44

## Insights…

- Even thought tasks were different in content and modality, they required the same kind of thinking

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## PASS neurocognitive theory

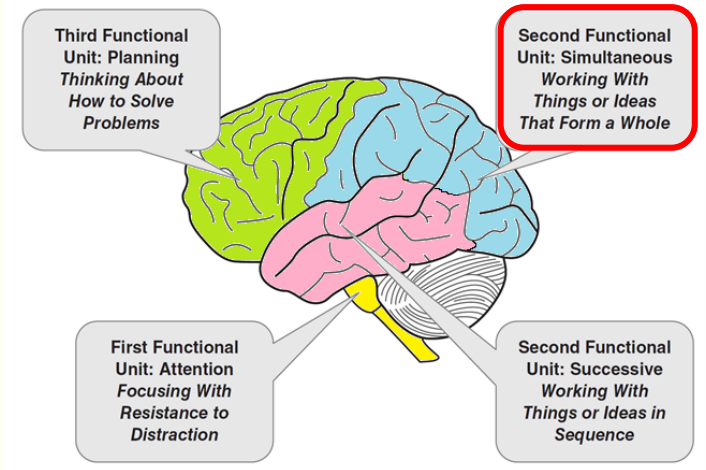


**Figure 1.2 Three Functional Units and Associated Brain Structures**
From: *Essentials of CAS2 Assessment*. Naglieri & Otero, 2017

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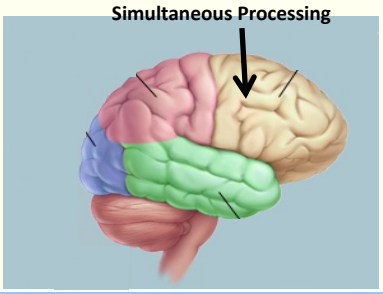
# PASS Theory

- **Simultaneous** processing is used to integrate stimuli into groups
  - Stimuli are seen as a whole
  - Each piece must be related to the other
    - Whole language
    - Seeing word as a whole
    - Verbal concepts
    - Geometry, math word problems

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# CAS2: Rating Scale Simultaneous

**Directions for Items 11–20.** These questions ask how well the child or adolescent sees how things go together. They also ask about working with diagrams and understanding how ideas fit together. The questions involve seeing the whole without getting lost in the parts. Please rate how well the child or adolescent visualizes things as a whole.

| During the past month, how often did the child or adolescent . . . | Never | Rarely | Sometimes | Frequently | Always |
|---|---|---|---|---|---|
| 11. like to draw designs? | 0 | 1 | 2 | 3 | 4 |
| 12. figure out how parts of a design go together? | 0 | 1 | 2 | 3 | 4 |
| 13. classify things into groups correctly? | 0 | 1 | 2 | 3 | 4 |
| 14. work well with patterns and designs? | 0 | 1 | 2 | 3 | 4 |
| 15. see how objects and ideas are alike? | 0 | 1 | 2 | 3 | 4 |
| 16. work well with physical objects? | 0 | 1 | 2 | 3 | 4 |
| 17. like to use visual materials? | 0 | 1 | 2 | 3 | 4 |
| 18. see the links among several things? | 0 | 1 | 2 | 3 | 4 |
| 19. show interest in complex shapes and patterns? | 0 | 1 | 2 | 3 | 4 |
| 20. recognize faces easily? | 0 | 1 | 2 | 3 | 4 |

___ + ___ + ___ + ___ + ___ = ☐
Simultaneous Raw Score

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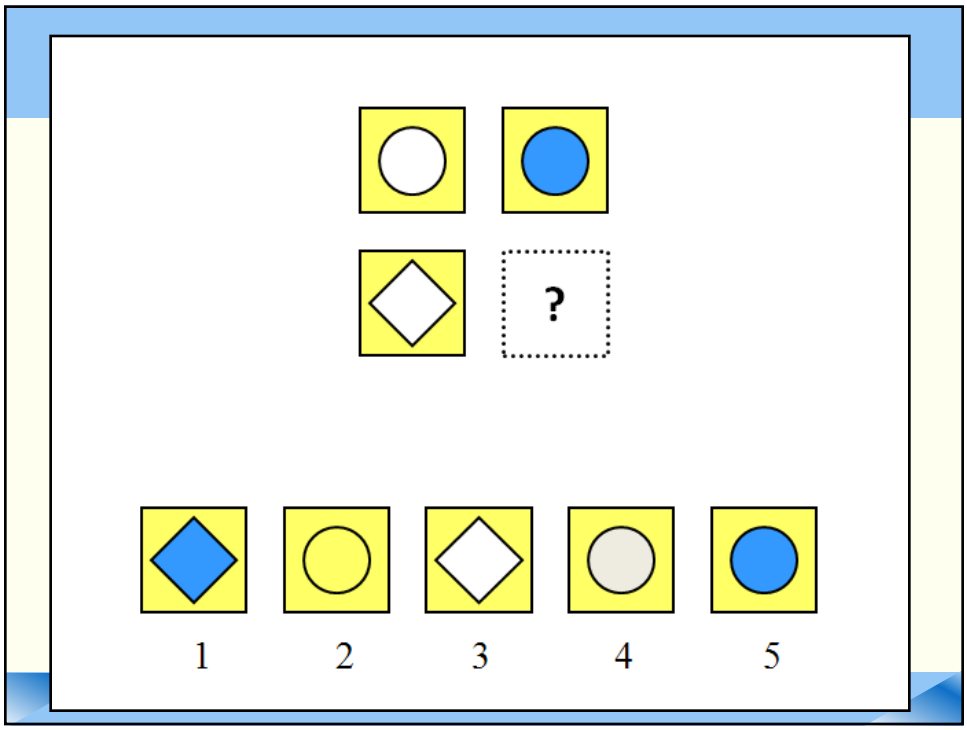
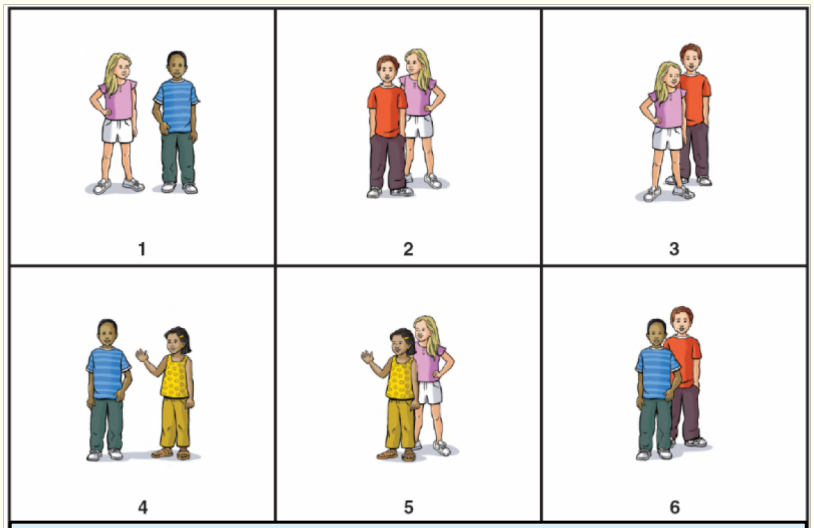



## CAS2 Verbal-Spatial Relations




Which picture shows a boy behind a girl?

## Test Yourself !

**Solve these analogies:**

**Girl is woman as boy is to _____?**

**$C^7$ is to F as $E^7$ is to _____?**

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## Insights…

- Even thought tasks were different in content and modality, they required the same kind of thinking

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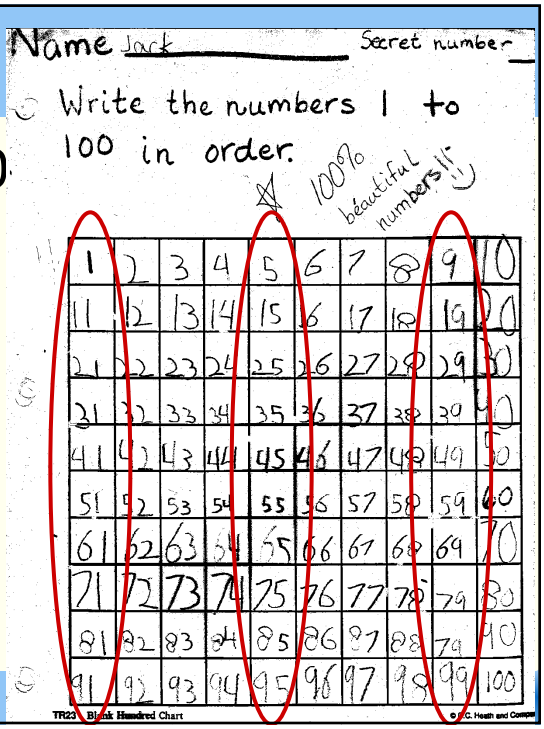
# Numbers from 1 to 100

Simultaneous processing facilitated by this work sheet

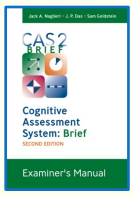


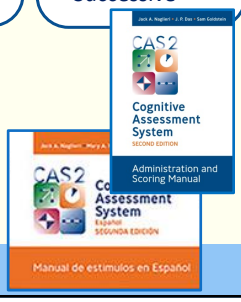

# PASS Comprehensive System

(Naglieri, Das, & Goldstein, 2014)

**For eligibility determination**

| CAS2 Rating Scale (4 subtests) | CAS2 Brief (4 subtests) | CAS2 Core (8 subtests) | CAS2 Extended (12 subtests) |
|---|---|---|---|
| Total Score<br>Planning<br>Simultaneous<br>Attention<br>Successive | Total Score<br>Planning<br>Simultaneous<br>Attention<br>Successive | Full Scale<br>Planning<br>Simultaneous<br>Attention<br>Successive | Full Scale<br>Planning<br>Simultaneous<br>Attention<br>Successive<br>Supplemental Scales<br>Executive Function<br>Working Memory<br>Verbal / Nonverbal<br>Visual / Auditory |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## Topical Outline

- Conclusions
- IQ's dirty little secret
- Improving IQ using neuroscience
  - A "basic psychological processing" approach to understanding learning and learning problems
    - Processing and SLD
    - Gifted and high ability students PASS processing, relevance to instructional planning and SLD eligibility determination

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## A Study of Gifted Students

- N = 142
  - Similar numbers of girls and boys in Grade 4, 5 and 6.
  - all native speakers of English
  - came from families of middle to upper-middle socioeconomic background
- Identified according to this definition:
  - "Giftedness is exceptional potential and/or performance across a wide range of abilities in one or more of the following areas: general intellectual, specific academic, creative thinking, social, musical, artistic and kinesthetic" (Alberta Education, 2012, p. 6).

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## A Study of Gifted Students

- Tests given
  - WASI –II (Vocabulary and Matrix Reasoning)
  - Woodcock-Johnson III (WJ-III; Woodcock, McGrew, & Mathers, 2001) Broad Reading score from: Letter-Word Identification, Reading Fluency, and Passage Comprehension
  - Cognitive Assessment System (CAS; Naglieri & Das, 1997) to measure PASS neurocognitive processes

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## A Study of Gifted Students

Table 1 shows WASI-II FSIQ slightly higher than CAS FS - but CAS shows more variability

Table 1
Descriptive Statistics for WASI-II, WJ-III Achievement, and Cognitive Assessment System (CAS) Scores ($N$ = 142)

| Variable | *Mean* | *SD* | *Min* | *Max* |
|---|---|---|---|---|
| **WJ-III Achievement** | | | | |
| **Broad Reading** | **125** | 14 | 97 | 166 |
| **Broad Math** | **116** | 13 | 91 | 162 |
| **Mean WJ** | **117** | 10 | 94 | 152 |
| **WASI-II FSIQ** | **123** | 8 | 105 | 145 |
| **CAS Full Scale** | **118** | 12 | 91 | 148 |
| **Planning** | **110** | 12 | 77 | 146 |
| **Simultaneous** | **121** | 16 | 88 | 152 |
| **Attention** | **113** | 13 | 79 | 141 |
| **Successive** | **111** | 11 | 81 | 137 |

- Average WASI-III Full Scale and CAS Full scale were similar but CAS standard deviation and range was higher

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# WASI-II, PASS, WJ-III scores >119 (91st %tile)

- 68% (n = 97) students had a Full Scale on the WASI-II of 120 or higher
- 72% (N = 102) had a Full Scale of 120 or higher on the CAS
- Not all the students in this sample of students identified as gifted had a Full Scale score above 119
- Most of the students had high (>119) reading scores

| **Broad Reading** | Letter-Word Identification | **Reading Fluency** | Passage Comprehension | Broad Math | Calculation | Math Fluency | Applied Problems |
|---|---|---|---|---|---|---|---|
| **94** | 58 | **105** | 20 | 45 | 27 | 25 | 54 |
| **66%** | 41% | **74%** | 14% | 32% | 19% | 18% | 38% |

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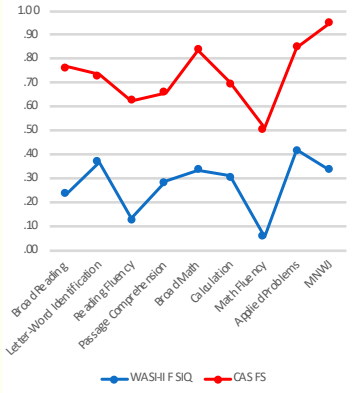
# A Study of Gifted Students

Table 2 shows CAS Full Scale scores correlated significantly higher with WJ-III achievement scores than the WASI-II

Table 2
Pearson Correlations

| | WASI-II FSIQ | CAS FS |
|---|---|---|
| **Broad Reading** | **.24** | **.53** |
| **Broad Math** | **.34** | **.50** |
| **Mean WJ-III** | **.34** | **.62** |




| | Broad Reading | Letter-Word Identification | Reading Fluency | Passage Comprehension | Broad Math | Calculation | Math Fluency | Applied Problems | MNWJ |
|---|---|---|---|---|---|---|---|---|---|
| WASI-II FSIQ | .24 | .37 | .13 | .29 | .34 | .31 | .06 | .42 | .34 |
| CAS FS | .53 | .36 | .50 | .38 | .50 | .39 | .46 | .43 | .62 |

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# A Study of Gifted Students

- This table shows the number of gifted students who have a PASS score that is significantly different from that student's average PASS score
  - That means the students has a specific neurocognitive processing strength or weakness (i.e., learning profile)

Table 3.

Percentages of Gifted Students with Significant Variability in PASS Standard Scores (N = 142).

| | | Planning | Simultaneous | Attention | Successive | PASS |
|---|---|---|---|---|---|---|
| PASS Weakness | n | 25 | 6 | 18 | 28 | 77 |
| | % | 18% | 4% | 13% | 20% | 54% |
| PASS Strength | n | 7 | 58 | 13 | 12 | 90 |
| | % | 5% | 41% | 9% | 8% | 63% |

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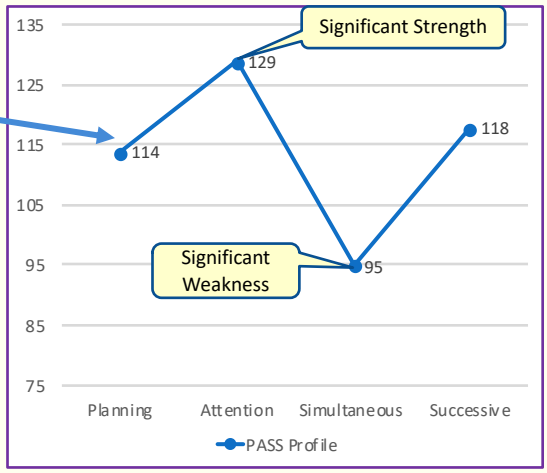
# A Study of Gifted Students

- Two sets of PASS scores were studied
  - Significant variation in relation to student's average has instructional relevance




**NOTE: 90 to 109 is the AVERAGE RANGE**

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# A Study of Gifted Students

- This table shows the number of gifted students who have a PASS score that is significantly different from that student's average PASS score AND the score is < 90; and with low WJ-III
  - These students have a specific neurocognitive processing weakness; suggesting instructional modifications
  - These students with low PASS scores AND low WJ-III achievement indicates a Specific Learning Disability

Table 3.

Percentages of Gifted Students with Significant Variability in PASS and Achievement Test Scores (N = 142).

| | | Planning | Simultaneous | Attention | Successive | PASS |
|---|---|---|---|---|---|---|
| PASS <90 | n | 4 | 0 | 4 | 4 | 12 |
| | % | 3% | 0% | 3% | 3% | 8% |
| PASS & Skills <90 | n | 3 | 0 | 2 | 1 | 6 |
| | % | 2% | 0% | 1% | 1% | 4% |

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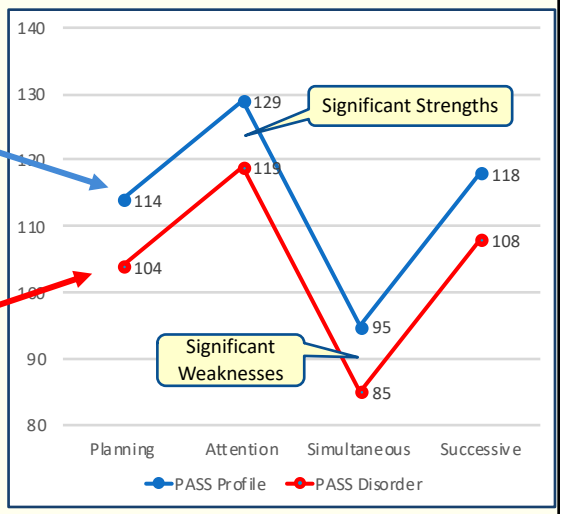
# A Study of Gifted Students

- Two sets of PASS scores were studied
  - Significant variation in relation to student's average has instructional relevance
  - Significant variation in relation to student's average AND a standard score less than 90 (< 25th %tile) supports designation as SLD




NOTE: 90 to 109 is the AVERAGE RANGE

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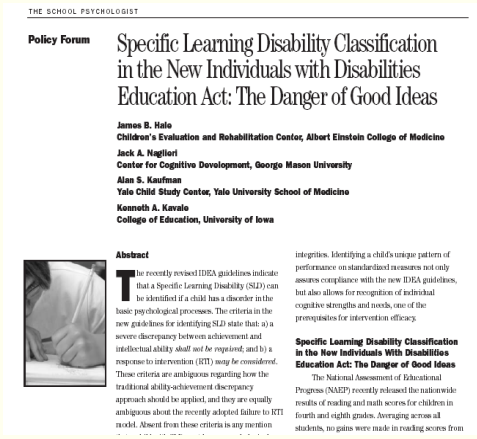
# Hale, Naglieri, Kaufman, & Kavale (2004)

- The IDEA definition of SLD is
  - "… a disorder in 1 or more of the basic psychological processes … [that results] in the imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations."
- "Establishing a disorder in the basic psychology processes is *essential* for determining SLD"



THE SCHOOL PSYCHOLOGIST

Policy Forum

Specific Learning Disability Classification in the New Individuals with Disabilities Education Act: The Danger of Good Ideas

James B. Hale
Children's Evaluation and Rehabilitation Center, Albert Einstein College of Medicine
Jack A. Naglieri
Center for Cognitive Development, George Mason University
Alan S. Kaufman
Yale Child Study Center, Yale University School of Medicine
Kenneth A. Kavale
College of Education, University of Iowa

**Abstract**

The recently revised IDEA guidelines indicate that a Specific Learning Disability (SLD) can be identified if a child has a disorder in the basic psychological processes. The criteria in the new guidelines for identifying SLD state that: a) a severe discrepancy between achievement and intellectual ability *shall not be required*; and b) a response to intervention (RTI) *may be considered*. These criteria are ambiguous regarding how the traditional ability-achievement discrepancy approach should be applied, and they are equally ambiguous about the recently adopted failure to RTI model. Absent from these criteria is any mention integrities. Identifying a child's unique pattern of performance on standardized measures not only assures compliance with the new IDEA guidelines, but also allows for recognition of individual cognitive strengths and needs, one of the prerequisites for intervention efficacy.

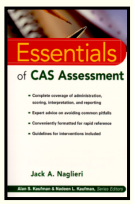
**Specific Learning Disability Classification in the New Individuals With Disabilities Education Act: The Danger of Good Ideas**

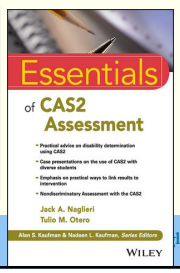
The National Assessment of Educational Progress (NAEP) recently released the nationwide results of reading and math scores for children in fourth and eighth grades. Averaging across all students, no gains were made in reading scores from



# Discrepancy Consistency Method (DCM)

- The Discrepancy Consistency Method (DCM) was first introduced in 1999 (most recently in 2017)




***Pattern of Strengths and Weaknesses Using the Discrepancy/Consistency Method for SLD Determination***

Three methods for detecting a pattern of strengths and weaknesses (PSW) that can be used as part of the process of identifying a student with a specific learning disability (SLD) have been suggested by Naglieri in 1999, Hale and Fiorello in 2004, and by Flanagan, Ortiz, and Alfonso in 2007. These authors share the same goal: to present a procedure to detect a PSW in scores that can be used to identify an SLD (sometimes referred to as a third option; Zirkel & Thomas, 2010). Despite differences in the composition of the scores used and the definitions of what constitutes a basic psychological process, these methods all rely on finding a combination of differences as well as similarities in scores across academic and cognitive tests. Our approach to operationalizing a PSW is called the Discrepancy/Consistency Method (DCM) for the identification of SLD. Determining SLD is essentially based on the combination of PASS and achievement test scores. The method involves a systematic examination of variability of PASS and academic

**DON'T FORGET 3.5**

The essence of the Discrepancy/Consistency Method is two discrepancies and one consistency.

Discrepancy 1:
Significant variability among the PASS scores indicating a weakness in one or more of the basic psychological processes

Discrepancy 2:
Significant difference between high PASS scores and low achievement test scores

Consistency:
No significant difference between low PASS scores and low achievement

# Discrepancy Consistency Method

- The Discrepancy Consistency Method is used to determine if there is evidence of "a disorder in 1 or more of the basic psychological processes … which manifests itself in the imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations."
- The disorder in 1 or more basic psychological processes is found when a student shows a pattern of strengths and weaknesses in basic psychological processes, **and**…
- The imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations is found when a student shows a pattern of strengths and weaknesses in achievement
- The result is two discrepancies and a consistency

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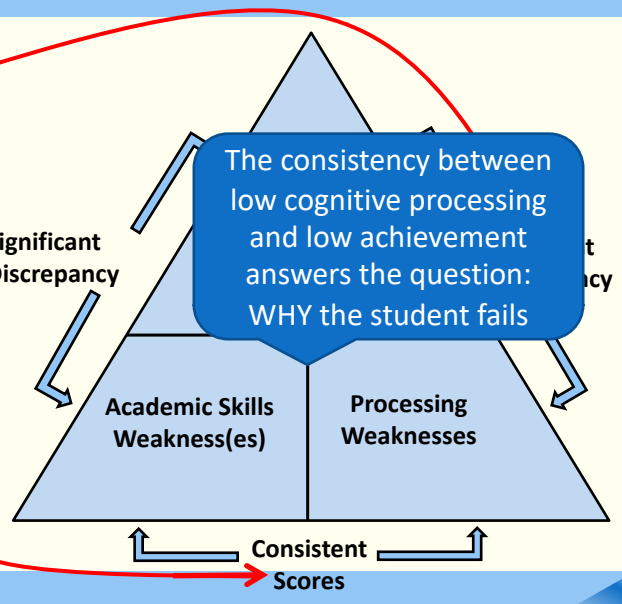
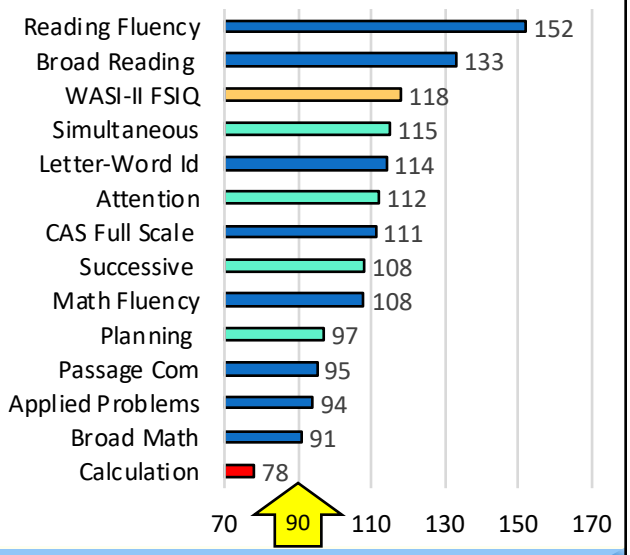
# Discrepancy Consistency Model for SLD

- Discrepancy between high and low processing scores
- Discrepancy between high processing and low achievement
- Consistency between low processing and low achievement



## Case Study #1

- Planning is significantly below the PASS average score but still Average
- Calculation is below 90 (25th %tile rank)
- NOT SLD but PASS does inform instruction

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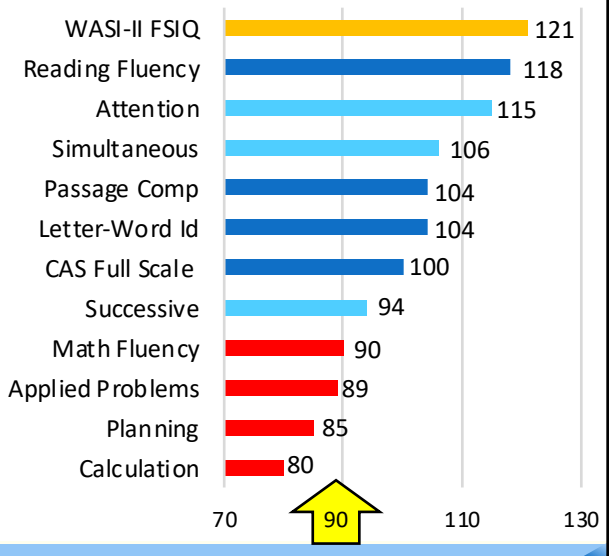
## Case Study #2

- This illustrates a student with scores <90 (25%tile) in basic psychological processing and academic achievement
- This is an example of a *Specific Learning Disability*

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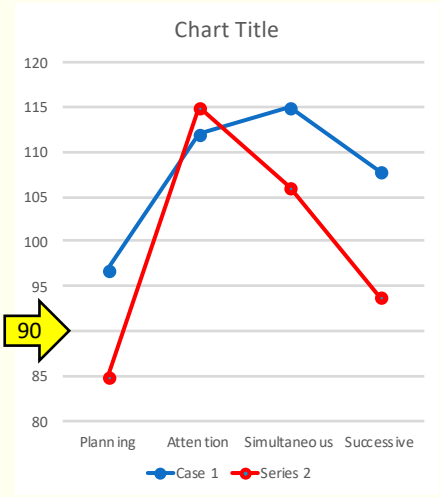
## Cases 1 and 2




- These two cases are different because Case 2 has a PASS score that is below the Average range (i.e. less than 25th percentile rank)
- This key distinction provides evidence of a "disorder in one or more of the basic psychological processes" essential to SLD eligibility determination in IDEA

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## Intervention Protocol (Kryza & Naglieri, 2017)

- Help the child understand his/her PASS strengths and areas of challenges (be clear)
- Encourage Motivation & Persistence
  - Adjusting the student's mindset to "I can't do it …yet"
  - Failure is an opportunity to learn, just keep trying
- Teach/encourage strategies for approaching tasks to build on strengths and remediate challenges?
  - Encourage independence and self efficacy (Metacognition/Self Assessment)
  - Ask questions such as: "How will you know if these strategies and ideas are helping you?" What can you do if they are not working?

# Planning

- Intervention Step 1
  - TALK to the student and explain PASS scores
  - ***Encourage*** the student to "think smart and use a plan"
  - See Planning Facilitation handout in *Helping Children Learn (Naglieri & Pickering)*

**Planning Facilitation for Math Calculation**

Math calculation is a complex activity that involves recalling basic math facts, following procedures, working carefully, and checking one's work. Math calculation requires a careful (i.e., planful) approach to follow all of the necessary steps. Children who are good at math calculation can move on to more difficult math concepts and problem solving with greater ease than those who are having problems in this area. For children who have trouble with math calculation, a technique that helps them approach the task planfully is likely to be useful. Planning facilitation is such a technique.

Planning facilitation helps students develop useful strategies to carefully complete math problems through discussion and shared discovery. It encourages students to think about how they solve problems, rather than just think about whether their answers are correct. This helps them develop careful ways of doing math.

**How to Teach Planning Facilitation**

Planning facilitation is provided in three 10-minute time periods: 1) 10 minutes of math, 2) 10 minutes of discussion, and 3) 10 more minutes of math. These steps can be described in more detail:

**Teaching Students About Planning**

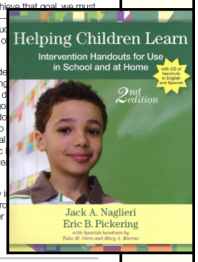
**How Learning Depends on Planning Ability**

The purpose of education is certainly to provide students with knowledge and skills, but researchers have found that children also need to learn how to learn. To achieve that goal, we must teach students to evaluate, apply solutions, self-monitor, and self-correct—work and use plans to solve all types of problems. When we teach our stu strategic, self-reliant, reflective, and flexible learners, we are teaching use c *nitive Strategy Instruction* (Scheid, 1993), and this is an effective method.

When reading, and especially when obtaining meaning from text, the stude proach to examining the information that is provided. This involves applyin the important from the less important part of the text, concentrate on the c self-correct as needed. Students who are good at writing organize their go and reflect and revise during and following production of the text. When do who are successful evaluate the problem, choose which method to use to success of that method, change methods if necessary, and check the final is also sometimes referred to as metacognition, problem solving, strategic reliant learning style. When we use cognitive strategy instruction, we are te think about what they are doing so that they can be more successful.

Importantly, these descriptions of how to learn, and the cognitive strategy general, are descriptions of the behaviors associated with the cognitive pro *Planning* in this book (see the Planning Explained handout, p. 55). In order more successful, we must teach them to be more planful.

**How to Teach Planning**



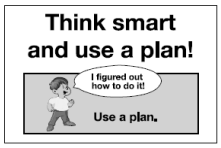




Figure 1. A drawing that helps students remember to use a plan.

The first step in teaching children to become strategic, self-reliant, reflective, and flexible learners is to tell them what a plan is and give them an easy way to remember to use a plan. In Figure 1 (which also appears in the PASS poster on the CD), we provide a fast and simple message: "Think smart and use a plan!" We should provide cognitive strategies in specific academic areas, such as decoding, reading comprehension, vocabulary, spelling, writing, math problem solving, science, and so forth, so that we

page 1 of 2



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# Iseman & Naglieri (2010)
## http://www.jacknaglieri.com/cas2.html

Hammill Institute on Disabilities

Journal of Learning Disabilities
44(2) 184–195

DOI: 10.1177/0022219410391190
http://journaloflearningdisabilities.sagepub.com
SAGE

**A Cognitive Strategy Instruction to Improve Math Calculation for Children With ADHD and LD: A Randomized Controlled Study**

Jackie S. Iseman[1] and Jack A. Naglieri[1]

**Abstract**

The authors examined the effectiveness of cognitive strategy instruction based or Successive) given by special education teachers to students with ADHD random experimental group were exposed to a brief cognitive strategy instruction for development and application of effective planning for mathematical computation, standard math instruction. Standardized tests of cognitive processes and mat students completed math worksheets throughout the experimental phase. St *Johnson Tests of Achievement, Third Edition*, Math Fluency and *Wechsler Indivi* Numerical Operations) were administered pre- and postintervention, and Mat follow-up. Large pre–post effect sizes were found for students in the experimental group but not the comparison group on

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# Design of the Study

**Experimental and Comparison Groups**

7 worksheets with Normal Instruction

**Experimental Group**

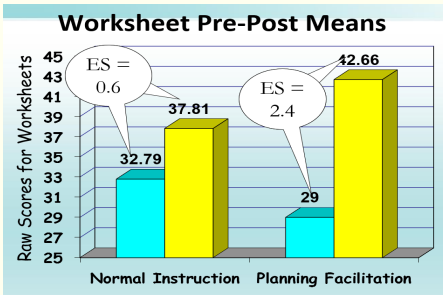
19 worksheets with Planning Facilitation

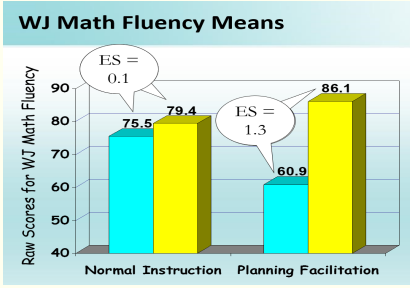
**Comparison Group**

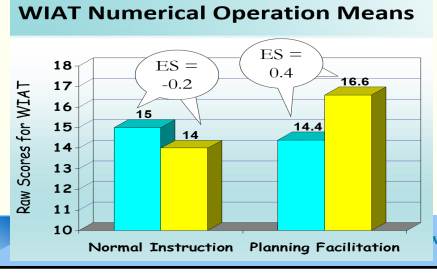
19 worksheets with Normal Instruction



# Pre-Post Means and Effect Sizes for the Students with LD and ADHD



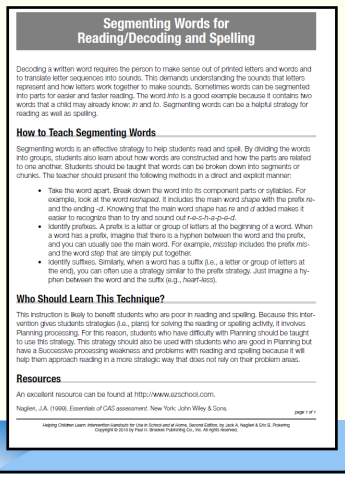




At 1-year follow-up, 27 of the students were retested on the WJ-III ACH Math Fluency subtest as part of the school's typical yearly evaluation of students. This group included 14 students from the comparison group and 13 students from the experimental group. The results indicated that the improvement of students in the experimental group ($M = 16.08$, $SD = 19$, $d = 0.85$) was significantly greater than the improvement of students in the comparison group ($M = 3.21$, $SD = 18.21$, $d = 0.09$).

# Interventions related to PASS

- Helping Children Learn Intervention Handouts for Use in School and at Home, *Second Edition* (Naglieri, & Pickering 2011)



**Segmenting Words for Reading/Decoding and Spelling**

Decoding a written word requires the person to make sense out of printed letters and words and to translate letter sequences into sounds. This demands understanding the sounds that letters represent and how letters work together to make sounds. Sometimes words can be segmented into parts for easier and faster reading. The word *into* is a good example because it contains two words that a child may already know: *in* and *to*. Segmenting words can be a helpful strategy for reading as well as spelling.

**How to Teach Segmenting Words**

Segmenting words is an effective strategy to help students read and spell. By dividing the words into groups, students also learn about how words are constructed and how the parts are related to one another. Students should be taught that words can be broken down into segments or chunks. The teacher should present the following methods in a direct and explicit manner:

- Take the word apart. Break down the word into its component parts or syllables. For example, look at the word *reshaped*. It includes the main word *shape* with the prefix *re-* and the ending *-d*. Knowing that the main word *shape* has *re* and *d* added makes it easier to recognize than to try and sound out *r-e-s-h-a-p-e-d*.
- Identify prefixes. A prefix is a letter or group of letters at the beginning of a word. When a word has a prefix, imagine that there is a hyphen between the word and the prefix, and you can usually see the main word. For example, *misstep* includes the prefix *mis-* and the word *step* that are simply put together.
- Identify suffixes. Similarly, when a word has a suffix (i.e., a letter or group of letters at the end), you can often use a strategy similar to the prefix strategy. Just imagine a hyphen between the word and the suffix (e.g., *heart-less*).

**Who Should Learn This Technique?**

This instruction is likely to benefit students who are poor in reading and spelling. Because this intervention gives students strategies (i.e., plans) for solving the reading or spelling activity, it involves Planning processing. For this reason, students who have difficulty with Planning should be taught to use this strategy. This strategy should also be used with students who are good in Planning but have a Successive processing weakness and problems with reading and spelling because it will help them approach reading in a more strategic way that does not rely on their problem areas.

**Resources**

An excellent resource can be found at http://www.ezschool.com.

Naglieri, J.A. (1999). *Essentials of CAS assessment*. New York: John Wiley & Sons.

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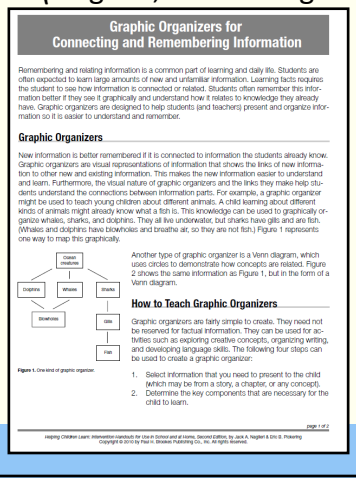

**Graphic Organizers for Connecting and Remembering Information**

Remembering and relating information is a common part of learning and daily life. Students are often expected to learn large amounts of new and unfamiliar information. Learning facts requires the student to see how information is connected or related. Students often remember this information better if they see it graphically and understand how it relates to knowledge they already have. Graphic organizers are designed to help students (and teachers) present and organize information so it is easier to understand and remember.

**Graphic Organizers**

New information is better remembered if it is connected to information the students already know. Graphic organizers are visual representations of information that shows the links of new information to other new and existing information. This makes the new information easier to understand and learn. Furthermore, the visual nature of graphic organizers and the links they make help students understand the connections between information parts. For example, a graphic organizer might be used to teach young children about different animals. A child learning about different kinds of animals might already know what a fish is. This knowledge can be used to graphically organize whales, sharks, and dolphins. They all live underwater, but sharks have gills and are fish. (Whales and dolphins have blowholes and breathe air, so they are not fish.) Figure 1 represents one way to map this graphically.



**Figure 1.** One kind of graphic organizer.

Another type of graphic organizer is a Venn diagram, which uses circles to demonstrate how concepts are related. Figure 2 shows the same information as Figure 1, but in the form of a Venn diagram.

**How to Teach Graphic Organizers**

Graphic organizers are fairly simple to create. They need not be reserved for factual information. They can be used for activities such as exploring creative concepts, organizing writing, and developing language skills. The following four steps can be used to create a graphic organizer:

1. Select information that you need to present to the child (which may be from a story, a chapter, or any concept).
2. Determine the key components that are necessary for the child to learn.

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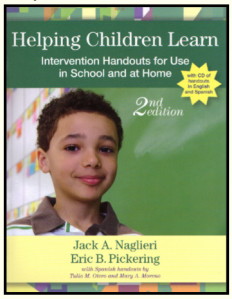


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# Study #2 High Ability Students

- N = 100 selected from the Cognitive Assessment System standardization sample if the Full Scale score was > 119

| | Planning | Simultaneous | Attention | Successive | Full Scale |
|---|---|---|---|---|---|
| Mean | 120.6 | 119.0 | 120.5 | 117.4 | 125.0 |
| SD | 10.1 | 10.7 | 11.8 | 9.4 | 4.4 |
| N | 100 | 100 | 100 | 100 | 100 |

- 11% had at least one PASS strength
- 13% had at least one PASS weakness
- 2% had a PASS weakness < 90

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# Conclusions

- You have seen only a small portion of research evidence about the PASS neuroscience approach to redefining intelligence but what we have seen is that PASS…
  - is much more informative than traditional IQ
  - is much more relevant to instruction
  - Is more fair to diverse students (i.e. more socially just)
  - is helpful for identification of Specific Learning Disabilities
- You already know that even students in Gifted programs can have learning challenges, now you know such issues can be related to varying PASS neurocognitive abilities which warrant instructional modifications and in some cases SLD designation

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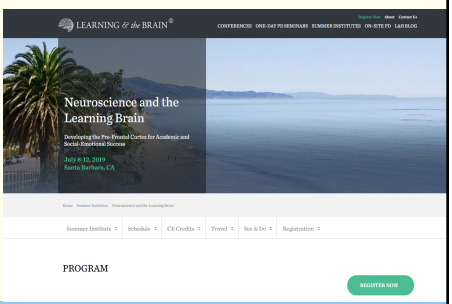
# Learning & the Brain Summer Institute 2019

July 8-12 by Naglieri & Kryza

- In this highly interactive Institute, you will learn about the four neurocognitive abilities that are critical to students' academic and social-emotional success and how to match those abilities to specific instructional methods. You will develop the skills you need to merge current knowledge on the neuroscience of learning with the realities of classroom instruction. You will leave with readily implementable strategies to teach students to effectively self-regulate their own academic and social-emotional lives. Students will become more mindful and develop metacognitive skills to "Think Smart" by taking charge of their own learning and knowing how to use their pre-frontal cortex to plan and pay attention. This institute is designed to be an interactive, hands-on session with group participation throughout the course and is **limited to 40 participants**

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