Students Referred for Suspected SLD, Including Non-responders in the Dyslexia Pilot Program: Where Do We Go From Here? Understanding Assessment, Identification Methods, and Interventions

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Today's Agenda

- Overview of the Dyslexia Pilot Program – Dr. McHale-Small
- Brief overview of the PA Dyslexia Screening and Early Intervention Pilot.
- Review of foundational sources of information necessary for making informed decisions about PSW method for SLD identification
- Description of the PSW method and conceptual similarities among PSW methods, including the one used with WISC-V and KTEA-3 or WIAT-III data
- Description of the Dual Discrepancy/Consistency (DD/C) operational definition of SLD – a PSW method
- How to use WISC-V/WIAT-III/KTEA-3 results to determine SLD following the DD/C model via X-BASS (PSW component)

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Today's Agenda

- Discussion of a systematic method of linking assessment results to intervention
- Identification of key elements of the "assessment" and "intervention" components of the process
- Focus on importance of cognitive abilities and processes in intervention planning
  - Which cognitive abilities and processes are most important in assessment of individuals with learning difficulties; their correlates to specific academic skills
  - How cognitive weaknesses manifest in classroom performance
- How to select interventions, accommodations, modifications, and compensatory strategies that minimize the impact of cognitive processing problems
- Why evidence-based academic interventions are often insufficient as the sole means of addressing a student's learning needs
- Introduction of STEPS (**S**trategies, **T**echniques, **E**vidence-based **P**rograms and **S**upports) to ensure that wrap around services are provided for the student, with particular emphasis on services that address the student's areas of cognitive weaknesses and the severity of the educational impact of those weaknesses
- Emphasis on importance of knowing specific information about the student, parent, teacher, and educational and home environments for intervention planning
- Example of how to link assessment data to interventions (e.g., curricular/instructional modifications, accommodations, remedial strategies/programs, compensatory strategies)

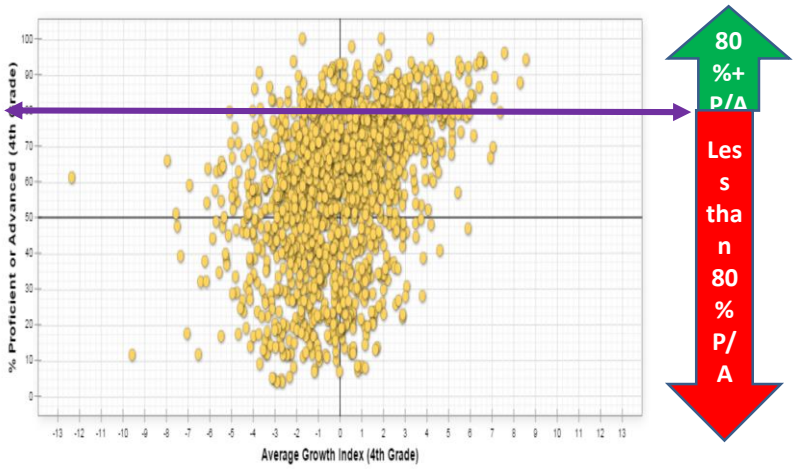
PA Act 69

- Signed into law on June 26, 2014.
- Establishes a Dyslexia Screening and Early Literacy Intervention Pilot.
- Why? Research continues to show that most children who experience academic failure struggle with reading and most students who struggle demonstrate word reading difficulties.
- Goal of the pilot is to put best practices in place in order to increase the number of students reading on grade level and reduce the number of students referred for special education.

Design of the Pilot

- Screening beginning in Kindergarten
- Evidenced Based Core Curriculum
- Diagnostic Assessments
- Intensive and targeted intervention by highly trained interventionists
- Students continue in intervention until there is ample evidence that skills are solid

Do We Need This Pilot?



SY 14-15 School Results: ELA Grade 4

What we Know

- Kindergarten is not too early to identify and intervene with students who are not acquiring skills typical of same age peers.
  - Why wait?
  - ***K-2 is the best "window" for intervention (viz., brain plasticity)***
  - Identification/diagnosis of SLD/Dyslexia is not appropriate in K, but explicit instruction is
- All students who struggle with reading will benefit from evidence-based interventions that are appropriately matched to their instructional level and that are delivered with fidelity, *but the extent to which they benefit will vary greatly*
- IQ mediates response to intervention
- Identifying students who have reading difficulties and teaching them how to read *does not guarantee* that they will learn at the same rate and achieve at the same level as most students of the same age/grade level. *Many students who know how to read struggle with learning*

What we Know

- No one method of SLD identification has been *proven* to be the best method. Three options are listed in the federal regulations
  - AAD – allowable
  - RTI – must allow, *as part of*, a comprehensive evaluation
  - PSW – may use
- **All current methods are <u>discrepancy-based</u> and, therefore, may include more or less of the population, depending on designated cut points**
  - AAD – Discrepancy between IQ and achievement
  - RTI – Discrepancy in rate and level of learning
  - PSW – Discrepancy between cognitive areas of strength and cognitive areas of weakness and cognitive areas of strength and academic areas of weakness

What's Wrong with AAD?

- The failure of the ability-achievement discrepancy method to identify SLD reliably and validly was summarized well by Ysseldyke (2005)

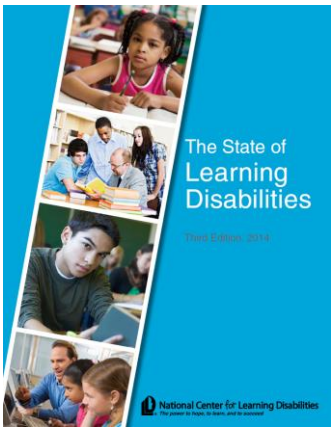
"Professional associations, advocacy groups, and government agencies have formed task forces and task forces on the task forces to study identification of students with LD. We have had mega-analyses of meta-analyses and syntheses of syntheses. Nearly all groups have reached the same conclusion: There is little empirical support for test-based discrepancy models in identification of students as LD." (p. 125)

What's Right about AAD?

- It doesn't matter
- It's been replaced by PSW, which is arguably a much better method for determining whether certain markers for SLD are present/not present, such as
  - Unexpected underachievement
  - Domain specific cognitive weakness(es)

What's Wrong with RTI?

- It doesn't work when it is not implemented as intended and with fidelity
- Failure to respond to evidence-based instruction, delivered with fidelity, over an extended period of time is not *de facto* evidence that a student has a specific learning disability
- Students fail to respond for a variety of reasons, only one of which is SLD
- Lack of agreement among methods for identifying non-responders



What's Right with RTI?

- It works when it is implemented as intended and with fidelity
- It's a necessary model of *prevention*

Reality Check #1

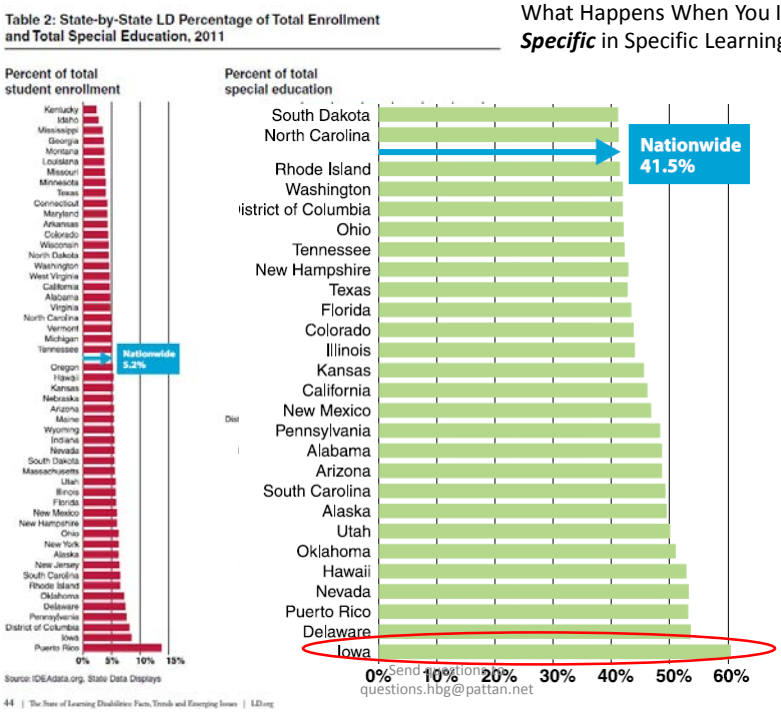
- The "RTI only" approach identifies the lowest functioning students in a school district (who do not meet criteria for ID) as "eligible for special educations services" and uses the SLD category *by default*.
  - There is nothing *specific* about below average ability across cognitive and academic areas
  - "General learning difficulty" is not one of the 13 disability categories

The Danger of Good Ideas

- *If applied in isolation, RTI methods will not increase diagnostic sensitivity and specificity, but will result in a generic "learning problems" category, comprising a considerable portion of the population.*

Source: Hale, J. B., Naglieri, J. A., Kaufman, A. S. & Kavale, K.A. (2004). Specific learning disability classification in the new Individuals with Disabilities Education Act: The danger of good ideas. *The School Psychologist, 58*, 6-13.

What Happens When You Ignore ***Specific*** in Specific Learning Disability?



What's Wrong with PSW?

- Too new to know, but we can speculate
  - Problems that plagued traditional discrepancy-based approaches will most likely emerge as a limitation of PSW
  - Different PSW models use different criteria and will identify different students (same problems as AAD and RTI)

What's Right with PSW?

- It is more in line with the SLD construct

All historical approaches to SLD *emphasize the spared or intact abilities* that stand in stark contrast to the deficient abilities

Kaufman, 2008, pp. 7-8

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What's Right with PSW?

- It is more in line with the SLD construct

"Weaknesses in word reading and spelling surrounded by a ***sea of strengths***"

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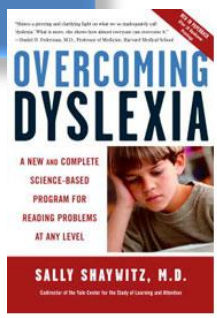


Reality Check #2

- Sole reliance on discrepancies will lead to many *false positives* (identifying SLD in error) and *false negatives* (missing SLD in error) in SLD identification
- *Discrepancies must be interpreted within the context of the student's case history, current system of supports and response to those supports, and current learning needs*

Issues that Deserve Thoughtful Consideration

- Students who perform in the below average range in many cognitive and academic areas are probably served best in Tiers 2 and 3 of an RTI model (assuming Tier 3 is intensive intervention, not special education).
  - Why is it necessary to exit Tier 2 or Tier 3 (intensive intervention)?
  - What will "special education" offer that has not already been implemented in a tiered service delivery model?
  - How will anyone know what "special education" should mean for a "non-responder" without the results of a comprehensive evaluation (that includes cognitive assessment)?

RESPONSE-TO-INTERVENTION: SEPARATING THE RHETORIC OF SELF-CONGRATULATION FROM THE REALITY OF SPECIFIC LEARNING DISABILITY IDENTIFICATION

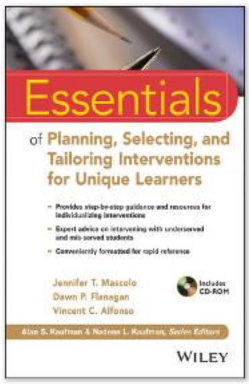
Kenneth A. Kavale, James M. Kauffman, Randy J. Bachmeier, and Gretchen B. LeFever

When a student does not meet the discrepancy criterion and, therefore, cannot be deemed an underachiever, there is the strong possibility that the student is a "slow learner" (SL; i.e., a student with an IQ level between about 70 and 85). About 14% of the school population may be deemed SL, but this group does not demonstrate unexpected learning failure, but rather an achievement level consonant with IQ level. Although NCLB makes such low achievement problematic, *slow learner* has never been a special education category, and "What should not happen is that a designation of SLD be given to a slow learner" (Kavale, 2005, p. 555).

***Learning Disability Quarterly*, Summer, 2008**

Cognitive Assessment: Why All the Fuss?

- The presence of cognitive ability and processing weaknesses *raises the risk* of academic deficits
  - Knowing how cognitive weaknesses manifest in real world performances is crucial for selecting or developing interventions, compensatory strategies, accommodations, and instructional/curricular modifications to minimize the effects of these weaknesses on the student's ability to access the curriculum, learn, and achieve



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Cognitive Assessment: Why All the Fuss?

- Learning disabilities are caused by inherent weaknesses in underlying cognitive processes (Robinson et al., 2002)
- Cognitive abilities are extremely important causal determinants of academic abilities (Flanagan & Schneider, in press)
  - The assessment process can be viewed as an ability-oriented evaluation designed to help formulate the problem and then determine specific interventions (Fletcher, Taylor, Levin, & Satz, 1995)
- *Psychologists need to give cognitive abilities their proper consideration, but must also weave together all evidential threads into a coherent narrative of the child's academic difficulties. Only then can psychologists be in the position to give truly helpful advice to parents and teachers trying to help children who have fallen behind* (Flanagan & Schneider, in press)

Comprehensive Evaluations (That Include Assessment of Cognitive Functions) Are Necessary for Non-responders

- WHY? ***According to Reynolds and Shaywitz (2009)***
  - "RTI provides few clues guiding what to do for instruction ***after a child fails to respond"***
  - "One of the major purposes of a comprehensive assessment is to derive hypotheses emerging from a student's cognitive profile that would allow the ***derivation of different and more effective instruction"***
  - "Elimination of an evaluation of cognitive abilities and psychological processes seems to revert to a ***one size fits all mentality*** where it is naively assumed that all children fail for the same reason"

Would Most Parents Turn Down an Evaluation that May Shed More Light on Learning Difficulties?

- **Psychologist to Parent:**
  - *It's been six months and your son is still not as far along as we anticipated based on the interventions we've been trying. At this time, we have two options.*
    - *One, we can try another intervention that is supported by research and, therefore, is expected to work (like the other interventions we tried)*
    - *Or two, we can take a more comprehensive look at how your son approaches tasks, how he learns, how he is smart, and what difficulties he may have when faced with new problems. That means that we can do a comprehensive evaluation of your son and get a better understanding of his strengths and weaknesses in cognitive areas that are important for learning and achievement. This additional information can help us understand why your son did not respond well to intervention and what we can do differently as we continue to plan and develop educational interventions for him.*

"At the *current state of scientific knowledge*, it is only through a comprehensive evaluation of a student's cognitive and psychological abilities and processes that insights into the underlying proximal and varied root causes of [academic] difficulties can be ascertained and then specific interventions be provided targeted to each student's individual needs, *a process long advocated*"

From Reynolds and Shaywitz (2009)

Reality Check #3

- Knowing how to use the results of an appropriately conducted comprehensive SLD evaluation for intervention planning requires that practitioners receive training
  - People who claim that cognitive assessment is irrelevant for SLD identification and intervention planning may not have received training on the utility of cognitive assessment for diagnosis and intervention planning and/or may adhere strictly to "group studies"
  - *There's a need to understand the results of group studies AND the unique characteristics of the student who stands before you*
- Research based on group data assists in providing expectations about performance on cognitive and achievement tests and the relationships among cognitive and academic abilities.
  - Every student with whom we work is an "N of 1".
  - *"Group studies do not reflect the complicated process of a highly specific individual issue being treated in highly unpredictable circumstances."* (Fletcher-Janzen, June 16, 2016, NASP listserv)

Issues that Deserve Thoughtful Consideration

- All students who need help should receive help. But under the SLD category?
  - Compromises the validity of the SLD category
  - There are *finite* dollars for special education
- There will always be debate (science thrives when all ideas are subject to scrutiny). The truth is most likely somewhere in the middle.
  - There's no litmus test for SLD identification
  - Every method provides important information about and insights into a student's academic difficulties and overall learning needs
  - *The best approach to serving students with learning difficulties most likely requires data from RTI and a comprehensive assessment for students who do not respond well to evidence-based instruction and intervention*
- There is no "one size fits all approach" to SLD identification
  - An RTI approach should require comprehensive assessment (including cognitive assessment) for "non-responders"
  - The results of a PSW analysis should be informed by data from an RTI service delivery model
- Why does the field buck an integrative approach?
  - RTI is an ideology?
  - Training programs have fallen far short of keeping pace with current theory and research related to identification of SLD?
  - Both?

We Need an Integrative Approach to SLD Identification: RTI and Cognitive Assessment/PSW are Not Mutually Exclusive

- There are arguments on each side, but none is strong enough to declare one approach better than the other
- It is time to embrace each approach as different but ***complimentary*** in the identification and diagnosis of specific learning disability

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To avoid a situation where a student is simply declared to have SLD, RTI procedures should be combined with psychometric testing. Wodrich, Spencer, and Daley (2006) provided reasons why RTI needs to be combined with psychoeducational assessments. Specifically, use of RTI alone makes it difficult to (a) distinguish SLD from mild mental retardation, (b) distinguish students with SLD from slow learners, (c) identify intra-individual differences, (d) determine the meaning of a positive RTI, and (e) identify the best means to implement effective interventions. Models that combine RTI and psychometric assessment have been described (e.g., Flanagan, Ortiz, Alfonso, & Dynda, 2006; Kavale & Flanagan, 2007), and are necessary because, "An RTI model without a comprehensive evaluation cannot identify SLD because it is not aligned with the construct of SLD" (Ofiesh, 2006, p. 887).

Learning Disability Quarterly, Summer, 2008

If Johnny Can't Read, Teach Johnny How to Read: Is it that Simple?

There are times when it is appropriate to just teach someone who is falling behind … to read. There are also times when a child has been traumatized, has ADHD, ASD, and/or LD and someone must figure out how best to treat the basic etiology of the problem because those children will need help in reading most likely too. I trust that school psychologists on the job in the real world, face to face with children, do their best to use all information to help in singular and unpredictable situations.

(Fletcher-Janzen, June 16, 2016, NASP listserv)

SLD Identification in Perspective

- All methods of SLD identification are "stepping stones" to the next best method. *Current methods, even if shown to be invalid for SLD identification, are not missteps. They are stepping stones, all designed in a well-intentioned effort to understand and help children who are entitled to special education services*
- The more practitioners know about the different methods that are used for SLD identification, the more they will be able to gather the most relevant data and filter those data through what is known about SLD, thereby making the most informed decisions

OVERVIEW OF SLD IDENTIFICATION

Cross-Battery XBA Assessment

IDEIA – Federal Definition of SLD

"A *disorder in one or more of the basic psychological processes* involved in understanding or using language, spoken or written, which manifests itself in the imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations. Such terms include such conditions as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia"

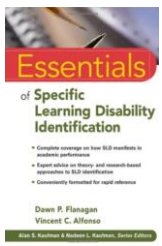
Federal Regulations (2006) Include Three Methods of SLD Identification

(34 CFR 300.311(a)(5)), (34 CFR 300.309(a)(2(ii))

- Ability-Achievement Discrepancy (AAD)
  - May allow
  - Cannot mandate
- Response-to-Intervention (RTI)
  - Must allow
  - "as part of" a comprehensive evaluation
- Alternative Research-based Approach (PSW)

Ability-Achievement Discrepancy is Insufficient for SLD Identification Because:

- It fails to adequately differentiate between students with LD from students who are low achievers.
- It is based on the erroneous assumption that IQ is a near-perfect predictor of achievement and is synonymous with an individual's potential.
- It is applied inconsistently across states, districts, and schools, rendering the diagnosis arbitrary and capricious.
- A discrepancy between ability and achievement may be statistically significant, but not clinically relevant.
- It is a wait-to-fail method because discrepancies between ability and achievement typically are not evident until the child has reached the 3rd or 4th grade.
- It does not identify the area of processing deficit.
- It leads to over-identification of minority students.
- It does not inform intervention.



Source: Hale, Wycoff, and Fiorello (2011). RTI and cognitive hypothesis testing for identification and intervention of specific learning disabilities: The best of both worlds. In Flanagan and Alfonso (eds), *Essentials of specific learning disability identification*. Hoboken, NJ: Wiley.

RTI Cannot Be Used Alone For SLD Identification Because:

- RTI advocates cannot agree whether a standard protocol or a problem-solving RTI approach should be used.
- There is no agreed-upon curriculum, instructional methods, or measurement tools with adequate technical quality for use in an RTI model.
- RTI research has primarily focused on word reading, and methods across grades and different content areas have not been examined sufficiently.
- There is no consensus on what constitutes an empirically based approach, and whether using a single-subject design is sufficient to make any approach "empirical."
- There is no consensus on how to determine response, or lack of response, with different methods, resulting in different children being labeled as responders or nonresponders.
- There is no consensus on establishing appropriate achievement benchmarks or intervention timelines to determine the aim line slope (a critical component of determining individual responsiveness).
- There are no agreed-upon methods for teacher training or supervision methods to ensure interventions are carried out with integrity.
- There is no possible way to determine whether a child who is nonresponsive to intervention meets SLD statutory requirements.
- Failure to respond to intervention can happen for multiple reasons, only one of which is SLD.

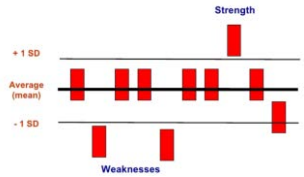
Source: Hale, Wycoff, and Fiorello (2011). RTI and cognitive hypothesis testing for identification and intervention of specific learning disabilities: The best of both worlds. In Flanagan and Alfonso (eds), *Essentials of specific learning disability identification*. Hoboken, NJ: Wiley.

Third Option is PSW
Federal Regulations Permit the Use of a PSW Model

(34 CFR 300.311(a)(5)), (34 CFR 300.309(a)(2(ii))

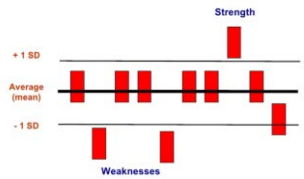
- Evaluation documentation must consider whether the student exhibits a pattern of strengths and weaknesses
  - In performance, achievement or both
  - Relative to age, State approved grade levels standards, *or intellectual development*
  - That is determined by the group to be relevant to the identification of SLD using appropriate instruments

Third Option - PSW



- Requires an understanding of contemporary theory
- Requires an understanding of the theoretical constructs that are measured by cognitive batteries
- Requires understanding of cognitive processes and abilities related to achievement
- May require cross-battery assessment to assess all the abilities and processes considered important based on referral and to follow up on aberrant test performances
- Requires understanding of what SLD is and is not

Third Option - PSW



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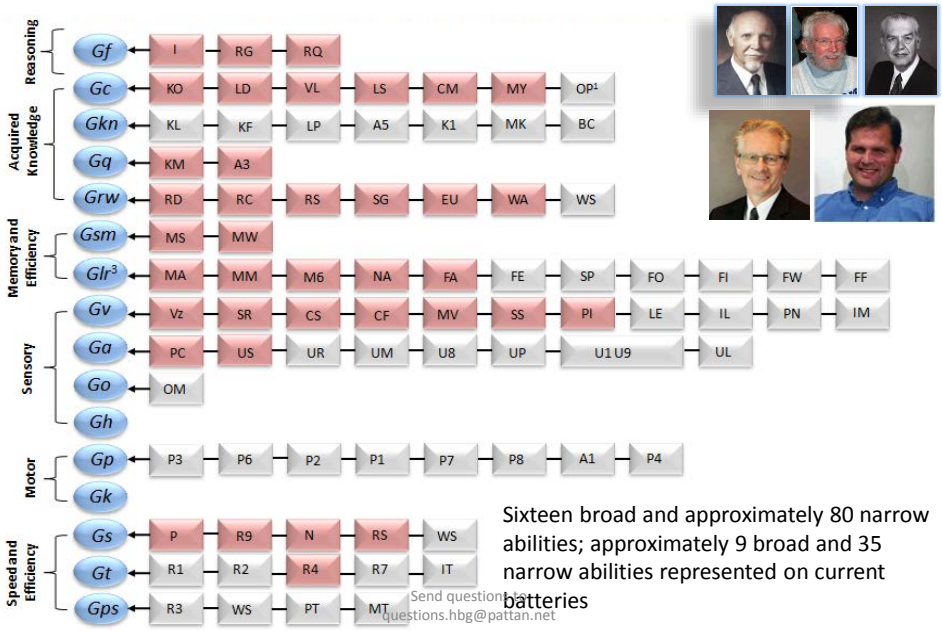
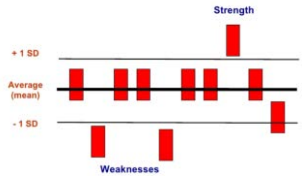
Current and Expanded Cattell-Horn-Carroll (CHC) Model of Cognitive Abilities
(adapted from Schneider & McGrew, 2012)



Sixteen broad and approximately 80 narrow abilities; approximately 9 broad and 35 narrow abilities represented on current batteries

Third Option - PSW



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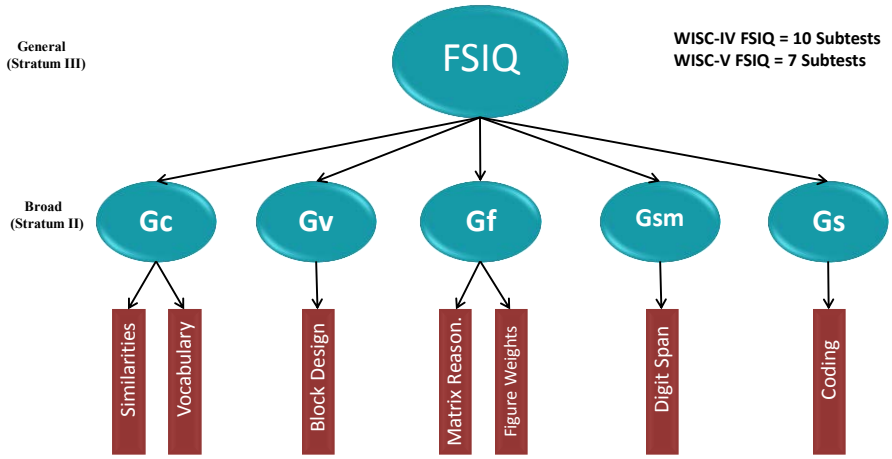
Composition of the WISC-V Full Scale IQ



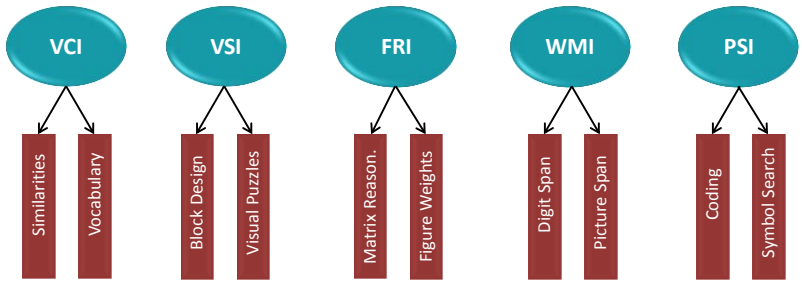
Allowable Substitutions for Core FSIQ Subtests (Only 1 Permitted)

Information	*Visual Puzzles*	*Picture Concepts*	*Picture Span*	*Symbol Search*
Comprehension		*Arithmetic*	*Letter-Number Sequencing*	*Cancellation*

D. P. Flanagan, 2015

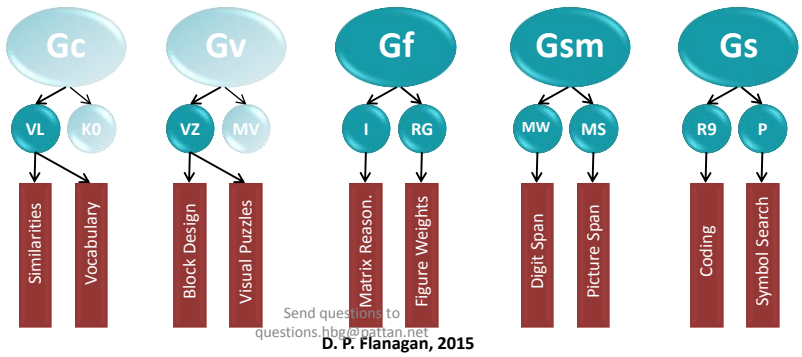
WISC-V Primary Index Scales

Based on 5-factor hierarchical CFA of primary and secondary subtests



No Substitutions are Permitted

Based on construct validation literature; Extant factor analyses; CHC classifications



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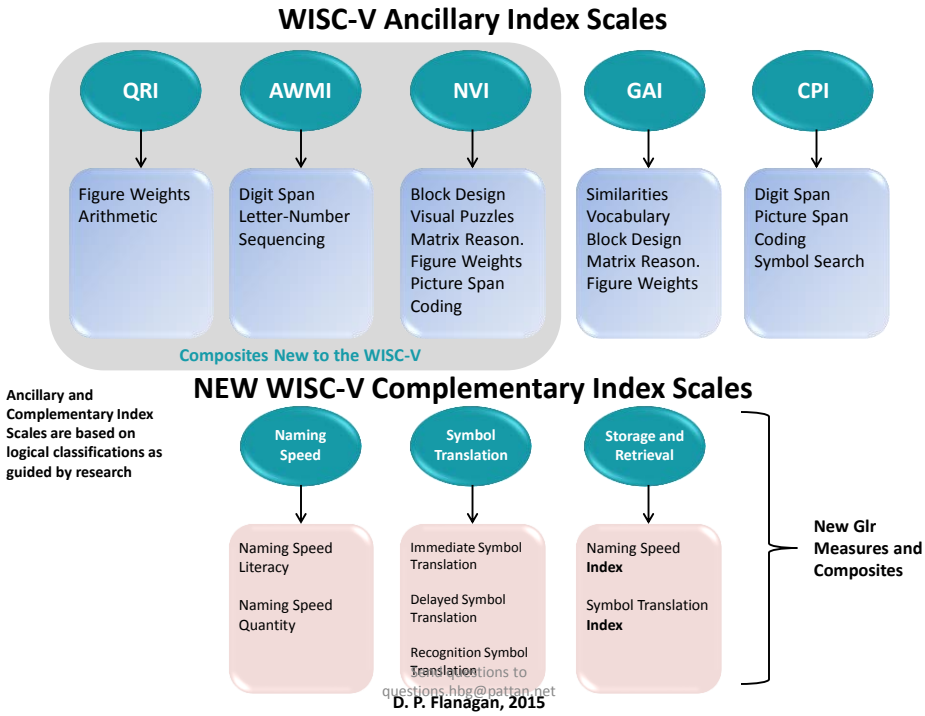
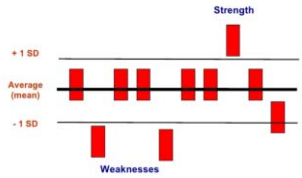


Third Option - PSW



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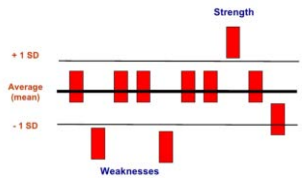
Summary of Relations between CHC Abilities and Specific Areas of Academic Achievement
(Berninger, 2013; Flanagan et al., 2006, 2013; McDonough, et al., 2016; McGrew & Wendling, 2010; McGrew et al., 2014)

	Reading Achievement	Math Achievement	Writing Achievement
Gf	Inductive (I) and general sequential reasoning (RG) abilities play a moderate role in **reading comprehension**. Executive functions, such as planning, organization, and self-monitoring are also important.	**Reasoning inductively and deductively with numbers (RQ) is very important for math problem solving at all ages.** Executive functions, such as set shifting and cognitive inhibition are also important.	Inductive (I) and general sequential reasoning abilities (RG) are consistently related to **written expression** at all ages. Executive functions, such as attention, planning, and self-monitoring are also important.
Gc	**Language development (LD), lexical knowledge (VL), and listening ability (LS) are important at all ages for reading acquisition and development. These abilities become increasingly important with age.** Oral Language, Listening Comprehension, and EF (planning, organization, self-monitoring) also important for **reading comprehension.**	**Language development (LD), lexical knowledge (VL), and listening abilities (LS) are important at all ages. These abilities become increasingly important with age.** Number representation (e.g., quantifying sets without counting, estimating relative magnitude of sets) and number comparisons related to overall **Number Sense**.	**Language development (LD), lexical knowledge (VL), and general information (K0) are important primarily after about the 2nd grade. These abilities become increasingly important with age.** Level of knowledge of syntax, morphology, semantics, and VL has a significant impact on clarity of **written expression** and text generation ability.
Gwm	Memory span (MS) and **working memory capacity (WM) or** attentional control, **Gwm important for overall reading success.** Phonological memory or WM for verbal and sound-based information may also be important.	Memory span (MS) and **working memory capacity (WM) or** attentional control, **Gmw important for math problem solving** and overall success in math.	Memory span (MS) is important to writing, especially **spelling** skills whereas working memory has shown relations with advanced writing skills (e.g., **written expression**; synthesizing multiple ideas, ongoing self-monitoring). Gmw important for overall writing success.
Gv	Orthographic Processing (often measured by tests of perceptual speed that use orthographic units as stimuli) – **reading rate and fluency.**	Visualization (VZ), including mental rotation, is important primarily for higher level (e.g., geometry, calculus) and **math problem solving**.	Orthographic Processing (often measured by tests of perceptual speed that use orthographic units as stimuli) - **spelling**
Ga	**Phonetic coding (PC) or "phonological awareness/processing" is very important during the elementary school years for the development of basic reading skills.** Phonological memory or WM for verbal and sound-based information may also be important.		**Phonetic coding (PC) or "phonological awareness/processing" is very important during the elementary school years for both basic writing skills and written expression (primarily before about grade 5).**
Glr	**Naming facility (NA) or "rapid automatic naming" (also called speed of lexical access) is very important during the elementary school years for reading rate and fluency.** Associative memory (MA) is also important.	Naming Facility (NA; or speed of lexical access); Associative Memory (MA) – **memorization and rapid retrieval of basic math facts; accurate and fluent calculation.**	Naming facility (NA) or "rapid automatic naming" **(also called speed of lexical access)** has demonstrated relations with written expression, primarily **writing fluency**. Storing and retrieving commonly occurring letter patterns in visual and motor memory are needed for **spelling**.
Gs	**Perceptual speed (P) abilities are important during all school years, particularly the elementary school years.**	**Perceptual speed (P) important during all years, especially the elementary school years for math calculation fluency.**	**Perceptual speed (P) abilities are important during all school years for basic writing and related to all ages for written expression.**

Third Option - PSW



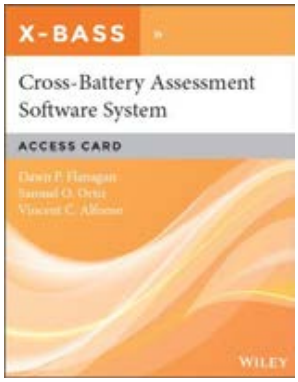
- Requires an understanding of contemporary theory
- Requires an understanding of the theoretical constructs that are measured by cognitive batteries
- Requires understanding of cognitive processes and abilities related to achievement
- May require cross-battery assessment to assess all the abilities and processes considered important based on referral and to follow up on aberrant test performances
- Requires understanding of what SLD is and is not

D. P. Flanagan, 2015

Most Current Contributions of the XBA Approach to Psychological Evaluation

Cross-Battery Assessment Software System

(X-BASS v1.2)



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D. P. Flanagan, 2016

Cross-Battery XBA Assessment

WJ IV

WISC®-V

The Cross-Battery Assessment Approach

APPLICATION: USE OF WJ IV AND WISC-V IN XBA

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Cross-Battery XBA Assessment

XBA Applied to WJ IV and WISC-V

Organization of WJ IV and WISC-V Assessments Following Research on Relations Between Ability and Achievement:

A Basic Reading Skills Example

Abilities and Processes Related to SLD Area: BRS	WJ IV COG Subtest	Degree of Relationship Based on Literature Review	Example of Supplemental Subtests via XBA if Necessary	Comments
Gc:VL (Lexical Knowledge)	Oral Vocabulary	High	**WJ IV OL** **Picture Vocabulary** WISC-V Vocabulary Similarities	**VL is underrepresented on the WJ IV COG**; Use WJ IV OL battery for another VL subtest or supplement with WISC-V, for example
Gc:K0 (General Information)	General Information	High	WISC-V Information Comprehension	**K0 is underrepresented on the WJ IV;** General Information is more like a VL than others intended to measure K0
Gsm:MS (Memory Span)	Memory for Words Nonword Repetition (also small loading on Ga: UM)	Low - Moderate	WJ IV OL Sentence Repetition WISC-V Digit Span Forward	**Evaluation of difference between auditory and visual memory span** will require use of a separate memory battery, such as the TOMAL-2
Gsm:MW (Working Memory Capacity)	Numbers Reversed Object Number Sequencing Verbal Attention	Low - Moderate	CAS2 Sentence Questions DAS-II Recall of Sequential Order	--
Glr:MA (Associative Memory)	Visual Auditory Learning	Low - Moderate	WISC-V Symbol Translation Subtests WRAML2 Sound Symbol Sound Symbol Recall	**MA is underrepresented on the WJ IV**
Glr: NA (Speed of Lexical Access)	--	Low - Moderate	**WJ IV OL** **Rapid Picture Naming** **Retrieval Fluency** WISC-V Naming Speed Literacy	**NA is not measured by the WJ IV COG**
Ga:PC (Phonetic Coding)	Phonological Processing	High	**WJ IV OL** **Segmentation** **Sound Awareness** **Sound Blending**	**PC is underrepresented on the WJ IV COG;** Hard to know what phonological processing scores mean b/c the test is a mixed measure
Ga:UM (Memory for Sound Patterns)	Nonword Repetition (but is mainly Gsm:MS)	Moderate	SCAN 3:C	**UM is underrepresented on the WJ IV** Nonword Repetition likely to be more difficult than MS with numbers and words for individuals with phonological processing problems
Gs:P (Perceptual Speed)	Number-Pattern Matching Letter-Pattern Matching Pair Cancellation	Moderate	WISC-V Naming Speed Literacy	Perceptual Speed tests that involve **attention to orthography** are more highly related to BRS than tasks that involve common pictures and abstract stimuli

D. P. Flanagan, 2016

Abilities and Processes Related to SLD Area: BRS	WISC-V Subtest	Degree of Relationship Based on Literature Review	Example of Supplemental Subtests via XBA if Necessary	Comments
Gc:VL (Lexical Knowledge)	Similarities Vocabulary	Moderate	**CELF-5** **Word Classes** **Word Definitions**	Similarities may also involve Gf:I CELF-5 is statistically linked to the WISC-V and therefore should be an initial supplemental battery
Gc:K0 (General Information)	Comprehension Information	Moderate	WJ IV COG General Information	In the majority of cases, it will not be necessary to go out of battery for additional K0 subtests
Gsm:MS (Memory Span)	Picture Span (also MW) Digit Span Forward	Low - Moderate	**CELF-5** **Recalling Sentences**	Evaluation of difference between auditory and visual memory span will likely require use of a separate memory battery, such as the TOMAL-2
Gsm:MW (Working Memory Capacity)	Letter-Number Seq. Digit Span Backward Digit Span Sequencing Arithmetic	Low – Moderate	WJ IV COG Numbers Reversed Object-Number Sequencing Verbal Attention TOMAL-2 Digits and Letters Backward DAS-II Recall of Sequential Order	Arithmetic also measures math achievement (Gq:A3) and at the older ages may also involve quantitative reasoning (Gf:RQ); Picture Span should also be considered as visual test of MW
Glr:MA (Associative Memory)	Immediate Symbol Translation Delayed Symbol Translation Recognition Symbol Translation	Low - Moderate	WJ IV COG Visual-Auditory Learning WRAML2 Sound Symbol (and Recall)	--
Glr: NA (Speed of Lexical Access)	Naming Speed Literacy	Low - Moderate	**KTEA-3 Letter-Naming Facility**	Naming Speed Quantity also measures Glr: NA but may not be relevant to BRS
Ga:PC (Phonetic Coding)	--	High	**KTEA-3 Phonological Processing** **WIAT-III Early Reading Skills** CTOPP-2 WJ IV OL Segmentation Sound Awareness Sound Blending	KTEA-3 is statistically linked to the WISC-V and, therefore, should be an initial supplemental battery
Ga:UM (Memory for Sound Patterns)	--	Low-Moderate	WJ IV Nonword Repetition (mostly a test of Gsm:MS)	--
Gs:P (Perceptual Speed);	Coding Symbol Search Cancellation	Moderate	WJ IV Number Pattern Matching WJ IV Letter Pattern Matching	Perceptual Speed tests, such as those included on the WJ IV COG are likely more highly related to BRS because they use **orthographic units** as test stimuli

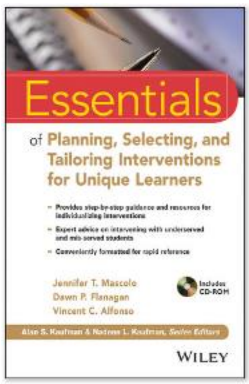
D. P. Flanagan, 2016

An Overview: SMAARTI

A Systematic Method of Analyzing Assessment Results for Tailoring Interventions

Step 1. Organize **primary data** using the CHC-based *Data Organization and Targets for Intervention* (DOTI) form

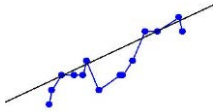
- Examine all primary data to gain an understanding of the student's unique pattern of ability and processing strengths and weaknesses



Chapter 1. ***A Systematic Method of Analyzing Assessment Results for Tailoring Intervention (SMAARTI)***
Jennifer T. Mascolo, Dawn P. Flanagan, and Vincent C. Alfonso (2014)

Step 1
Organize Primary Data

- ***Primary data*** include standardized test scores from cognitive and academic measures, special-purpose batteries, district-wide testing programs, and progress monitoring


- Organized into 10 CHC domains plus an "other" category
  - Three columns for each domain separated into normative weaknesses, within normal limits, and normative strengths
    - Standard scores that are 1 SD below the mean or lower are considered normative weaknesses, and scores 1 SD above the mean or higher are considered normative strengths

Data Organization and Targets for Intervention

CHC Cognitive/Academic Ability or Processing Domain	Normative Weakness and Information about Intervention	Within Normal Limits	Normative Strength and Information about Intervention
Fluid Reasoning (Gf)			
Target for Intervention?			
Crystallized Intelligence (Gc)			
Target for Intervention?			
Long-Term Retrieval (Glr)			
Target for Intervention?			
Short-Term Memory (Gsm)			
Target for Intervention?			
Visual Processing (Gv)			
Target for Intervention?			

Normal Limits is a LARGE RANGE; IT ENCOMPASSES:
Some Below Average Scores 85-89
Average Scores 90-109
Some Above Average Scores 110-115

An Overview: Steps of SMAARTI

Step 2. Determine whether academic weaknesses are empirically related to the cognitive weaknesses by reviewing the research on the relations among specific cognitive abilities, neuropsychological processes, and academic skills

- Empirically-established relationships will help practitioners understand the potential cognitive correlates to academic deficits

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An Overview: Steps of SMAARTI

Step 3.

a) Review manifestations of cognitive weaknesses;

b) organize secondary data;

c) identify initial targets for intervention; and

d) identify types of academic skill deficits for remediation

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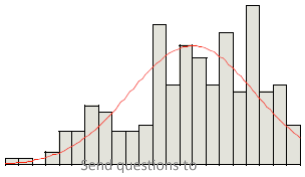
An Overview: Steps of SMAARTI

Step 3

a) Review manifestations of cognitive weaknesses

- Determine whether identified cognitive weaknesses manifest in real-world performances in predictable ways

When practitioners are able to observe the manifestations of specific cognitive deficits in classroom performance, for example, cognitive test results are ***ecologically valid***.



An Overview: Steps of SMAARTI

Step 3. (continued)

b) organize secondary data

Secondary data include information from rating scales, classroom observations, and interviews with parents, teachers, and the student him or herself.

An Overview: Steps of SMAARTI

Step 3. (continued)

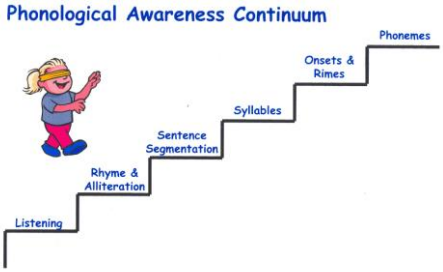
c) identify initial targets for intervention

Hypothesize whether cognitive areas of weakness should be targeted for one or more intervention methods – For example, a Glr deficit may require an Accommodation and use of Compensatory strategies

An Overview: Steps of SMAARTI

Step 3. (continued)

d) identify types of academic skill deficits for remediation



hypothesize whether areas of academic weakness are related to basic skill acquisition, fluency, or higher level skill

Basic (or foundational) skill (**B**)
Fluency (**F**)
Higher-level (or applied) skill (**H**)

Setting-general v. Setting-specific

- Be sure to note whether manifestations of cognitive deficits are ***setting-general*** (i.e., occur across settings) or ***setting-specific*** (e.g., occur only in school during mathematics instruction).

An Overview: Steps of SMAARTI

Step 4. Consider ***tertiary data***, which are comprised of information about classroom instruction, instructional materials, environment, and strategies

- Includes information about factors that affect learning and that are largely ***external*** to student

An Overview: Steps of SMAARTI

Step 5. Integrate data from previous steps, design and implement an intervention, and monitor its effectiveness

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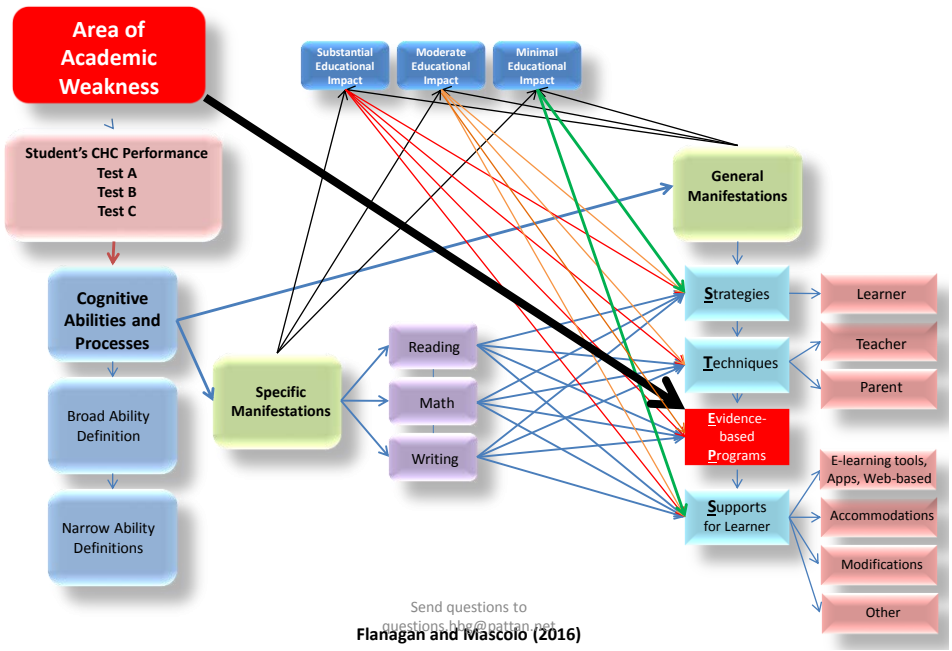
Strategies, Techniques, Evidence-based Programs, and Supports (STEPS)



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Flanagan and Mascolo (2016)

The Assessment-Intervention Connection

Assessment

- Academic Skills
- Cognitive Abilities and Processes
- General and Specific Manifestations of Cognitive Weaknesses
- Severity of Educational Impact

Intervention

- Evidence-based Interventions
- Compensatory Strategies for the Learner
- Techniques for Teachers and Parents
- Supports – accommodations, modifications, e-learning tools, apps, web-based

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The Assessment-Intervention Connection

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Strategies, Techniques, Evidence-based Programs, and Supports (STEPS)

Area of Academic Weakness

Academic Skills: Eight Areas in Which SLD May Manifest (IDEA, 2004)

- **Basic Reading Skills** – letter and word identification; nonsense word decoding
- **Reading Fluency** – word recognition/decoding fluency; oral reading fluency with comprehension
- **Reading Comprehension** – deriving meaning from text with and without inference

- **Math Calculation** – addition, subtraction, multiplication, division, math concepts, math fluency
- **Math Problem Solving** – higher level quantitative concepts and application, reasoning inductively and deductively with numbers

- **Written Expression** –organization of thoughts, feelings, and ideas on paper; conveying meaning through well-constructed text; spelling, vocabulary, grammar, and organization are important

- **Oral Expression** – conveying wants, needs, thoughts, and ideas meaningfully using appropriate syntactic, pragmatic, semantic, and phonological language structures
- **Listening Comprehension** – ability to understand the meaning of words and sentences that are heard and to relate to them in some way

Strategies, Techniques, Evidence-based Programs, and Supports (STEPS)

Area of Academic Weakness

Assessment Instruments That Measure the Eight Areas

Print BRS — **BRS - Basic Reading Skills** — Back to Top

	Basic Reading Skills (BRS)	Age Range
AAB	Letter/Word Reading	3-85
AAB	Reading Fluency	4-85
DAB-3	Alphabet/Word Knowledge	6-14
DAB-4	Alphabet/Phonics/Word Identification	6-14
DAB-I	Word Identification	13-17
GDRT-2	Letter/Word Recognition	6-13
GDRT-2	Reading Vocabulary	6-13
GORT-5	Accuracy	6-18
GORT-5	Fluency	6-18
ITPA-3	Sight Decoding	6:6-12
ITPA-3	Sound Decoding	6:6-12
KBNA	Reading Single Words	20-89
KTEA-3	Decoding Fluency	8-25
KTEA-3	Letter and Word Recognition	4-25
KTEA-3	Letter Naming Facility	5-25
KTEA-3	Nonsense Word Decoding	6-25
KTEA-3	Word Recognition Fluency	6-25
KTEA-II	Decoding Fluency	8-25
KTEA-II	Letter and Word Recognition	4:6-25
KTEA-II	Nonsense Word Decoding	6-25
KTEA-II	Word Recognition Fluency	8-25
PRT	Decoding	6-12
SHIPLEY-2	Vocabulary	7-89
SORT-R3	Slosson Oral Reading Test Revised	5-99+
TERA 3	Alphabet	3:6-8:6
TIWRE	Reading Efficiency Index	3-94
TOSWRF	Silent Word Reading Fluency	6-24
TOSWRF-2	Silent Word Reading Fluency	6-24
TOWRE2	Phonemic Decoding Efficiency	6-24
TOWRE2	Sight Word Efficiency	6-24
WFAS	Word Reading	5-50
WIAT-III	Early Reading Skills	4-9
WIAT-III	Pseudoword Decoding	6-50
WIAT-III	Word Reading	6-50
WIST	Sound-Symbol Knowledge	7-18
WIST	Word Identification	7-18
WJ III NU ACH	Form C Letter-Word Identification	2-90+
WJ III NU ACH	Letter-Word Identification	2-90+
WJ III NU ACH	Word Attack	4-90+
WJ III NU DRB	Letter-Word Identification	2-90+
WJ III NU DRB	Word Attack	4-90+
WJ IV ACH	Letter-Word Identification	2-80+
WJ IV ACH	Oral Reading	
WJ IV ACH	Word Attack	
WMLS-R: NU	Letter-Word Ider	
WRAT-4	Word Reading	
WRAT	Expanded Readi	
WRMT-3	Oral Reading	
WRMT-3	Word Attack	
WRMT-3	Word Comprehe	
WRMT-3	Word Identificat	

Information from: *Cross-Battery Assessment Software System* (X-BASS)

Strategies, Techniques, Evidence-based Programs, and Supports (STEPS)

Area of Academic Weakness

Assessment Instruments That Measure the Eight Areas

Print RF — **RF - Reading Fluency** — Back to Top

Reading Fluency (RF)		Age Range
KTEA-3	Decoding Fluency	8-25
KTEA-3	Silent Reading Fluency	6-25
KTEA-3	Word Recognition Fluency	6-25
PRT	Fluency	6-12
TORC-4	Contextual Fluency	7-17
TOSCRF	All Forms A-D	7-18
TOSCRF-2	Test of Silent Contextual Reading Fluency	7-24
TOSREC	Test of Silent Reading Efficiency and Comprehension	6-18
WIAT-III	Oral Reading Fluency	6-50
WJ III NU ACH	Form C Reading Fluency	6-90+
WJ III NU ACH	Reading Fluency	6-90+
WJ III NU DRB	Reading Fluency	6-90+
WJ IV ACH	Oral Reading	5-80+
WJ IV ACH	Sentence Reading Fluency	5-80+
WJ IV ACH	Word Reading Fluency	5-80+

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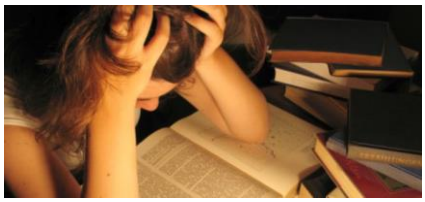
Strategies, Techniques, Evidence-based Programs, and Supports (STEPS)

Area of Academic Weakness

Assessment Instruments That Measure the Eight Areas

Print RC — **RC - Reading Comprehension** — Back to Top

Reading Comprehension (RC)		Age Range
AAB	Reading Comprehension: Words and Sentences	4-85
AAB	Reading Comprehension: Passages	5-85
CELF-5	Reading Comprehension	8-21
DAB-3	Reading Comprehension	6-14
DAB-4	Reading Comprehension	6-14
DAB-I	Reading Comprehension	13-17
GDRT-2	Meaningful Reading	6-13
GORT-5	Comprehension	6-18
ITPA-3	Sentence Sequencing	6:6-12
KTEA-3	Reading Comprehension	4-25
KTEA-3	Reading Vocabulary	6-25
KTEA-II	Reading Comprehension	6-25
NAB	Reading Comprehension	18-97
OWLS-II	Reading Comprehension	5-21
PRT	Comprehension	6-12
TERA-3	Meaning	2:6-8:6
TORC-4	Paragraph Construction	7-17
TORC-4	Relational Vocabulary	7-17
TORC-4	Sentence Completion	7-17
TORC-4	Text Comprehension	7-17
WFAS	Reading Comprehension (Form A & B)	6-35
WIAT-III	Reading Comprehension	6-50
WJ III NU ACH	Form C Passage Comprehension	2-90+
WJ III NU ACH	Passage Comprehension	2-90+
WJ III NU DRB	Passage Comprehension	2-90+
WJ IV ACH	Passage Comprehension	2-80+
WJ IV ACH	Reading Recall	5-80+
WJ IV ACH	Reading Vocabulary	5-80+
WMLS-R:NU	Passage Comprehension	2-90+
WRAT-4	Sentence Comprehension	5-94
WRMT-3	Passage Comprehension	5-75+



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Information from: *Cross-Battery Assessment Software System* (X-BASS)

Strategies, Techniques, Evidence-based Programs, and Supports (STEPS)

Area of Academic Weakness

Assessment Instruments That Measure the Eight Areas

Print MC — MC - Math Calculation — Back to Top

	Math Calculation (MC)	Age Range
AAB	Mathematical Calculation	3-85
AAB	Mathematics Reasoning	4-85
CMAT	Addition	7-18
CMAT	Algebra	7-18
CMAT	Charts, Tables, and Graphs	7-18
CMAT	Division	7-18
CMAT	Geometry	10-18
CMAT	Measurement	7-18
CMAT	Money	7-18
CMAT	Multiplication	7-18
CMAT	Problem Solving	7-18
CMAT	Rational Numbers	7-18
CMAT	Subtraction	7-18
CMAT	Time	7-18
DAB-3	Math Calculation	6-14
DAB-3	Math Reasoning	6-14
DAB-4	Mathematics Calculation	6-14
DAB-I	Math Calculation	13-17
KBNA	Sentence Reading- Arithmetic	20-89
KM3	Addition and Subtraction	5-21
KM3	Algebra	5-21
KM3	Foundations of Problem Solving	5-21
KM3	Measurement	5-21
KM3	Mental Computation and Estimation	6-21
KM3	Multiplication and Division	7-21
KM3	Numeration	5-21
KTEA-3	Math Computation	5-25
KTEA-3	Math Concepts and Application	4-25
KTEA-3	Math Fluency	6-25
KTEA-II	Math Computation	5-25
KTEA-II	Math Concepts and Application	4-25
RAIT	Quantitative Knowledge	10-75
TOMA-3	Computation	8-18
TOMA-3	Word Problems	8-18
WFAS	Numerical Operations	5-50
WIAT-III	Math Fluency- Addition	4-19
WIAT-III	Math Fluency- Subtraction	4-19
WIAT-III	Math Fluency- Multiplication	4-19
WIAT-III	Numerical Operations	5-50
WISC-IV Integrated	Written Arithmetic	6-16
WJ III NU ACH	Calculation	5-90+
WJ III NU ACH	Calculation - Form C	5-90+
WJ IV ACH	Applied Problems	
WJ IV ACH	Calculation	
WJ IV ACH	Math Facts Fluency	
WRAT-4	Math Computation	
WRAT-4	Expanded Mathematics	

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Strategies, Techniques, Evidence-based Programs, and Supports (STEPS)

Area of Academic Weakness

Assessment Instruments That Measure the Eight Areas

Print MPS — MPS - Math Problem Solving — Back to Top

	Math Problem Solving (MPS)	Age Range
AAB	Mathematics Reasoning	4-85
CMAT	Algebra	7-18
CMAT	Problem Solving	7-18
DAB-3	Math Reasoning	6-13
DAB-I	Math Reasoning	13-17
KM3	Applied Problem Solving	5-21
KM3	Foundations of Problem Solving	5-21
KTEA-3	Math Concepts and Application	4-25
KTEA-II	Math Concepts and Application	4-25
TOMA-3	Word Problems	8-18
WIAT-III	Math Problem Solving	4-50
WJ NU ACH	Applied Problems	2-90+
WJ NU ACH	Form C Applied Problems	2-90+
WJ NU ACH	Quantitative Concepts	2-90+
WJ IV ACH	Applied Problems	2-80+
WJ IV ACH	Number Matrices	5-80+
WRAT-4	Expanded Mathematics	5-24

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Information from: *Cross-Battery Assessment Software System* (X-BASS)

Strategies, Techniques, Evidence-based Programs, and Supports (STEPS)

Area of Academic Weakness

Assessment Instruments That Measure the Eight Areas

Print WE — **WE - Written Expression** — Back to Top

Written Expression (WE)		Age Range
AAB	Spelling	3-85
AAB	Written Composition	8-85
CELF-5	Structured Writing	8-21
DAB-3	Capitalization	6-14
DAB-3	Contextual Language	7-14
DAB-3	Punctuation	6-14
DAB-3	Spelling	6-14
DAB-3	Story Construction	6-14
DAB-4	Punctuation/Capitalization	6-14
DAB-4	Spelling	6-14
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DAB-I	Spelling	13-17
ITPA-3	Sight Spelling	6:6-12
ITPA-3	Sound Spelling	6:6-12
KBNA	Picture Description: Written	20-89
KTEA-3	Spelling	5-25
KTEA-3	Writing Fluency	7-25
KTEA-3	Written Expression	4-25
KTEA-II	Spelling	6-25
KTEA-II	Written Expression	4:6-25
NAB	Writing	18-97
OWLS-II	Written Expression	5-21
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TEWL3	Basic Writing	3-10
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TOAL-4	Orthographic Usage	12-24
TOC	Homophone Choice	6-17
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TOWL-4	Contextual Conventions	7-17
TOWL-4	Logical Sentences	7-17
TOWL-4	Punctuation	7-17
TOWL-4	Sentence Combining	7-17
TOWL-4	Spelling	7-17
TOWL-4	Story Composition	7-17
TWS-5	Test of Written Spelling	6-18
WFA5	Spelling	5-90+
WIAT-III	Alphabet Writing Fluency	5-90+
WIAT-III	Essay Composition	5-90+
WIAT-III	Sentence Composition	5-90+
WIAT-III	Spelling	5-90+
WIST	Spelling	5-90+
WJ III NU ACH	Editing	5-90+
WJ III NU ACH	Form C Spelling	5-90+
WJ III NU ACH	Form C Writing Fluency	5-90+
WJ III NU ACH	Form C Writing Samples	5-90+
WJ III NU ACH	Punctuation and Capitali	5-90+
WJ III NU ACH	Spelling	5-90+
WJ III NU ACH	Spelling of Sounds	5-90+
WJ III NU ACH	Writing Fluency	5-90+
WJ III NU ACH	Writing Samples	5-90+
WJ III NU DRB	Spelling of Sounds	6-90+
WJ IV ACH	Editing	7-80+
WJ IV ACH	Sentence Writing Fluency	5-80+
WJ IV ACH	Spelling	2-80+
WJ IV ACH	Spelling of Sounds	5-80+
WJ IV ACH	Writing Samples	4-80+
WJ IV NU	NU Dictation	2-90+
WRAT-4	Spelling	5-94

Information from: *Cross-Battery Assessment Software System* (X-BASS)

Strategies, Techniques, Evidence-based Programs, and Supports (STEPS)

Area of Academic Weakness

Assessment Instruments That Measure the Eight Areas

Print OE — **OE - Oral Expression** — Back to Top

Oral Expression (OE)		Age Range
AAB	Oral Expression	4-85
AAB	Oral Production	4-85
CELF-4	Formulated Sentences	5-21
CELF-5	Formulated Sentences	5-21
DELV-NR	Pragmatics	4-9
KBNA	Picture Description	20-89
KTEA-3	Associational Fluency	4-25:11
KTEA-3	Object Naming Facility	4-25:11
KTEA-3	Oral Expression	4-25
KTEA-II	Oral Expression	4:6-25
NAB	Oral Production	18-97
OWLS-II	Oral Expression	3-21
PLAI 2	Expressive	3-5
SPELT-3	Structured Photographic Expressive Language Test	4-9
TNL	Oral Narration	5-11
TOPL-2	Test of Pragmatic Language	6-18
WIAT-III	Oral Expression	4-50
WJ IV OL	Oral Vocabulary	4-80+
WJ IV OL	Picture Vocabulary	2-80+
WJ IV OL	Sentence Repetition	2-80+

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Information from: *Cross-Battery Assessment Software System* (X-BASS)

Strategies, Techniques, Evidence-based Programs, and Supports (STEPS)

Area of Academic Weakness

Assessment Instruments That Measure the Eight Areas

Print LC | LC - Listening Comprehension | Back to Top

Listening Comprehension (LC)		Age Range
AAB	Listening Comprehension: Words and Sentences	3-85
AAB	Listening Comprehension: Passages	5-85
APAT	Complex Sentences	5-12
APAT	Following Directions	5-12
APAT	Passage Comprehension	5-12
CAS-2	Verbal Spatial Relations	5-18
CELF-4	Concepts and Following Directions	5-12
CELF-4	Semantic Relationships	9-21
CELF-4	Sentence Structure	5-8
CELF-4	Understanding Spoken Paragraphs	5-21
CELF-4	Word Structure	5-8
CELF-5	Following Directions	5-21
CELF-5	Linguistic Concepts	5-8
CELF-5	Semantic Relationships	9-21
CELF-5	Sentence Comprehension	5-8
CELF-5	Understanding Spoken Paragraphs	5-21
CELF-5	Word Structure	5-8
CELF-Pre2	Concepts & Following Directions	3-6
CELF-Pre2	Sentence Structure	3-6
CELF-Pre2	Word Structure	3-6
DAB-3	Characteristics	6-14
DAB-3	Story Comprehension	6-14
DAB-4	Listening Comprehension	6-14
DAS-II	Verbal Comprehension	2:6-6
DELV-NR	Syntax	4-9
KBNA	Auditory Comprehension	20-89
KTEA-3	Listening Comprehension	4-25
KTEA-II	Listening Comprehension	4:6-25
LCT-2	Details	6-11
LCT-2	Main Idea	6-11
LCT-2	Reasoning	6-11
LCT-2	Understanding Messages	6-11
NAB	Auditory Comprehension	18-97
NAB	Bill Payment	18-97
NEPSY-II	Comprehension of Instruction	3-16
NEPSY-II		
PLAI 2		
PLAI 2		
TAPS-3		
TNL		
TOLD-P:4		
TTFC-2		
WIAT-III		
WJ III NU		
WJ III NU		
WJ III NU		
WJ IV OL		
WJ IV OL		
WMLS-R:		
WRMT-3		

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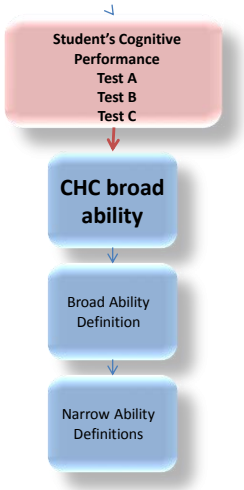

Cognitive Abilities and Processes: A Student's Cognitive Ability and Processing Strengths and Weaknesses Inform Diagnosis and Intervention

A Comprehensive Evaluation for Suspected SLD Ought to Include Measurement of Cognitive Abilities and Processes within at least Seven CHC Domains

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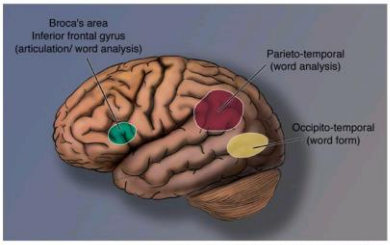
SLD Area	Skill	Etiology	Associated impairments / Cognitive correlates
READING	**Word reading accuracy**	Several cortical and subcortical structures are frequently implicated, including the planum temporale, temporal lobes, corpus callosum, and cerebellum (e.g., Eckert et al., 2003). More recent work appears to identify dysfunction in a left hemispheric network that includes the occipitotemporal region, inferior frontal gyrus, and inferior parietal region of the brain (Silani et al., 2005; Shaywitz et al., 2000; Fletcher, Simos, Papanicolaou, & Denton, 2004; Richlan et al., 2009; Richlan, 2012). Numerous imaging studies have also found that dysfunctional responses in the left inferior frontal and temporo-parietal cortices play a significant role with regard to phonological deficits (Skeide et al., 2015). Family and genetic factors have long been identified as crucial in dyslexia, with some researchers suggesting that a child with a parent with a reading disability is eight times more likely to be dyslexic compared to the general population (Pennington & Olson, 2005). Certainly, there is converging evidence from family and twin studies demonstrating the heritability and familiality of dyslexia (Grigorenko, 2001). Recently, genetic linkage studies have also identified several susceptibility genes for reading disabilities. These include sites on chromosomes 1, 2, 3, 4, 6, 11, 15, and 18, with one of the most commonly identified genetic locus being on chromosome 6 (Grigorenko, 2005; Paracchini et al., 2007; Scerri & Schulte-Korne, 2010; Scerri et al., 2011; Skeide et al., 2015). Shared environmental factors include language and literacy environment during childhood (Wadsworth et al., 2000), quality of reading instruction.	**Phonological awareness** – primary cognitive correlate; the metacognitive understanding that words have internal structures based on phonemes (Fletcher et al., 2007; Melby-Lervåg, Lyster, & Hulme, 2012; Willcutt et al., 2013). When this awareness is impaired, word recognition is delayed and fluency and comprehension skills are consequently affected. **Rapid naming** – some researchers have found that phonological awareness and rapid letter naming both uniquely predict word recognition skills (Schatschneider, Fletcher, Francis, Carlson, & Foorman, 2004; Wagner, Torgesen, & Rashotte, 1994; Wagner, Torgesen, Rashotte, & Hecht, 1997). However, a meta-analysis of studies examining the relationship between rapid naming and dyslexia found little evidence to support a central and persistent deficit in naming speed in individuals with the disorder (Vukovic & Siegel, 2006). On the other hand, there are findings to suggest that phonological awareness and rapid naming, although correlated, are distinct variables and contribute uniquely to word recognition (Petrill, Deater-Deckard, Thompson, DeThorne, & Schatschneider, 2006). **Phonological memory** – working memory for verbal and sound-based information has also been found to be significantly related to word recognition, although it may not uniquely contribute when phonological processing is accounted for (Melvy-Lervag, Lyster, & Hulme, 2012; Schatschneider et al., 2004; Wagner et al., 1997; Willcutt et al., 2013).

Neural Systems for Reading



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SLD Area	Skill	Etiology	Associated impairments / Cognitive correlates
	Reading rate or fluency	Brain regions activated are similar to the network implicated in word reading, but additional activation is observed in areas involved in eye movement and attention (Jones, Ashby, & Branigan, 2013). Further, there is also evidence for increased activation in the left occipitotemporal region, in particular the occipitotemporal sulcus, which is important for rapid processing of letter patterns (Shaywitz et al., 2004; Dehaene & Cohen, 2011). Some studies have found increased activation in this region when normal reading automaticity is disrupted (Benjamin & Gaab, 2012). While limited, there is evidence of genetic influences specific to rapid naming and reading, suggesting that RAN may be etiologically distinct from phonological awareness (Byrne et al., 2005; Compton et al., 2001; Petrill et al., 2006). Genetic linkage studies have identified susceptibility genes for fluency, namely chromosome 2 (Raskind et al., 2005).	**Rapid automatized naming (RAN)** – while the exact relationship between RAN and reading remains unclear, RAN is believed to be one of the best predictors of reading fluency (Georgiou et al., 2008, Tan et al., 2005). The automaticity required to complete RAN tasks is related to the ability to synthesize and automatize letter sequences / words when reading (Norton & Wolf, 2012). There are also a variety of cognitive processes implicated in rapid naming. These include attention, executive functions (i.e., response inhibition, set shifting), lexical retrieval, and processing speed (Moll, Gobel, & Snowling, 2015). **Orthographic processing** – processing of orthographic information (i.e., the ability to process units of words based on visual long-term memory representations) is considered critical in automatic word recognition and consequently plays a crucial role in fluency (O'Brien et al., 2011). This ability is often impaired or underdeveloped in some reading disabled individuals.

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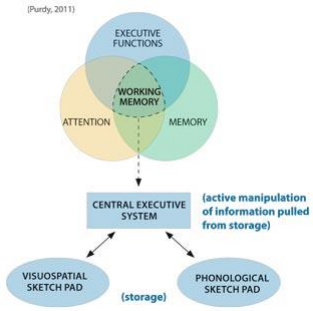
SLD Area	Skill	Etiology	Associated impairments / Cognitive correlates
	Reading comprehension	Several brain regions are often implicated in reading comprehension. These include the anterior temporal lobe, inferior temporal gyrus, inferior frontal gyrus, inferior frontal sulcus, and middle and superior frontal and temporal regions (Ferstl et al., 2008; Gernsbacher & Kaschak, 2003). More recent research has revealed a relationship between listening and reading comprehension and activation along the left superior temporal sulcus, which has referred to by some as the "comprehension cortex" (Berl et al., 2010). However, broader pathways are also activated in reading comprehension, reflecting increased cognitive demand compared to listening comprehension. Genetic factors are said to account for 41 to 76 percent of the variance in comprehension (e.g., Betjemann et al., 2008; Harlaar, Dale, & Plomin, 2007; Petrill et al., 2007). While genetic factors that influence decoding and listening comprehension account for nearly 40 percent of the variance in reading comprehension, there is little evidence for an independent source of genetic influence on comprehension alone (Harlaar et al., 2010; Keenan et al., 2006). However, estimating the genetic influences on reading comprehension may be particularly sensitive to the type of assessment test used (Betjemann, Keenan, Olson, & DeFries, 2011).	**Oral language** – difficulties in reading comprehension are frequently associated with deficits oral language in general, including areas such as vocabulary, morphology, and syntax (Catts et al., 1999; Cutting & Scarborough, 2006; Share & Leikin, 2004; Torgesen, 2000; Willcutt et al., 2013). **Listening comprehension** – several studies have demonstrated that a unique portion of the variance in reading comprehension can be explained by listening comprehension (Cutting & Scarborough, 2006; Kendeou, van den Broek, White, & Lynch, 2009). **Working memory** – comprehension involves holding words and sentences in awareness, while integrating prior knowledge with incoming information (Carretti et al., 2009). Poor comprehenders may have particular difficulty updating / revising information already in working memory (Pelegrina et al., 2014). **Executive functioning** – several executive functions are involved in reading comprehension, including planning, organization, and self-monitoring (Cutting et al., 2009; Locascio, et al., 2010; Sesma et al., 2008). Weaknesses in these executive functions result in difficulties with higher-order comprehension skills such as inferencing, integrating prior knowledge, monitoring comprehension, and adapting to text structure or genre (Fletcher et al., 2007).



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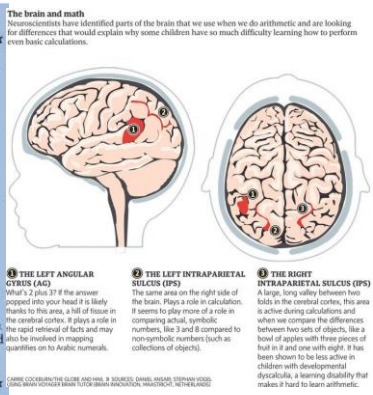
SLD Area	Skill	Etiology	Associated impairments / Cognitive correlates
Math	**Number sense**	Researchers differentiate between the basic processing of numerical information and processes involved in math calculation and problem solving, suggesting that these are both structurally and functionally distinct (Ansari, 2010). The intraparietal sulcus in both hemispheres is widely viewed as crucial in processing and representing numerical quantity, although there may be differences in activation as a function of age (Ansari & Dhital, 2006; Ansari, Garcia, Lucas, Hamon, & Dhital, 2005; Dehaene et al., 2004; Kaufmann et al., 2006; Kucian, von Aster, Loenneker, Dietrich, & Martin, 2008; Price & Ansari, 2013; Mussolin et al., 2010).	**Number representation** – math disorders are associated with weaknesses in fundamental number representation and processing, which manifest in difficulties with quantifying sets without counting, using non-verbal processes to complete simple numerical operations, and estimating the relative magnitude of sets (Geary, 2013; Geary et al., 2012; Geary et al., 2008; Geary et al., 2009; Halberda et al., 2008; Rouder & Geary, 2014; Feigenson, Dehaene, & Spelke, 2004; Mazzocco, Feigenson, & Halberda, 2011). **Number comparison** – several studies have indicated that math difficulties are associated with deficient basic number-processing abilities, such as number comparison (Price & Ansari, 2013). These weaknesses are characterized by increased reaction times and error rates on tasks that involve comparing numbers, with particular difficulty when numbers are closer together (Mussolin, Mejias, & Noel, 2010).
	Memorization of arithmetic facts	A left hemisphere network that includes the precentral gyrus, inferior parietal cortex, and intraparietal sulcus, is often implicated in math fact retrieval (Dehaene & Cohen, 1992; Dehaene & Cohen, 1997; Dehaene et al., 1999). Further, some researchers believe that rote math facts are retrieved from verbal memory, thereby requiring activation of the angular gyrus and other regions associated with linguistic processes (Dehaene, 1992; Dehaene & Cohen, 1995; Dehaene et al., 1999).	**Long-term retrieval** – weak or impaired long-term retrieval of facts and increased error rates in recall (Geary, 1993; Mazzocco, Devlin, & McKenney, 2008). Because fact-retrieval mechanisms fail to develop adequately, fluency is impaired and those with dyscalculia continue to utilize procedural strategies rather than memory-based strategies (Geary, Bow-Thomas, & Yao, 1992; Geary, Hamson, & Hoard, 2000; Jordan & Hanich 2003; Hanich et al., 2001; Landerl, Bevan, & Butterworth, 2004).



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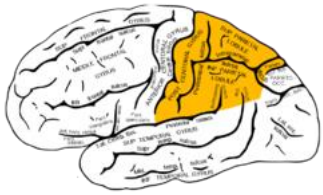
SLD Area	Skill	Etiology	Associated impairments / Cognitive correlates
	Accurate or fluent calculation	Regions of the left fronto-parietal cortex, including the intraparietal sulcus, angular gyrus, and supramarginal gyrus have been consistently associated with math calculation (Ansari, 2008; De Smedt, Holloway, & Ansari, 2011; Dehaene, Molko, Cohen, & Wilson, 2004; Dehaene et al., 2004). However, there is evidence to suggest that math fluency, while related to other skills, may be genetically distinct and may reflect variance above and beyond untimed calculation abilities (Hart, Petrill, & Thompson, 2010; Petrill et al., 2012). The dorsolateral prefrontal cortex has also been found to show increased activation during calculation, implying that executive functioning and working memory may be playing a role in the process (Davis et al., 2009).	**Long-term retrieval** – weak or impaired long-term retrieval of facts and increased error rates in recall (Geary, 1993; Mazzocco, Devlin, & McKenney, 2008). Because fact-retrieval mechanisms fail to develop adequately, fluency is impaired and those with dyscalculia continue to utilize procedural strategies rather than memory-based strategies (Geary, Bow-Thomas, & Yao, 1992; Geary, Hamson, & Hoard, 2000; Jordan & Hanich 2003; Hanich et al., 2001; Landerl, Bevan, & Butterworth, 2004). **Rapid naming** – the rate of access to information in long-term storage is believed to affect calculation fluency (D'Amico & Passolunghi, 2009). Some studies have found that math disorders are associated with deficits in rate of access of numerical information alone (e.g., D'Amico & Guarnera, 2005), while others have demonstrated that rate of access to both numerical and non-numerical information is impaired (e.g., Temple & Sherwood, 2002). **Processing speed** – there is a body of evidence to support the contribution of processing speed in math calculation fluency; however, the relationship remains unclear, as processing speed is often highly related to working memory and general intelligence (Berg, 2008; Bull & Johnston, 1997; Geary, 2011; Mazzocco & Rasanen, 2013; Willcutt et al., 2013).



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SLD Area	Skill	Etiology	Associated impairments / Cognitive correlates
	Math Problem Solving	As mentioned above, the intraparietal sulcus is often identified as a neural correlate of math disorders. However, it is likely that an entire network of brain regions is implicated, as the intraparietal sulcus plays a role in a variety of cognitive processes involved in math achievement (Szucs & Goswami, 2013). It has been suggested that the parietal network is involved in manipulating numerical quantities (Lemer et al., 2003). Further, some studies have found that individuals with dyscalculia have structural abnormalities in the parietal cortex (Rotzer et al., 2008; Rykhlevskaia et al., 2009). Prevalence of math disabilities is about 10 times higher in those with family members who had math disabilities (Shalev et al., 2001). Twin studies suggest a moderate genetic influence, with some studies finding additive genetic influences shared between math calculation and problem solving and several working memory components (Kovas et al., 2007; Lukowski et al., 2014). Environmental factors, including motivation, emotional functioning (e.g., math anxiety), and suboptimal or inadequate teaching may also contribute to math difficulties (Szucs & Goswami, 2013; Vukovic et al., 2013). Further, math achievement in particular may be associated with cultural or gender-based attitudes that may be transmitted in the family environment (e.g., Chiu & Klassen, 2010; Gunderson et al., 2011).	**Working memory** – because mathematical reasoning relies on concurrently retaining multiple pieces of information while performing one or more procedures or mental operations, working memory is often implicated. Those with math difficulties tend to struggle with holding information in working memory, updating or revising the information, and tracking or monitoring the process, resulting in difficulties in sequencing, increased errors in counting, and other procedural errors (Geary, 2003; Lukowski et al., 2014; Pelegrina et al., 2014; Peng & Fuchs, 2014; Raghubar, Barnes, & Hecht, 2010; Swanson & Jerman, 2006; Willcutt et al., 2013). **Visual-spatial ability** – visual-spatial skills, such visual perception, spatial reasoning, and mental rotation, have been found to influence math performance (Gunderson et al., 2012). Weaknesses in these may present as difficulties with representing numbers and aligning numerals, and problems in areas such as geometry or fractions (Geary, 2004; Swanson & Jerman, 2006). **Attention and executive functioning** – math difficulties often reflect weaknesses in executive functioning skills, such as set shifting and cognitive inhibition (D'Amico & Passolunghi, 2009; van der Sluis, de Jong, & van der Leij, 2004; Willcutt et al., 2013). Further, poor attentional control (i.e., difficulty ignoring irrelevant information and focusing on goal-relevant information) is often observed (Geary, 2013).

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SLD Area	Skill	Etiology	Associated impairments / Cognitive correlates
Written Expression	**Spelling accuracy**	Functional neuroimaging studies have provided substantial evidence for the role of the ventral-temporal inferior frontal gyrus and the posterior inferior frontal gyrus in spelling (Rapp et al., 2015; van Hoorn et al., 2013). Other areas that have been identified include the left ventral cortex, bilateral lingual gyrus, bilateral fusiform gyrus (Planton et al., 2013; Purcell et al., 2014; Richards et al., 2005; Richards et al., 2006). However, many of these regions have also been associated with reading and are not distinct to spelling / writing disorders. There is evidence that links spelling to a region of chromosome 15 (Schulte-Korne, 2001), although this locus has also been reported in dyslexia (Grigorenko, 2005).	**Phonological processing** – phonological awareness is a significant predictor of spelling achievement (Caravolas, Hulme, & Snowling, 2001; Cornwall, 1992; Holm, Farrier, & Dodd, 2008; Skeide et al., 2015; Yeong, Fletcher, & Bayliss, 2014). Weaknesses in this area may manifest as poor segmentation of words into phonemes, poor sequencing of sounds, and omission or addition of sounds (Berninger, 1999). **Orthographic processing / orthographic coding** – effective spelling involves storing and retrieving commonly occurring letter patterns in visual and motor memory; these skills are often impaired in poor spellers (Caravolas, Hulme, & Snowling, 2001; Ehri, 2014; Yeong, Fletcher, & Bayliss, 2014). **Motor skills** – poor spelling is often accompanied by underlying skill deficits in areas such as fine-motor control, motor planning, orthographic motor coordination, and visual-motor integration (Christensen, 2004; Daly, Kelley, & Krauss, 2003; Feder & Majnemer, 2007).
	Grammar and punctuation	With regard to English grammar, some researchers distinguish between the mental lexicon (i.e., memorized associations) and mental grammar (i.e., language rules and structure) and posit that each has distinct neural correlates (Pinker, 1994). There is some evidence to support this view, with data indicating that the mental lexicon involves left temporal and temporo-parietal regions, whiles the mental grammar recruits a system that includes left frontal regions (Ullman et al., 2005).	**Long-term memory** – it has been suggested that some components of long-term storage, in particular procedural and declarative memory, may be involved in grammar; however, much of this research has focused on children with language impairments (Conti-Ramsden, Ullman, & Lum, 2015; Hedenius, et al., 2011).

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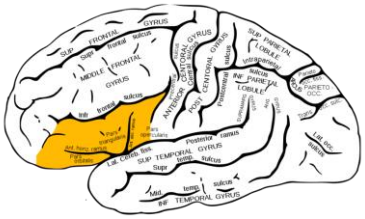

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SLD Area	Skill	Etiology	Associated impairments / Cognitive correlates
	Clarity of written expression	Neural correlates of writing are less understood, but some studies have suggested that the cerebellum and parietal cortex, particularly the left superior parietal lobe, may be involved (Katanoda et al., 2001; Magrassi et al., 2010). In addition, the frontal lobes have also been implicated and are considered crucial in planning, brainstorming, organizing, and goal setting (Shah et al., 2013). While there is a significant genetic component involved in the development of writing skills, this etiology is often shared with a broad variety of reading and language skills (Olson et al., 2013).	**Working memory** – a substantial body of research has highlighted the role of working memory in written expression, as text generation requires the coordination of multiple processes, such as synthesizing multiple ideas, retrieving grammar rules from long-term storage, and ongoing self-monitoring (Berninger, 1999; Bourke et al., 2013; Hooper et al., 2002; McCutchen, 1996). **Attention and executive functioning** – a variety of executive functions, including attention, planning, self-monitoring have been implicated in written expression (Altemeier, Jones, Abbott, & Berninger, 2006; Graham, Gillespie, & McKeown, 2013; Graham & Harris, 2005; Hooper et al., 2002; Mason, Harris, & Graham, 2011; Reiter, Tucha, & Lange, 2005; Rosenblum et al., 2009; Troia & Graham, 2002). **Language** – level of knowledge of syntax, morphology, semantics, vocabulary has a significant impact on text generation ability (Dockrell, Lindsay, & Connelly, 2009; Fey, Catts, Proctor-Williams, Tomblin, & Zhang, 2004; Olinghouse & Wilson, 2013). Language impairments are associated with higher rates of grammatical errors, less lexical diversity, and poorer overall content (Fey et al., 2004; Mackie & Dockrell, 2004).

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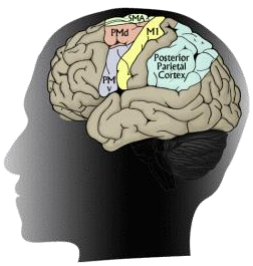

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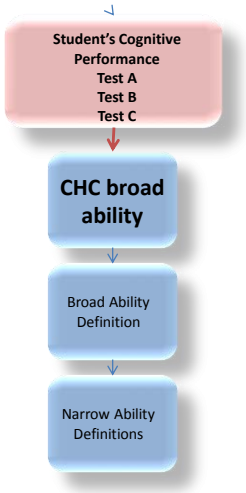
Strategies, Techniques, Evidence-based Programs, and Supports (STEPS)



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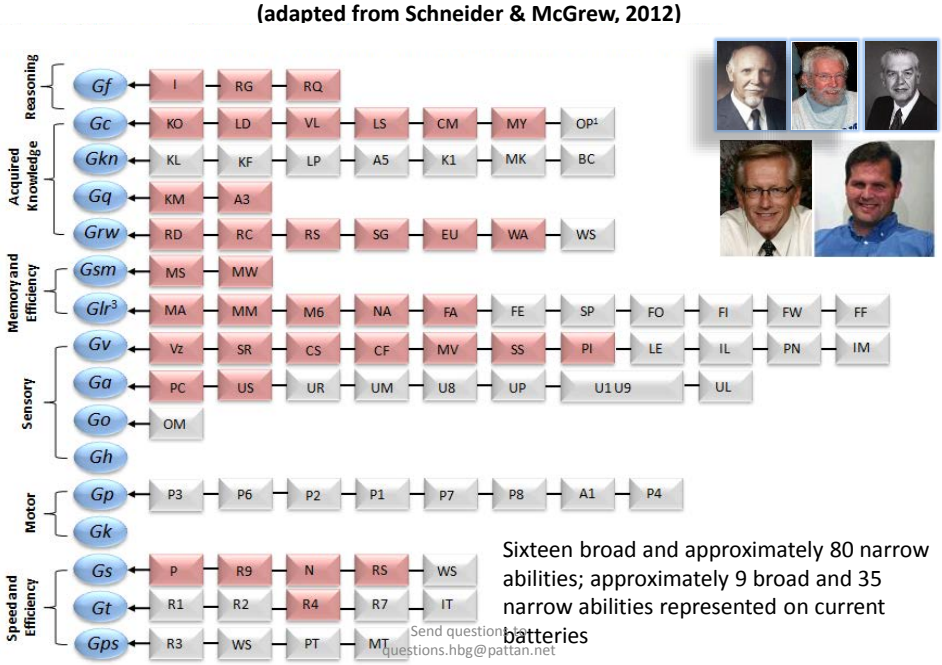
Current and Expanded Cattell-Horn-Carroll (CHC) Model of Cognitive Abilities
(adapted from Schneider & McGrew, 2012)



Sixteen broad and approximately 80 narrow abilities; approximately 9 broad and 35 narrow abilities represented on current batteries

Summary of Relations between CHC Abilities and Specific Areas of Academic Achievement
(Berninger, 2013; Flanagan et al., 2006, 2013; McDonough, et al., 2016; McGrew & Wendling, 2010; McGrew et al., 2014)

	Reading Achievement	Math Achievement	Writing Achievement
Gf	Inductive (I) and general sequential reasoning (RG) abilities play a moderate role in **reading comprehension**. Executive functions, such as planning, organization, and self-monitoring are also important.	**Reasoning inductively and deductively with numbers (RQ) is very important for math problem solving at all ages.** Executive functions, such as set shifting and cognitive inhibition are also important.	Inductive (I) and general sequential reasoning abilities (RG) are consistently related to **written expression** at all ages. Executive functions, such as attention, planning, and self-monitoring are also important.
Gc	**Language development (LD), lexical knowledge (VL), and listening ability (LS) are important at all ages for reading acquisition and development. These abilities become increasingly important with age.** Oral Language, Listening Comprehension, and EF (planning, organization, self-monitoring) also important for **reading comprehension.**	**Language development (LD), lexical knowledge (VL), and listening abilities (LS) are important at all ages. These abilities become increasingly important with age.** Number representation (e.g., quantifying sets without counting, estimating relative magnitude of sets) and number comparisons related to overall **Number Sense**.	**Language development (LD), lexical knowledge (VL), and general information (K0) are important primarily after about the 2nd grade. These abilities become increasingly important with age.** Level of knowledge of syntax, morphology, semantics, and VL has a significant impact on clarity of **written expression** and text generation ability.
Gwm	Memory span (MS) and **working memory capacity (WM) or** attentional control, **Gwm important for overall reading success.** Phonological memory or WM for verbal and sound-based information may also be important.	Memory span (MS) and **working memory capacity (WM) or** attentional control, **Gmw important for math problem solving** and overall success in math.	Memory span (MS) is important to writing, especially **spelling** skills whereas working memory has shown relations with advanced writing skills (e.g., **written expression**; synthesizing multiple ideas, ongoing self-monitoring). Gmw important for overall writing success.
Gv	Orthographic Processing (often measured by tests of perceptual speed that use orthographic units as stimuli) – **reading rate and fluency.**	Visualization (VZ), including mental rotation, is important primarily for higher level (e.g., geometry, calculus) and **math problem solving**.	Orthographic Processing (often measured by tests of perceptual speed that use orthographic units as stimuli) - **spelling**
Ga	**Phonetic coding (PC) or "phonological awareness/processing" is very important during the elementary school years for the development of basic reading skills.** Phonological memory or WM for verbal and sound-based information may also be important.		**Phonetic coding (PC) or "phonological awareness/processing" is very important during the elementary school years for both basic writing skills and written expression (primarily before about grade 5).**
Glr	**Naming facility (NA) or "rapid automatic naming" (also called speed of lexical access) is very important during the elementary school years for reading rate and fluency.** Associative memory (MA) is also important.	Naming Facility (NA; or speed of lexical access); Associative Memory (MA) – **memorization and rapid retrieval of basic math facts; accurate and fluent calculation.**	Naming facility (NA) or "rapid automatic naming" **(also called speed of lexical access)** has demonstrated relations with written expression, primarily **writing fluency**. Storing and retrieving commonly occurring letter patterns in visual and motor memory are needed for **spelling**.
Gs	**Perceptual speed (P) abilities are important during all school years, particularly the elementary school years.**	**Perceptual speed (P) important during all years, especially the elementary school years for math calculation fluency.**	**Perceptual speed (P) abilities are important during all school years for basic writing and related to all ages for written expression.**

What is Fluid Reasoning (Gf)?

Fluid Reasoning (*Gf*) refers to a type of thinking that an individual may use when faced with a relatively new task that cannot be performed automatically.

- forming and recognizing concepts (e.g., how are a dog, cat, and cow alike?)
- identifying and perceiving relationships (e.g., sun is to morning as moon is to *night*)
- drawing inferences (e.g., after reading a story, answering the question, "What will John do next?")
- reorganizing or transforming information (e.g., selecting one of several pictures to complete a puzzle).

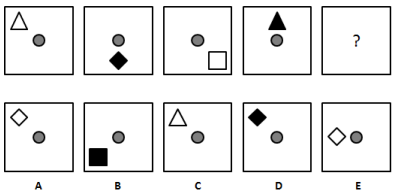
Fluid Reasoning (Gf)

Broad Ability	Definition
Fluid Reasoning (Gf)	The deliberate but flexible control of attention to solve novel, "on-the-spot" problems that cannot be performed by relying exclusively on previously learned habits, schemas, and scripts.

Induction (I)	The ability to observe a phenomenon and discover the underlying principles or rules that determine its behavior.
General Sequential Reasoning (RG)	The ability to reason logically, using known premises and principles.
Quantitative Reasoning (RQ)	The ability to reason, either with induction or deduction, with numbers, mathematical relations, and operators.

Induction (I)		Age Range
CAS-2	Matrices	5-18
CTONI-2	Geometric Analogies	6-89
CTONI-2	Geometric Categories	6-89
CTONI-2	Pictorial Analogies	6-89
CTONI-2	Pictorial Categories	6-89
DAS-II	Matrices	3:6-17
DAS-II	Picture Similarities	2:6-6
D-KEFS	Sorting Test: Free Sorting	8-89
D-KEFS	Sorting Test: Sort Recognition	8-89
D-KEFS	Twenty Questions Test	8-89
KABC-II	Pattern Reasoning	7-18
KBIT-2	Matrices	4-90
Leiter-3	Classification and Analogies	3-75
NAB	Categories	18-97
NEPSY-II	Animal Sorting	7-16
RAIT	Sequences	10-75
SB5	Nonverbal Fluid Reasoning	2-85+
SB5	Verbal Fluid Reasoning	2-85+
SHIPLEY-2	Abstractions	7-89
TONI-4	Test of Nonverbal Intelligence – 4th Edition	6-90
TVCF	Classification	8-89
WAIS-IV	Matrix Reasoning	16-90
WASI-2	Matrix Reasoning	6-90
WECH	Matrix Reasoning	4-90
WISC-IV	Matrix Reasoning	6-16
WISC-IV	Picture Concepts	6-16
WISC-V	Matrix Reasoning	6-16
WISC-V	Picture Concepts	6-16
WJ III NU COG	Concept Formation	4-90+
WJ IV COG	Concept Formation	2-80+
WNV	Matrices	4-21
WPPSI-III	Matrix Reasoning	4-7:3
WPPSI-IV	Matrix Reasoning	4-7:7

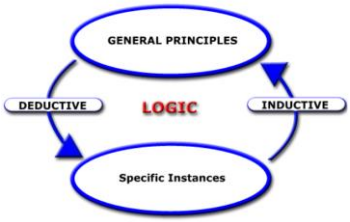
Task Example: An examinee is presented with a certain pattern of related stimuli and must select one of several stimuli that would complete or continue the pattern.



33 Subtests Measure Induction (Gf – I)

Information from: *Cross-Battery Assessment Software System* (X-BASS)

General Sequential Reasoning (RG)		Age Range
CTONI-2	Geometric Sequences	6-89
CTONI-2	Pictorial Sequences	6-89
D-KEFS	Word Context Test	8-89
KABC-II	Story Completion (7-18 years)	7-18
KBNA	Conceptual Shifting	20-89
Leiter-3	Sequential Order	3-75
Leiter-3	Visual Patterns	3-75
NNAT-2	Naglieri Nonverbal Ability Test	5-17
PLAI 2	Reasoning	3-5
RAIT	Nonverbal Analogies	10-75
RIAS	Odd-Item Out	3-94
WISC-V	Figure Weights	6-16
WJ III NU COG	Analysis-Synthesis	4-90+
WJ IV COG	Analysis-Synthesis	5-80+



14 Subtests Measure General Sequential Reasoning or Deduction (Gf – RG)

Task Example: An examinee is presented with an incomplete logic puzzle and must deduce the missing components following careful analysis of the presented stimuli.

Send questions to questions.hbg@pattan.net

Information from: *Cross-Battery Assessment Software System* (X-BASS)

Quantitative Reasoning (RQ)		Age Range
DAB-I	Math Reasoning	13-17
DAS-II	Sequential & Quantitative Reasoning	7-17
KM3	Applied Problem Solving	5-21
KTEA-3	Math Concepts & Application	4-25:11
RAIT	Quantitative Reasoning	10-75
SB5	Nonverbal Quantitative Reasoning	2-85+
SB5	Verbal Quantitative Reasoning	2-85+
WAIS-IV	Figure Weights	16-90
WIAT-III	Math Problem Solving	4-50
WJ III NU ACH	Applied Problems	2-90+
WJ III NU ACH	Quantitative Concepts	2-90+
WJ III NU ACH Form C	Applied Problems	2-90+
WJ III NU DS	Number Matrices	4-90+
WJ III NU DS	Number Series	4-90+
WJ IV ACH	Number Matrices	5-80+
WJ IV ACH	Applied Problems	2-80+
WJ IV COG	Number Series	5-80+

Measures of Quantitative Reasoning are about evenly distributed across cognitive and achievement batteries

Task Example: An examinee is presented with an incomplete series of related numbers and must select the number(s) that best complete the series.

2, 4, 12, 48, 240, 1440, ___ ___

Describe the Pattern:

2, 6, 12, 20, 30, 42, 56, ___ ___

Describe the Pattern:

1, 8, 27, 64, 125, 216, 343, ___

Describe the Pattern:

0, 3, 8, 15, 24, 35, 48, ___ ___

Describe the Pattern:

17 Subtests Measure Quantitative Reasoning (Gf – RQ)

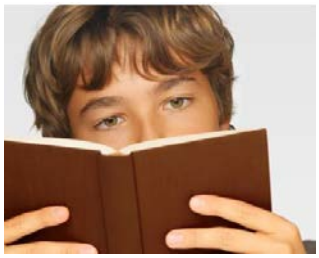
Send questions to questions.hbg@pattan.net

Information from: *Cross-Battery Assessment Software System* (X-BASS)

Relations between Gf and Reading Achievement

Gf – Induction (I) and general sequential reasoning (RG) play a moderate role in ***reading comprehension***

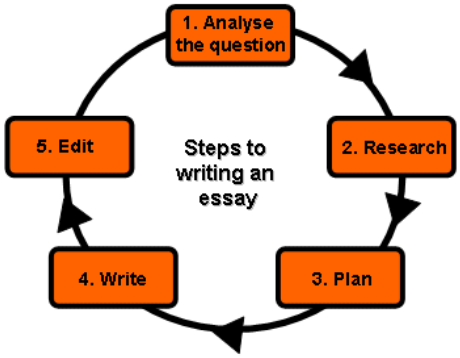
Executive functions* – *planning, organization, and self-monitoring are also important



Relations between Gf and Math and Writing Achievement

Quantitative Reasoning (RQ) consistently related to math achievement

Executive functions, such as set shifting and cognitive inhibitions are also important



Induction (I) and **General Sequential Reasoning (RG; Deduction)** consistently related to written expression

Executive functions, such as attention, planning, and self-monitoring are also important.

Crystallized Intelligence (Gc)

- a person's knowledge base (or general fund of information) that has built up over time, beginning in infancy.
- your own personal library or everything you know.
- Having well developed or good Crystallized intelligence means that one understands and uses language well, has an average or better vocabulary, has good listening skills, and is able to use language well via verbal expression.

Crystallized Knowledge - Gc

Broad Ability	Definition
Crystallized Intelligence or Crystallized Knowledge (Gc)	The depth and breadth and of knowledge and skills that are valued by one's culture.

General Verbal Information (K0)	The breadth and depth of knowledge that one's culture deems essential, practical, or otherwise worthwhile for everyone to know.
Language Development (LD)	General understanding of spoken language at the level of words, idioms, and sentences.
Lexical Knowledge (VL)	Extent of vocabulary that can be understood in terms of correct word meanings.

Carroll (1993); McGrew (1997); Flanagan, McGrew, & Ortiz (2000); Flanagan, Ortiz, and Alfonso (2013); McGrew and Flanagan (1998); Schneider and McGrew (2012)

General Verbal Information (K0)		Age Range
APAT	Sentence Absurdities	5-12
BSRA-3	Letters	3-6
BSRA-3	Shapes	3-6
KABC-II	Story Completion	5-6
KBNA	Clocks	20-89
KBNA	Orientation	20-89
KBNA	Practical Problem Solving	20-89
KBNA	Praxis	20-89
LPT3	Associations	5-11
LPT3	Attributes	5-11
LPT3	Categorization	5-11
NAB	Judgment	18-97
NAB	Orientation	18-97
NEPSY-II	Body Part Naming and Identification	3-4
NEPSY-II	Clocks	7-16
RIAS	Guess What	3-94
SB5	Nonverbal Knowledge	2-85+
TOC	Abbreviations	6-17
TOC	Signs and Symbols	6-17
WAIS-IV	Comprehension	16-90
WAIS-IV	Information	16-90
WECH	Comprehension	4-90
WECH	Information	2:6-90
WECH	Picture Concepts	4-7:7
WISC-IV	Comprehension	6-16
WISC-IV	Information	6-16
WISC-IV Integrated	Comprehension Multiple Choice	6-16
WISC-IV Integrated	Information Multiple Choice	6-16
WISC-V	Comprehension	6-16
WISC-V	Information	6-16
WJ III NU ACH	Academic Knowledge	2-90+
WJ III NU COG	General Information	2-90+
WJ IV COG	General Information	2-80+
WPPSI-III	Comprehension	4-7:3
WPPSI-III	Information	2:6-7:3
WPPSI-III	Picture Concepts	4-7:3
WPPSI-IV	Comprehension	4-7:7
WPPSI-IV	Information	2:6-7:7
WPPSI-IV	Picture Concepts	4-7:7

Approximately 40 Subtests Measure General Information (Gc – K0)

Task Example: An examinee must provide specific responses to questions of general factual information (e.g., In what direction does the sun set?)

Information from: *Cross-Battery Assessment Software System* (X-BASS)

Language Development (LD)		Age Range
CELF-4	Sentence Assembly	9-21
CELF-Pre2	Word Classes(Receptive,Expressive,Total)	4-6
D-KEFS	Proverb Test: Free Inquiry	16-89
D-KEFS	Proverb Test: Recognition	16-89
ITPA-3	Spoken Vocabulary	5-12
PLAI 2	Reordering	3-5
TACL-4	Elaborated Phrases and Sentences	3-12
TACL-4	Grammatical Phonemes	3-12
TAPS-3	Auditory Reasoning	4-18
TOLD-I:4	Sentence Combining	8-17
TOLD-I:4	Word Ordering	8-17
Word-2	Flexible Word Use	6-17

12 Subtests Measure Language Development (Gc – LD)

The definition of narrow ability LD may appear redundant to a large extent with the definition of the broad ability of Gc. In general, the narrow LD code is reserved for those subtests that require understanding and use of more complex language (e.g., understanding idioms)

Clarification: Language development is an ***intermediate category*** between Gc and more specific-related abilities (e.g., lexical knowledge). It is a label for all language abilities.

Information from: *Cross-Battery Assessment Software System* (X-BASS)

	Lexical Knowledge (VL)	Age Range
AAB	Listening Comprehension: Passages	4-85
APAT	Semantic Relationships	5-12
BBCS-3:R	Direction/Position	3-6
BBCS-3:R	Quantity	3-6
BBCS-3:R	Self/Social Awareness	3-6
BBCS-3:R	Subtests 1-5 (SRC)	3-6
BBCS-3:R	Texture/Material	3-6
BBCS-3:R	Time/Sequence	3-6
BBCS-E	Direction/Position	3-6
BBCS-E	Quantity	3-6
BBCS-E	Self/Social Awareness	3-6
BBCS-E	Subtests 1-5 (SRC)	3-6
BBCS-E	Texture/Material	3-6
BBCS-E	Time/Sequence	3-6
BSRA-3	Colors	3-6
BSRA-3	Size Comparisons	3-6
BVAT-NU	Oral Vocabulary	4-90+
BVAT-NU	Picture Vocabulary	4-90+
BVAT-NU	Verbal Analogies	4-90+
CELF-4	Expressive Vocabulary	5-9
CELF-4	Word Classes-Expressive	5-21
CELF-4	Word Classes-Receptive	5-21
CELF-4	Word Definitions	10-21
CELF-5	Word Classes-Expressive	5-21
CELF-5	Word Classes-Receptive	5-21
CELF-5	Word Definitions	10-21
CELF-Pre2	Basic Concepts	3-4
CELF-Pre2	Expressive Vocabulary	3-6
CREVT-2	Expressive Vocabulary	5-89
CREVT-2	Receptive Vocabulary	4-89
CREVT-3	Expressive Vocabulary	5-89
CREVT-3	Receptive Vocabulary	5-89
DAB-3	Synonyms	6-14
DAB-4	Synonyms	6-14
DAB-I	Word Relationships	13-17
DAS-II	Early Number Concepts	2:6-6
DAS-II	Naming Vocabulary	2:6-6
DAS-II	Verbal Similarities	7-17
DAS-II	Word Definitions	7-17
DWNB	Naming Pictures of Objects	4-90
EOWPVT-4	Expressive One Word Vocabulary Picture Test	2-80+
ERA	Receptive Vocabulary	4-7
ERA	Written Word Vocabulary	4-7
EVT-2	EVT-2 (Form A and B)	2:6-90+
GDRT-2	Listening Vocabulary	6-13
ITPA-3	Spoken Analogies	5-12
ITPA-3	Written Vocabulary	5-12
KABC-II	Expressive Vocabulary	3-18
KABC-II	Riddles	3-18
KABC-II	Verbal Knowledge	3-18
KBIT-2	Riddles	3-18
KBIT-2	Verbal Knowledge	4-90
KBNA	Picture Naming	20-89
KTEA-3	Reading Vocabulary	6-25:11
LCT-2	Vocabulary	6-11
LPT3	Differences	5-11
LPT3	Multiple Meanings	6-11
LPT3	Similarities	5-11
NAB	Naming	18-97
OWLS-II	Listening Comprehension	3-21
PLAI 2	Matching	3-5
PLS-5	Auditory Comprehension	Birth-7
PLS-5	Expressive Communication	0-7
PPVT-4	Peabody Picture Vocabulary Test	2-90+
PTI-2	Verbal Abstractions	3-8
QPRT	Quick Picture Reading Test	8-89
RAIT	Odd-Word Out	10-75
RAIT	Word Opposites	10-75
RIAS	Verbal Reasoning	3-94
ROWPVT-4	Receptive One-Word Picture Vocabulary Test	2-80+
SB5	Verbal Knowledge	2-85
TACL-4	Vocabulary	3-12
TEXL	Vocabulary	3-12
TOAL-4	Spoken Analogies	12-24
TOAL-4	Word Derivations	12-24
TOAL-4	Word Opposites	12-24
TOAL-4	Word Similarities	12-24
TOLD-I:4	Multiple Meanings	8-17
TOLD-I:4	Picture Vocabulary	8-17
TOLD-I:4	Relational Vocabulary	8-17
TOLD-P:4	Oral Vocabulary	4-8
TOLD-P:4	Picture Vocabulary	4-8
TOLD-P:4	Relational Vocabulary	4-8
TOPEL	Definitional Vocabulary	3-5
TOWL-4	Vocabulary	7-17

Information from: *Cross-Battery Assessment Software System* (X-BASS)

VAS	Receptive	3-95
WAIS-IV	Similarities	16-90
WAIS-IV	Vocabulary	16-90
WASI-2	Vocabulary	6-90
WASI-2	Similarities	6-90
WECH	Picture Naming	2:6-7:7
WECH	Receptive Vocabulary	2:6-7:7
WECH	Similarities	4-90
WECH	Vocabulary	4-90
WECH	Word Reasoning	4-16
WIAT-III	Listening Comprehension	4-50
WIAT-III	Oral Expression	4-50
WISC-IV	Similarities	6-16
WISC-IV	Vocabulary	6-16
WISC-IV	Word Reasoning	6-16
WISC-IV Integrated	Picture Vocabulary Multiple Choice	6-16
WISC-IV Integrated	Similarities Multiple Choice	6-16
WISC-IV Integrated	Vocabulary Multiple Choice	6-16
WISC-V	Similarities	6-16
WISC-V	Vocabulary	6-16
WJ III NU ACH	Picture Vocabulary	2-90+
WJ III NU ACH	Reading Vocabulary	5-90+
WJ III NU COG	Verbal Comprehension	2-90+
WJ III NU DRB	Oral Vocabulary	3-90+
WJ III NU DRB	Reading Vocabulary	5-90+
WJ III NU DS	Bilingual Verbal Comprehension (Spanish)	2-90+
WJ IV COG	Oral Vocabulary	4-80+
WJ IV OL	Picture Vocabulary	2-80+
WJ IV ACH	Reading Vocabulary	5-80+
WMLS-R: NU	Picture Vocabulary	2-90+
WMLS-R: NU	Verbal Analogies	2-90+
Word-2	Antonyms	6-17
Word-2	Associations	6-17
Word-2	Definitions	6-17
Word-2	Semantic Absurdities	6-17
Word-2	Synonyms	6-17
WPPSI-III	Picture Naming	2:6-7:3
WPPSI-III	Receptive Vocabulary	2:6-7:3
WPPSI-III	Similarities	4-7:3
WPPSI-III	Vocabulary	4-7:3
WPPSI-III	Word Reasoning	4-7:3
WPPSI-IV	Picture Naming	2:6-3:11
WPPSI-IV	Receptive Vocabulary	2:6-7:7
WPPSI-IV	Similarities	4-7:7
WPPSI-IV	Vocabulary	4-7:7

Over 130 Subtests Measure Vocabulary Knowledge (Gc – VL)

The narrow Gc abilities of General Information (K0), Language Development (LD), and Lexical Knowledge (VL) are measured by *cognitive ability and intelligence batteries*

Task Example: An examinee must provide oral definitions for words of increasing difficulty.

Information from: *Cross-Battery Assessment Software System* (X-BASS)

Crystallized Knowledge – Gc (Continued)

Broad Ability	Definition
Crystallized Intelligence or Crystallized Knowledge (Gc)	The depth and breadth and of knowledge and skills that are valued by one's culture.

Listening Ability (LS)	The ability to understand speech.
Communication Ability (CM)	The ability to use speech to communicate one's thoughts clearly.
Grammatical Sensitivity (MY)	Awareness of the formal rules of grammar and morphology of words in speech.

Carroll (1993); McGrew (1997); Flanagan, McGrew, & Ortiz (2000); Flanagan, Ortiz, and Alfonso (2013); McGrew and Flanagan (1998); Schneider and McGrew (2012)

	Listening Ability (LS)	Age Range
AAB	Listening Comprehension: Words & Sentences	3-85
APAT	Complex Sentences	5-12
APAT	Following Directions	5-12
APAT	Passage Comprehension	5-12
CAS-2	Verbal Spatial Relations	5-18
CELF-4	Concepts and Following Directions	5-12
CELF-4	Semantic Relationships	9-21
CELF-4	Sentence Structure	5-8
CELF-4	Understanding Spoken Paragraphs	5-21
CELF-4	Word Structure	5-8
CELF-5	Following Directions	5-21
CELF-5	Linguistic Concepts	5-8
CELF-5	Semantic Relationships	9-21
CELF-5	Sentence Comprehension	5-8
CELF-5	Understanding Spoken Paragraphs	5-21
CELF-5	Word Structure	5-8
CELF-Pre2	Concepts and Following Directions	3-6
CELF-Pre2	Sentence Structure	3-6
CELF-Pre2	Word Structure	3-6
DAB-3	Characteristics	6-14
DAB-3	Story Comprehension	6-14
DAB-4	Listening Comprehension	6-14
DAS-II	Verbal Comprehension	2:6-6
DELV-NR	Syntax	4-9
KBNA	Auditory Comprehension	20-89
KTEA-II	Listening Comprehension	4-25
KTEA-II	Listening Comprehension	4:6-25
LCT-2	Details	6-11
LCT-2	Main Idea	6-11
LCT-2	Reasoning	6-11
LCT-2	Understanding Messages	6-11
NAB	Auditory Comprehension	18-97
NAB	Bill Payment	18-97
NEPSY-II	Comprehension of Instructions	3-16
NEPSY-II	Theory of Mind	3-16
PLAI 2	Receptive	3-5
PLAI 2	Selective Analysis	3-5
TAPS-3	Auditory Comprehension	4-18
TNL	Narrative Comprehension	5-11
TOLD-P:4	Syntactic Understanding	4-8
TTFC-2	Token Test for Children	3-12
WJ III NU ACH	Oral Comprehension	2-90+
WJ III NU ACH	Understanding Directions	2-90+
WJ III NU DRB	Oral Comprehension	2-90+
WJ IV OL	Oral Comprehension	2-80+
WMLS-R: NU	Understanding Directions	2-90
WRMT-3	Listening Comprehension	4:6-79

Approximately 50 Subtests Measure Listening Ability (Gc – LS)

Task Example: An examinee is presented with an incomplete verbal passage and must provide a word that completes the passage.

Information from: *Cross-Battery Assessment Software System* (X-BASS)

Communication Ability (CM)		Age Range
AAB	Oral Expression	5-85
AAB	Oral Production	5-12
CELF-5	Formulated Sentences	5-21
CELF-4	Formulated Sentences	5-21
DELV-NR	Pragmatics	4-9
KBNA	Picture Description Oral	20-89
KTEA-3	Oral Expression	4-25
KTEA-II	Oral Expression	4:6-25
NAB	Oral Production	18-97
OWLS-II	Oral Expression	3-21
PLAI 2	Expressive	3-5
SPELT-3	Structured Photographic Expressive Language Test	4-9
TNL	Oral Narration	5-11
TOC	Abbreviations	6-17
TOC	Signs and Symbols	6-17

15 Subtests Measure Communication Ability (Gc – CM)

There are over three times as many tests of Listening Ability (Receptive Language) as compared to Communication Ability (Expressive Language)

Task Example: An examinee is presented with a starting stimulus word and must use the word properly in a sentence.

Information from: *Cross-Battery Assessment Software System* (X-BASS)

Grammatical Sensitivity (MY)		Age Range
CELF-5	Sentence Assembly	9-21
DAB-3	Grammatic Completion	6-14
DAB-I	Grammatic Sentences	13-17
DELV-NR	Semantics	4-9
ITPA-3	Morphological Closure	5-12
TEXL	Elaborated Phrases and Sentences	3-12
TEXL	Grammatical Morphemes	3-12
TOAL-3	Sentence Combining	12-24
TOAL-4	Sentence Combining	12-24
TOLD-I:4	Morphological Comprehension	8-17
TOLD-P:4	Morphological Completion	4-8

11 Subtests Measure Grammatical Sensitivity (Gc – MY)

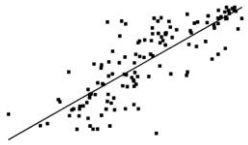
The narrow Gc abilities of Listening Ability (LS), Communication Ability (CM), and Grammatical Sensitivity (MY) are measured primarily by *speech-language batteries (and to a lesser extent, achievement batteries)*

Task Example: An examinee must correctly label the parts of speech contained in a sentence and/or correct those parts of speech that are used incorrectly.

Information from: *Cross-Battery Assessment Software System* (X-BASS)

Relations between Gc Abilities and Reading Achievement

- ***Gc*** – Language development (LD), lexical knowledge (VL), general information (K0) and listening ability (LS) are important at all ages. *These abilities become increasingly important with age*



- *Oral Language, Listening Comprehension, and Executive Functions (planning, organization, self-monitoring) also important for reading comprehension*

Relations between Gc Abilities and Math and Writing Achievement

Language development (LD), lexical knowledge (VL), and listening abilities (LS) are important at all ages. These abilities become increasingly important with age. Number representation (e.g., quantifying sets without counting, estimating relative magnitude of sets) and number comparisons related to overall **Number Sense**.

Language development (LD), lexical knowledge (VL), and general information (K0) are important primarily after about the 2nd grade. These abilities become increasingly important with age. Level of knowledge of syntax, morphology, semantics, and VL has a significant impact on clarity of **written expression** and text generation ability.

Auditory Processing (Ga)

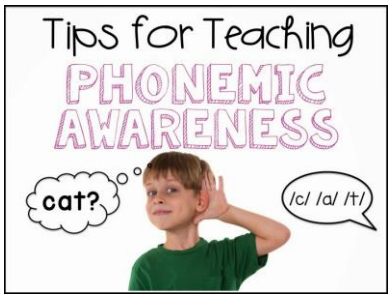
- Auditory processing (Ga) refers to the ability to perceive, analyze, and synthesize a variety of auditory information (e.g., sounds).
  - auditory processing include listening to words with missing letters and saying the correct word (e.g., hearing “olipop” and saying “lollipop”)
  - listening to piano music and identifying the key in which the piece is being played (e.g., C sharp)

Auditory Processing - Ga

Broad Ability	Definition
Auditory Processing (Ga)	The ability to detect and process meaningful nonverbal information in sound.
Phonetic coding (PC)	The ability to hear phonemes distinctly.
Speech Sound Discrimination (US)	The ability to detect and discriminate differences in speech sounds (other than phonemes) under conditions of little distraction or distortion.
Resistance to Auditory Stimulus Distortion (UR)	The ability to hear words correctly even under conditions of distortion or loud background noise.
Memory for Sound Patterns (UM)	The ability to retain (on a short-term basis) auditory events such as tones, tonal patterns, and voices.

Carroll (1993); McGrew (1997); Flanagan, McGrew, & Ortiz (2000); Flanagan, Ortiz, and Alfonso (2013); McGrew and Flanagan (1998); Schneider and McGrew (2012)

Phonetic Coding (PC)		Age Range
AAB	Reading Foundational Skills	3-8
APAT	Phonemic Awareness	5-12
ASA	Blending	5-6
CELF-4	Phonological Awareness	5-12
CELF-Pre2	Phonological Awareness	3-6
CTOPP-2	Blending Nonwords	4-24
CTOPP-2	Blending Words	4-24
CTOPP-2	Elision	4-24
CTOPP-2	Phoneme Isolation	7-24
CTOPP-2	Segmenting Nonwords	7-24
CTOPP-2	Sound Matching	4-6
DAB-3	Phonemic Analysis	6-14
DAS-II	Phonological Processing	5-12
ERA	Phonological Awareness	4-7
GDRT-2	Phonetic Analysis	6-13
GDRT-2	Phonological Awareness	6-13
ITPA-3	Sound Deletion	5-12
KTEA-3	Phonological Processing	4-25
KTEA-II	Phonological Awareness	5-12
NEPSY-II	Phonological Processing	3-16
SCAN-3:A	Filtered Words	13-50
SCAN-3:C	Filtered Words	5-12
TAPS-3	Phonological Blending	4-18
TAPS-3	Phonological	4-18
TAPS-3	Word Discrimination	4-18
TOLD-P:4	Phonemic Analysis	4-8
TOPA-2+	Letter Sounds	5-18
TOPA-2+	Phonological Awareness	5-18
TOPAS	Incomplete Words	5-10
TOPAS	Phoneme Deletion	5-10
TOPAS	Rhyming	5-10
TOPAS	Sound Sequencing	6-10
TOPEL	Phonological Awareness	3-5
WIAT-III	Early Reading Skills	4-9
WJ III NU ACH	Sound Awareness	4-90+
WJ III NU COG	Incomplete Words	6-90+
WJ III NU COG	Sound Blending	2-90+
WJ III NU DRB	Sound Awareness	4-90+
WJ III NU DRB	Sound Blending	2-90+
WJ IV ACH	Word Attack	5-80+
WJ IV COG	Phonological Processing	3-80+
WJ IV OL	Segmentation	3-80+
WJ IV OL	Sound Awareness	3-80+
WJ IV OL	Sound Blending	2-80+
WRMT-3	Phonological Awareness	4:6-8



Task Example: An examinee blends sounds together fluently to form words.

Phonemic Awareness tests are found on cognitive, achievement, speech-language, and special purpose (e.g., reading) tests

45 Subtests Measure Phonetic Coding (Ga – PC)

Information from: *Cross-Battery Assessment Software System* (X-BASS)

Resistance to Auditory Stimulus Distortion (UR)		Age Range
SCAN-3:A	Auditory Figure-Ground at 0db	13-50
SCAN-3:A	Auditory Figure-Ground at 12dB	13-50
SCAN-3:A	Auditory Figure-Ground at 8dB	13-50
SCAN-3:A	Time Compressed Sentences	13-50
SCAN-3:C	Auditory Figure-Ground at 0db	5-12
SCAN-3:C	Auditory Figure-Ground at 12dB	5-12
SCAN-3:C	Auditory Figure-Ground at 8dB	5-12
SCAN-3:C	Time Compressed Sentences	5-12
WJ III NU COG	Auditory Attention	2-90+

Musical Discrimination and Judgment (U1 U9)		Age Range
ASA	Tonal Discrimination	5-6

Speech Sound Discrimination (US)		Age Range
ASA	Rhyming	5-6
ASA	Speech Discrimination in Noise	3-6
ASA	Tonal Patterning	5-6
KBNA	Auditory Signal Detection	20-89
SCAN-3:A	Competing Words-Free Recall	13-50
SCAN-3:C	Competing Words-Free Recall	5-12
TOLD-P:4	Word Discrimination	4-8
WJ III NU DS	Sound Patterns-Music	6-90+
WJ III NU DS	Sound Patterns-Voice	6-90+

Sound Localization (UL)		Age Range
SCAN-3:A	Competing Sentences	13-50
SCAN-3:A	Competing Words-Directed Ear	13-50
SCAN-3:C	Competing Sentences	5-12
SCAN-3:C	Competing Words-Directed Ear	5-12

The majority of Ga narrow abilities are assessed by audiologists

Task Example of UR: An examinee must identify mono- and multisyllabic words while listening to an increasing level of noise presented through earphones.

Information from: *Cross-Battery Assessment Software System* (X-BASS)

Relations between Ga and Reading Achievement

- ***Ga*** – **Phonetic Coding (PC)** or *phonological awareness/ phonological processing* – very important during the elementary school years for development of basic reading skills.
- **Phonological Memory** or WM for verbal and sound-based information may also be important.

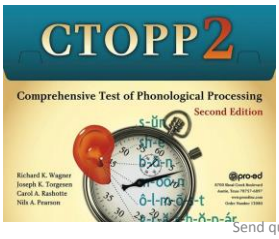
Relations between Ga and Writing Achievement

Phonetic coding (PC) or "phonological awareness/processing" is very important during the elementary school years for both basic writing skills (e.g., spelling) and written expression (primarily before about grade 5).

Most Intelligence and Cognitive Batteries do not Measure Ga

Assessing Phonological Processing Related to Reading

- Examples of assessments of phonological processing directly related to reading:
  - **PAL-II** Rhyming, Syllables, Phonemes, Rimes
  - **KTEA-II** Phonological Awareness Subtest
  - **NEPSY-II** Phonological Processing Subtest
  - **WJ IV** Phonological Processing Test
  - **DAS-II** Phonological Processing Subtest
  - **CTOPP-II** Blending and Segmenting Subtests
  - **FAR** – Feifer Assessment of Reading



Short-term (Working) Memory (Gsm)

- Short-term memory (Gsm) is the ability to hold information in one's mind and then use it within a few seconds.
  - holding a phone number in one's mind long enough to dial it.

  - Working Memory Capacity is also part of the short-term memory system and involves manipulating or transforming information and using it in some way (e.g., saying the months of the year backwards).

Sample Items From The Letter-Number Sequencing Test

	Item	Correct response
LNS-Forward	9 – A – 6 – J – 3 – P	9 – A – 6 – J – 3 – P
LNS-Reordered	E – 1 – R – 8 – M – 7	1 – 7 – 8 – E – M - R

Short-term (Working) Memory (Gsm)

- A child with short-term memory difficulties may have a hard time
  - Following directions
  - understanding long reading passages (e.g., a story read aloud by the teacher)
  - Spelling
  - sounding out words
  - and doing math problems (e.g., remembering the steps required to solve long math problems)
- Children who have difficulties with short-term memory do better when they are *taught how to use strategies* to help them remember things.
  - Mnemonics

Short-Term (Working) Memory – Gsm (Gwm)

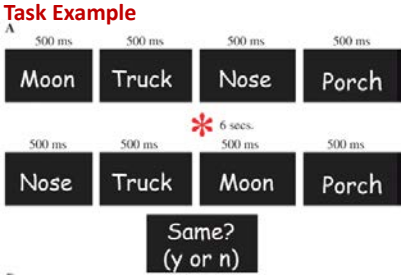
Broad Ability	Definition
Short-Term (Working) Memory (Gsm/Gwm)	The ability to encode, maintain and manipulate information in one's immediate awareness.

Memory Span (MS)	The ability to maintain information in primary memory and immediately reproduce the information in the same sequence in which it was represented.
Working Memory Capacity (MW)	The ability to direct the focus of attention to perform relatively simple manipulations, combinations, and transformations of information within primary memory, while avoiding distracting stimuli and engaging in strategic/controlled searches for information in secondary memory.

Carroll (1993); McGrew (1997); Flanagan, McGrew, & Ortiz (2000); Flanagan, Ortiz, and Alfonso (2013); McGrew and Flanagan (1998); Schneider and McGrew (2012)

Memory Span (MS)		Age Range
APAT	Sentence Memory	5-12
APAT	Word Sequences	5-12
ASA	Mimicry	3-6
CAS-2	Sentence Repetition	5-7
CAS-2	Visual Digit Span	5-18
CAS-2	Word Series	5-18
CELF-4	Familiar Sequences	5-21
CELF-4	Number Repetition-Forward	5-21
CELF-4	Recalling Sentences	5-21
CELF-5	Recalling Sentences	5-21
CELF-Pre2	Recalling Sentences	3-6
CELF-Pre2	Recalling Sentences in Context	3-6
CTOPP-2	Memory for Digits	4-24
CTOPP-2	Nonword Repetition	4-24
DAS-II	Recall of Digits-Forward	6-17
DWNB	Expressive Speech	4-90+
ITPA-3	Rhyming Sequences	5-12
ITPA-3	Syntactic Sentences	5-12
KABC-II	Hand Movements	3-18
KABC-II	Number Recall	3-18
KABC-II	Word Order	3-18
KBNA	Numbers	20-89
KBNA	Repetition	20-89
Leiter-3	Forward Memory	3-75
NAB	Digits Forward	18-97
NEPSY-II	Repetition of Nonsense Words	5-12
NEPSY-II	Sentence Repetition	3-6
NEPSY-II	List Memory	7-12
NEPSY-II	Word List Interference	7-16.
RIAS	Verbal Memory	3-94
SB5	Nonverbal Working Memory	2-85+
SB5	Verbal Working Memory	2-85+
TAPS-3	Number Memory Forward	4-18.
TAPS-3	Sentence Memory	4-18.
TAPS-3	Word Memory	4-18
TOLD-P:4	Sentence Imitation	4-8
TOMAL-2	Digits Forward	5-59
TOMAL-2	Letters Forward	5-59
TOMAL-2	Manual Imitation	5-59
TOMAL-2	Visual Sequential Memory	5-59
TVPS3	Sequential Memory	4-18
WAIS-IV	Digit Span	16-90
WECH	Digit Span	6-90
WISC-IV	Digit Span	6-16
WISC-IV Integrated	Letter Span	6-16
WISC-IV Integrated	Spatial Span Forward and Backward	6-16
WISC-IV Integrated	Visual Digit Span	6-16
WISC-V	Digit Span Forward	6-16
WISC-V	Picture Span	6-16
WJ III NU COG	Memory for Words	4-90+
WJ III NU DS	Memory for Sentences	6-90+
WJ IV COG	Memory for Words	2-80+
WJ IV COG	Nonword Repetition	3-80+
WJ IV COG	Sentence Repetition	2-80+
WJ IV OL	Sentence Repetition	2-80+
WNV	Spatial Span	8-21
WRAML-2	Finger Windows	5-85+
WRAML-2	Number Letter	5-85+
WRAML-2	Sentence Memory	5-85+

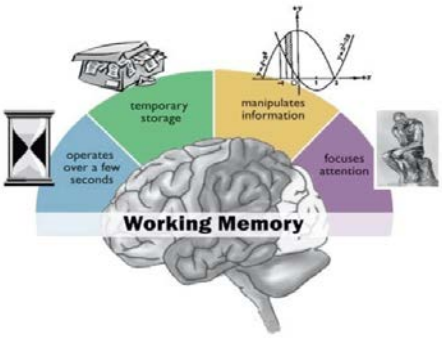
Task Example



Approximately 60 subtests measure Memory Span (Gsm – MS)

Information from: *Cross-Battery Assessment Software System* (X-BASS)

	Working Memory (MW)	Age Range
CAS-2	Sentence Questions	8-18
CELF-4	Number Repetition-Backward	5-21
DAB-4	Mathematics Reasoning	6-14
DAS-II	Recall of Digits-Backwards	5-17
DAS-II	Recall of Sequential Order	5-17
Leiter-3	Attention Divided	3-75
Leiter-3	Reverse Memory	3-75
NAB	Digits Backward	18-97
NEPSY-II	Auditory Attention and Response Set	5-16
NEPSY-II	Inhibition	5-16
SIT	Section D	6-17
SIT	Section E	6-17
TAPS-3	Number Memory Reversed	4-18
TOMAL-2	Digits Backward	5-59
TOMAL-2	Letters Backward	5-59
WAIS-IV	Arithmetic	16-90
WAIS-IV	Letter-Number Sequencing	16-90
WECH	Arithmetic	6-90
WECH	Letter-Number Sequencing	6-90
WISC-IV	Arithmetic	6-16
WISC-IV	Letter-Number Sequencing	6-16
WISC-IV Integrated	Arithmetic Process Approach	6-16
WISC-IV Integrated	Letter-Number Sequencing Process Approach	6-16
WISC-V	Arithmetic	6-16
WISC-V	Digit Span	6-16
WISC-V	Digit Span Backward	6-16
WISC-V	Digit Span Sequencing	6-16
WISC-V	Letter-Number Sequencing	6-16
WJ III NU COG	Auditory Working Memory	4-90+
WJ III NU COG	Numbers Reversed	4-90+
WJ IV COG	Numbers Reversed	3-80+
WJ IV COG	Object-Number Sequencing	5-80+
WJ IV COG	Verbal Attention	3-80+
WJ IV OL	Understanding Directions	2-80+
WMS-4	Symbol Span	16-90
WPPSI-IV	Picture Memory	2:6-7:7
WPPSI-IV	Zoo Locations	2:6-7:7
WRAML-2	Symbolic Working Memory	9-85+
WRAML-2	Verbal Working Memory	9-85+



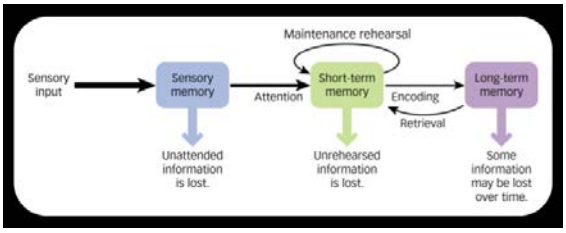
Task Example: An examinee is presented a series of numbers and words in a mixed-up order and is then required to reorder and say the complete list of numbers first in order followed by the words in order.

Approximately 40 subtests measure Working Memory Capacity (Gsm – MW)

Information from: *Cross-Battery Assessment Software System* (X-BASS)

Relations between Gsm and Achievement

- ***Gsm*** – Memory span (MS) and working memory capacity (WM) are important at all ages



Reading

Memory span (MS) and **working memory capacity (WM)** or attentional control**. Gwm important for overall reading** success**. Phonological memory** or WM for verbal and sound-based information may also be important.

Math

Memory span (MS) and **working memory capacity (WM) or** attentional control**. Gmw important for math problem solving** and overall success in math.

Writing

Memory span (MS) is important to writing, especially **spelling** skills whereas working memory has shown relations with advanced writing skills (e.g., **written expression**; synthesizing multiple ideas, ongoing self-monitoring). Gmw important for overall writing success.

Long-term Storage and Retrieval (Glr)

- Refers to an individual's ability to take in and store a variety of information (e.g., ideas, names, concepts) in one's mind and then retrieve it quickly and easily at a later time by using association.

What is Long-term Storage and Retrieval (Glr)?

- This ability does not represent *what* is stored in long-term memory or what you know. Rather, it represents the *process* of storing and retrieving information.
- When someone says, "It's on the tip of my tongue," they are having a hard time retrieving something that they know.

Long-Term Storage and Retrieval - Glr

Broad Ability	Definition
Long-Term Storage and Retrieval (Glr)	The ability to store, consolidate, and retrieve information over periods of time measured in minutes, hours, days, and years.

Learning Efficiency (Carroll's superordinate L1 ability)

Associative Memory (MA)	The ability to remember previously unrelated information as having been paired.
Meaningful Memory (MM)	The ability to remember narratives and other forms of semantically related information.
Free Recall Memory (M6)	The ability to recall lists in any order.

Carroll (1993); McGrew (1997); Flanagan, McGrew, & Ortiz (2000); Flanagan, Ortiz, and Alfonso (2013); McGrew and Flanagan (1998); Schneider and McGrew (2012)

	Associative Memory (MA)	Age Range
APAT	Cued Recall	5-12
KABC-II	Atlantis	3-18
KABC-II	Atlantis Delayed	5-18
KABC-II	Rebus	4-18
KABC-II	Rebus Delayed	5-18
NEPSY-II	Memory For Names	5-16
NEPSY-II	Memory for Names Delayed	5-16
TOMAL-2	Paired Recall	5-59
WISC-IV Integrated	Coding Recall	6-16
WISC-V	Delayed Symbol Translation	6-16
WISC-V	Immediate Symbol Translation	6-16
WISC-V	Recognition Symbol Translation	6-16
WJ III NU COG	Delayed Recall: Visual-Auditory Learning	4-90+
WJ III NU COG	Visual Auditory Learning	4-90+
WJ III NU DS	Delayed Recall: Memory for Names	2-90+
WJ III NU DS	Memory for Names	2-90+
WJ IV COG	Visual-Auditory Learning	2-80+
WMS-4	Verbal Paired Associates I	16-90
WMS-4	Verbal Paired Associates II	16-90
WRAML-2	Sound Symbol	5-8
WRAML-2	Sound Symbol Delay Recall	5-8

21 subtests measure Associative Memory (Glr – MA)

Task Example: An examinee is presented with a set of visual stimuli paired with nonsense words and must correctly identify the nonsense word that had been presented with a certain visual stimulus.

Information from: *Cross-Battery Assessment Software System* (X-BASS)

	Meaningful Memory (MM)	Age Range
APAT	Content Memory Delayed	5-12
APAT	Content Memory Immediate	5-12
KTEA-3	Listening Comprehension	4-25
NAB	Daily Living Memory	18-97
NAB	Story Learning	18-97
NEPSY-II	Narrative Memory	3-16
TOMAL-2	Memory for Stories	5-59
TOMAL-2	Memory for Stories-Delayed	5-59
WJ III NU ACH	Story Recall	2-90+
WJ III NU ACH	Story Recall-Delayed	3-90+
WJ IV ACH	Reading Recall	5-80+
WJ IV COG	Story Recall	2-80+
WMLS-R: NU	Story Recall	2-90+
WMS-4	Logical Memory I	16-90
WMS-4	Logical Memory II Delayed Recall	16-90
WMS-4	Logical Memory II Recognition	16-90
WRAML2	Story Memory	5-85+
WRAML2	Story Memory Recall	5-85+
WRAML2	Story Memory Recognition	5-85+

19 subtests measure Meaningful Memory (Glr – MM)

Task Example: An examinee is presented with a short story and must retell the story as accurately as possible immediately following a single presentation.

Information from: *Cross-Battery Assessment Software System* (X-BASS)

	Free-recall Memory (M6)	Age Range
DAS-II	Recall of Objects-Delayed	4-17
DAS-II	Recall of Objects-Immediate	4-17
KBNA	Word Lists 1	20-89
KBNA	Word Lists 2	20-89
NAB	List Learning	18-97
NEPSY-II	List Memory Delayed	7-12
NEPSY-II	Memory for Designs Delayed	3-16
NEPSY-II	Memory for Faces Delayed	5-16
TOMAL-2	Object Recall	5-59
TOMAL-2	Visual Selective Reminding	5-59
TOMAL-2	Word Selective Reminding	5-59
TOMAL-2	Word Selective Reminding-Delayed	5-59
WRAML2	Verbal Learning	5-85+
WRAML2	Verbal Learning Recall	5-85+
WRAML2	Verbal Learning Recognition	5-85+

15 subtests measure Free Recall Memory (Glr – M6)

Task Example: An examinee is presented with a series of words and, after they are removed, must recall as many of the words as possible in any order.

Information from: *Cross-Battery Assessment Software System* (X-BASS)

Long-Term Storage and Retrieval – Glr (Cont.)

Broad Ability	Definition
Long-Term Storage and Retrieval (Glr)	The ability to store, consolidate, and retrieve information over periods of time measured in minutes, hours, days, and years.

Retrieval Fluency (or Speed of Lexical Access)

Ideational Fluency (FI)	The ability to rapidly produce a series of ideas, words, or phrases related to a specific condition or object.
Word Fluency (FW)	The ability to rapidly produce words that share a non-semantic feature.
Figural Fluency (FF)	Ability to rapidly draw or sketch as many things (or elaborations) as possible when presented with a non-meaningful visual stimulus (e.g., a set of unique visual elements).
Naming Facility (NA)	The ability to rapidly name pictures, letters or objects that are known to the individual.

Carroll (1993); McGrew (1997); Flanagan, McGrew, & Ortiz (2000); Flanagan, Ortiz, and Alfonso (2013); McGrew and Flanagan (1998); Schneider and McGrew (2012)

Ideational Fluency (FI)		Age Range
AAB	Oral Fluency	4-85
CELF-4	Word Associations	5-21
D-KEFS	Verbal Fluency Test: Category Fluency	8-89
D-KEFS	Verbal Fluency Test: Category Switching	8-89
KTEA-3	Associational Fluency	4-25
KTEA-II	Associational Fluency	4:6-25
NAB	Word Generation	18-97
NEPSY-II	Word Generation	3-16
TVCF	Categorical Fluency	8-89
WJ III NU COG	Retrieval Fluency	6-90+
WJ IV OL	Retrieval Fluency	2-80+

Word Fluency (FW)		Age Range
D-KEFS	Verbal Fluency Test: Letter Fluency	8-89
KBNA	Sequences	20-89
KBNA	Verbal Fluency	20-89
TVCF	Letter Naming	8-89

Figural Fluency (FF)		Age Range
D-KEFS	Design Fluency Test: Empty Dots Only	8-89
D-KEFS	Design Fluency Test: Filled Dots	8-89
D-KEFS	Design Fluency Test: Switching	8-89

11 subtests measure Ideational Fluency (Glr – FI); Less than a handful measure Word Fluency and Figural Fluency

Task Example of FI: An examinee must rapidly name as many kitchen utensils/appliances as s/he can think of within a specified time limit.

Task Example of FW: An examinee must name as many words as s/he can think of that start with the "sh" sound within a specified time limit.

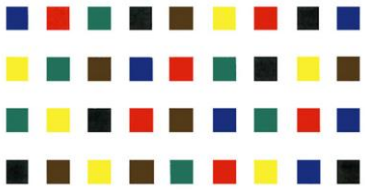
Information from: *Cross-Battery Assessment Software System* (X-BASS)

Naming Facility (NA)		Age Range
CAS-2	Expressive Attention	5-18
CELF-4	Rapid Automatic Naming	5-21
CTOPP-2	Rapid Color Naming	4-6
CTOPP-2	Rapid Digit Naming	4-24
CTOPP-2	Rapid Letter Naming	4-24
CTOPP-2	Rapid Object Naming	4-6
DAS-II	Rapid Naming	5-17
D-KEFS	Color-Word Interference: Color-Naming	8-89
D-KEFS	Color-Word Interference: Inhibition	8-89
D-KEFS	Color-Word Interference: Inhibition/ Switching	8-89
D-KEFS	Color-Word Interference: Word Reading	8-89
ERA	Rapid Orthographic Naming	4-7
GDRT-2	Rapid Naming	6-13
KTEA-3	Letter Naming Facility	5-25
KTEA-3	Object Naming Facility	4-25
KTEA-II	Naming Facility	4:6-25
NEPSY-II	Speeded Naming	5-12
RAN/RAS	Colors	5-18
RAN/RAS	Letters	5-18
RAN/RAS	Numbers	5-18
RAN/RAS	Objects	5-18
RAN/RAS	RAS 2-Set	5-18
RAN/RAS	RAS 3-Set	5-18
WISC-V	Naming Speed Literacy	6-16:11
WISC-V	Naming Speed Color-Object	6-16:11
WISC-V	Naming Speed Size-Color-Object	6-16:11
WISC-V	Naming Speed Letter-Number	6-16:11
WJ III NU COG	Rapid Picture Naming	4-90+
WJ IV OL	Rapid Picture Naming	2-80+
WRMT-3	Rapid Automatic Naming	4-8

Task Examples: Rapid Naming of Letters; Rapid Color Naming

O F N P V D T C H E
Y B A K O E Z L R X
E T H W F M B K A P
B X F R T O S M V C
R A D V S X P E T O
M P O E A N C B K F
C R G D B K E P M A
F X P S M A R D L G
T M U A X S O G P B
H O S N C T K U Z L

Form A



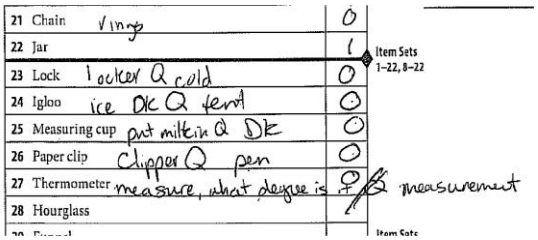
Rapid Color Naming

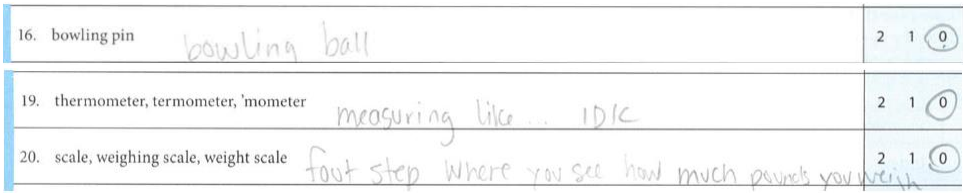
30 subtests measure Naming Facility (Glr – NA)

Information from: *Cross-Battery Assessment Software System* (X-BASS)

Evaluation of *Vocabulary Knowledge - Gc* (Looking for an Exact Word)

- DAS-II Naming Vocabulary = **79**
- CELF-4 Expressive Vocabulary = **75**

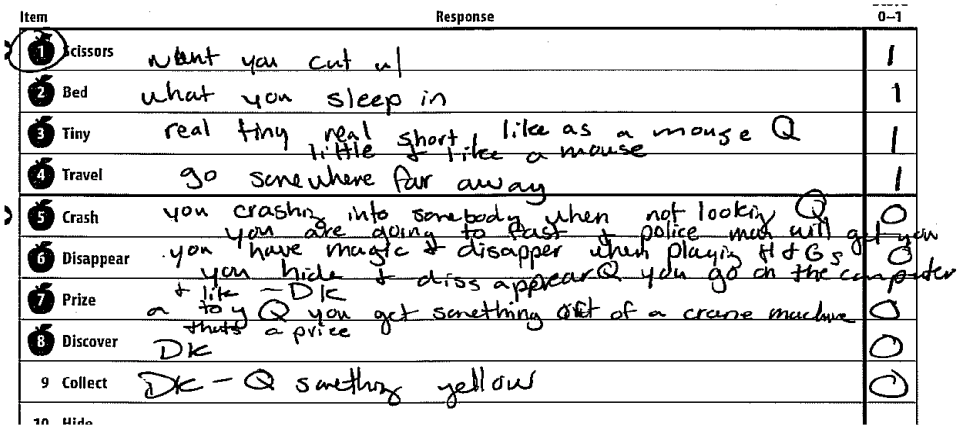




Retrieval Difficulties - Glr

Evaluation of *Vocabulary Knowledge* – Gc (Looking for a Definition of a Word)

- DAS-II Word Definitions = **90**

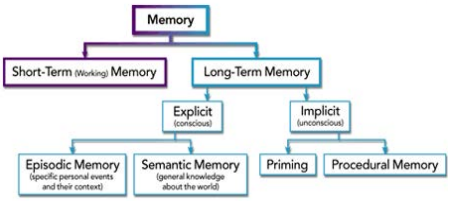


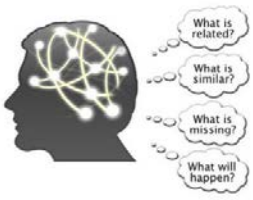
Item	Response	0–1
1 Scissors	want you cut w/	1
2 Bed	what you sleep in	1
3 Tiny	real tiny real little short like as a mouse Q like a mouse	1
4 Travel	go somewhere far away	1
5 Crash	you crashing into somebody when not looking Q you are going to fast & police men will get you	0
6 Disappear	you have magic & disapper when playing H&GS you hide & diss appear Q you go on the computer	0
7 Prize	a toy Q you get something out of a crane machine & like – DK that's a price	0
8 Discover	DK	0
9 Collect	DK – Q something yellow	0
10 Hide		

Broader parameters; Can give enough information to show understanding

Relations between Glr and Achievement

Glr – Naming facility (NA) or "rapid automatic naming" is very important during the elementary school years. Associative memory (MA) also appears to be important in the early elementary school years.





Reading

Naming facility (NA) or "rapid automatic naming" (RAN) (also called speed of lexical access) is very important during the elementary school years for reading rate and fluency. Associative memory (MA) is also important.

Math

Naming Facility (NA; or speed of lexical access); Associative Memory (MA) – **memorization and rapid retrieval of basic math facts; accurate and fluent calculation.**

Writing

Naming facility (NA) or "rapid automatic naming" (also called speed of lexical access) has demonstrated relations with written expression, primarily **writing fluency**. Storing and retrieving commonly occurring letter patterns in visual and motor memory are needed for **spelling**.

Schneider and McGrew's CHC-based Conceptualization of Gsm and Glr with WISC-V Subtests and Corresponding Memory Construct Highlighted

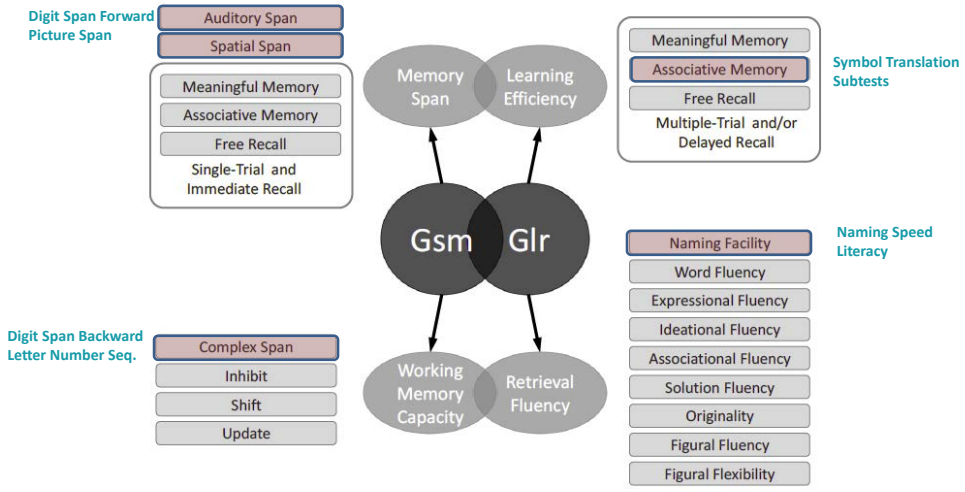


Figure 4.6. Conceptual map of memory-related abilities in CHC theory.

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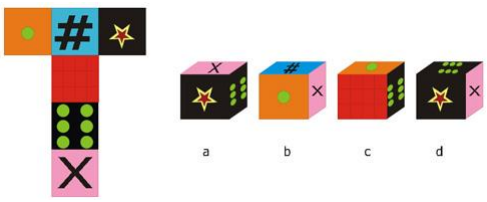
In Flanagan & Harrison (2012). *Contemporary Intellectual Assessment: Theories, Tests, and Issues (3rd ed.).* New York: Guilford.

Visual Processing (Gv)

- Visual processing (Gv) is an individual's ability to think about visual patterns (e.g., what is the shortest route from your house to school?) and visual images (e.g., what would this shape look like if I turned it upside down?).



Mental Rotation: Cube Folding Puzzle

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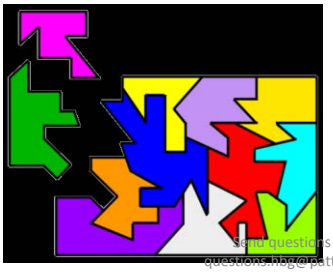
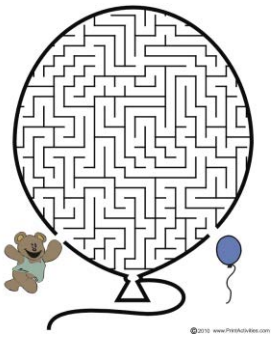
Visual Processing (Gv)

- This type of ability also involves generating, perceiving, and analyzing visual patterns and visual information.
  - putting puzzles together
  - completing a maze (such as the ones often seen on children's menus in restaurants)
  - interpreting a graph or chart.
- Important when doing advanced math (e.g., geometry and calculus).





Visual Processing - Gv

Broad Ability	Definition
Visual Processing (Gv)	The ability to make use of simulated mental imagery (often in conjunction with currently perceived images) to solve problems.
Visualization (Vz)	The ability to perceive complex patterns and mentally simulate how they might look when transformed (e.g., rotated, changed in size, partially obscured).
Speeded Rotation (SR)	The ability to solve problems quickly by using mental rotation of simple images.
Closure Speed (CS)	The ability to quickly identify a familiar meaningful visual object from incomplete (e.g., vague, partially obscured, disconnected) visual stimuli, without knowing in advance what the object is.
Visual Memory (MV)	The ability to remember complex visual images over short periods of time (less than 30 seconds).
Spatial Scanning (SS)	The ability to visualize a path out of a maze or a field with many obstacles.

Carroll (1993); McGrew (1997); Flanagan, McGrew, & Ortiz (2000); Flanagan, Ortiz, and Alfonso (2013); McGrew and Flanagan (1998); Schneider and McGrew (2012)

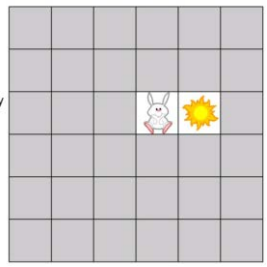
Visualization (Vz)		Age Range
AAB	Pre-Writing Skills	3-8
Beery VMI	Beery-VMI	2-99
Beery VMI	Visual Perception	2-99
DAS-II	Copying	3:6-6
DAS-II	Matching Letter-Like Forms	4-6
DAS-II	Pattern Construction	2:6-17
D-KEFS	Tower	8-89
DTVP-3	Copying	4-12
DTVP-3	Form Constancy	4-12
DTVP-3	Visual Closure	4-12
DTVP-A	Copying	11-74
DTVP-A	Form Constancy	11-74
DTVP-A	Visual Closure	11-74
FRTVNMI	Full Range Test of Visual Motor Integration	5-74
KABC-II	Block Counting	5-18
KABC-II	Pattern Reasoning	5-6
KABC-II	Triangles	3-18
KABC-II	Conceptual Thinking	3-6
KBNA	Complex Figure 1	20-89
Leiter-3	Form Completion	3-75
MFVPT-3	Motor Free Visual Perception Test	4-70
NAB	Design Construction	18-97
NAB	Figure Drawing	18-97
NAB	Map Reading	18-97
NAB	Visual Discrimination	18-97
NEPSY-II	Arrows	5-16
NEPSY-II	Block Construction	3-6
NEPSY-II	Design Copying	3-16
PTI-2	Form Discrimination	3-8
PTONI	Primary Test of Nonverbal Intelligence	3-9
SB5	Nonverbal Visual-Spatial Processing	2-85+
SB5	Verbal Visual-Spatial Processing	2-85+
SHIPLEY-2	Block Patterns	7-89
TVMS-3	Test of Visual Motor Skills-Third Edition	3-90+
TVPS3	Form Constancy	4-18
TVPS3	Spatial Relations	4-18
TVPS3	Visual Closure	4-18
TVPS3	Visual Discrimination	4-18
WAIS-IV	Block Design	16-90
WAIS-IV	Visual Puzzles	16-90
WASI-2	Block Design	6-90
WECH	Block Design	2:6-90
WISC-IV	Block Design (BD) and BD No Time Bonus	6-16
WISC-IV Integrated	Block Design Multiple Choice (BDMC) and BDMC No Time Bonus	6-16
WISC-IV Integrated	Block Design Process Approach	6-16
WISC-V	Block Design	6-16
WISC-V	Block Design No Time Bonus	6-16
WISC-V	Block Design Partial Score	6-16
WISC-V	Visual Puzzles	6-16
WJ III NU COG	Spatial Relations	6-90+
WJ III NU DS	Block Rotation	6-90+
WJ IV COG	Visualization	2-80+
WMS-4	Visual Reproduction II Copy	16-90
WNV	Picture Arrangement	8-21
WPPSI-III	Block Design	2:6-7:3
WPPSI-IV	Block Design	2:6-7:7

Task Example: An examinee is required to assemble blocks to match a picture or standing model.

Approximately 60 subtests measure Visualization (Gv – Vz)

Information from: *Cross-Battery Assessment Software System* (X-BASS)

Visual Memory (MV)		Age Range
CAS-2	Figure Memory	5-18
DAS-II	Recall of Designs	7-17
DAS-II	Recognition of Pictures	2:6-13:5
KABC-II	Face Recognition	3-5
KBNA	Complex Figure 2	20-89
KBNA	Picture Recognition	20-89
KBNA	Spatial Location	20-89
NAB	Dots	18-97
NAB	Driving Scenes	18-97
NAB	Shape Learning	18-97
NEPSY-II	Memory for Designs	3-16
NEPSY-II	Memory for Faces	5-16
RIAS	Nonverbal Memory	3-94
SIT	Section A	6-17
SIT	Section B	6-17
TOMAL-2	Abstract Visual Memory	5-59
TOMAL-2	Facial Memory	5-59
TOMAL-2	Memory for Location	5-59
TVPS3	Visual Memory	4-18
WJ III NU COG	Picture Recognition	6-90+
WJ IV COG	Picture Recognition	2-80+
WMS-4	Designs I	16-69
WMS-4	Designs II Delayed Recall	16-69
WMS-4	Designs II Recognition	16-69
WMS-4	Spatial Addition	16-69
WMS-4	Visual Reproduction I	16-90
WMS-4	Visual Reproduction II Delayed Recall	16-90
WMS-4	Visual Reproduction II Recognition	16-90
WNV	Recognition	4-7
WRAML2	Design Memory	5-85+
WRAML2	Design Memory Recognition	5-85+
WRAML2	Picture Memory	5-85+
WRAML2	Picture Memory Recognition	5-85+



Task Example: An examinee is required to reproduce or recognize a previously presented visual stimulus that has been removed.

Approximately 30 subtests measure Visual Memory (Gv – MV)

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Information from: *Cross-Battery Assessment Software System* (X-BASS)

Flexibility of Closure (CF)		Age Range
DTVP-3	Figure-Ground	4-12
DTVP-A	Figure Ground	11-74
Leiter-3	Figure Ground	3-75
NEPSY-II	Geometric Puzzles	3-16
NEPSY-II	Picture Puzzles	7-16
NEPSY-II	Route Finding	5-12
RIAS	What's Missing	3-94
TVPS3	Figure Ground	4-18
WAIS-IV	Picture Completion	16-90
WISC-IV	Picture Completion	6-16
WECH	Picture Completion	6-90
WPPSI-III	Picture Completion	4-7:3

Closure Speed (CS)		Age Range
KABC-II	Gestalt Closure	5-18
WECH	Object Assembly	2:6-7:7
WJ III NU DS	Visual Closure	6-90+
WNV	Object Assembly	4-7
WPPSI-III	Object Assembly	2:6-7:3
WPPSI-IV	Object Assembly	2:6-7:7

Spatial Scanning (SS)		Age Range
KABC-II	Rover	5-18
NAB	Mazes	18-97
WISC-IV Integrated	Elithorn Mazes (EM) and EM No Time Bonus	6-16
WJ III NU COG	Planning	6-90+

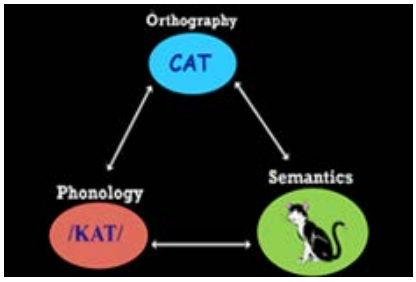
Task Example of CF

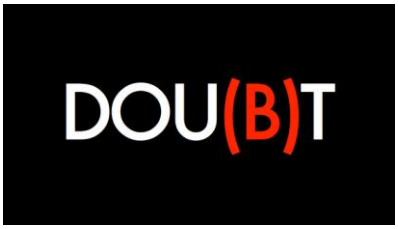
Other Gv narrow abilities are not measured routinely by popular tests of intelligence and cognitive abilities

Information from: *Cross-Battery Assessment Software System* (X-BASS)

Relations between Gv Abilities and Reading Achievement

- *Gv* – Orthographic processing





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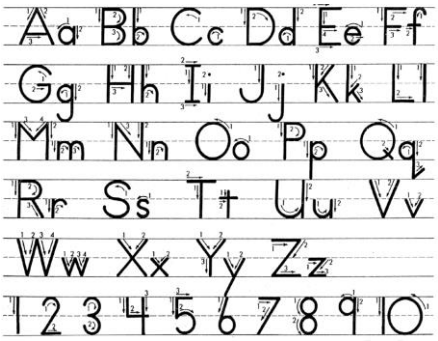
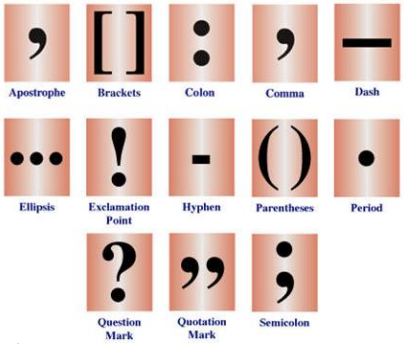
Orthography (Wagner & Barker, 1994)

- The system of marks that make up the English language, including upper and lower case letters, numbers, and punctuation marks





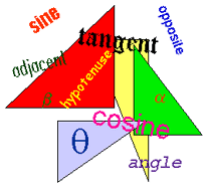
Assessing Visual Processing Related to Reading

- Visual processing must be assessed using *orthography* (letters, words and numbers) rather than abstract designs or familiar pictures

Relationship Between Gv and Achievement

Math

Visualization (VZ), including mental rotation, is important primarily for higher level (e.g., geometry, calculus) and **math problem solving**.

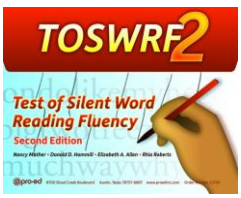


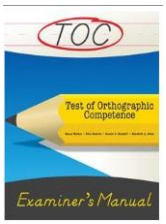
Writing

Orthographic Processing (often measured by tests of perceptual speed that use orthographic units as stimuli) – **spelling.**

Assessing Orthographic Processing Related to Reading

- ***Examples of assessments of orthographic processing directly related to reading:***
  - Test of Silent Word Reading Fluency-2 (TOSWRF-2)
  - Test of Irregular Word Reading Efficiency (TIWRE)
  - Test of Orthographic Competence (TOC)
  - Process Assessment of the Learner (PAL-II)
  - Early Reading Assessment (ERA)
  - Feifer Assessment of Reading (FAR)





Processing Speed (Gs)

- Processing speed (Gs) refers to an individual's ability to perform simple clerical tasks quickly, especially when under pressure to maintain attention and concentration.
- It can also be thought of as how quickly one can think or how quickly one can take simple tests that require simple decisions.
- Involves sustained/focused and selective attention.

Processing Speed - Gs

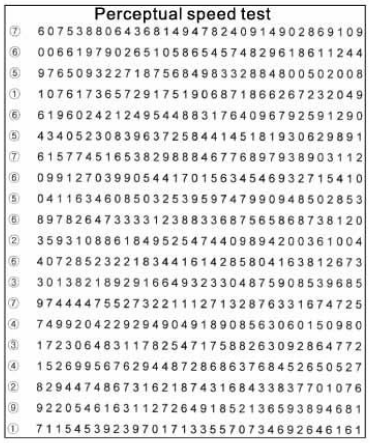
Broad Ability	Definition
Processing Speed (Gs)	The speed at which visual stimuli can be compared for similarity or difference.

Perceptual Speed (P)	The ability at which visual stimuli can be compared for similarity or difference.
Rate-of-Test-Taking (R9)	The speed and fluency with which simple cognitive tests are completed.
Number Facility (N)	The speed at which basic arithmetic operations are performed accurately.
Reading Speed (RS)	The rate of reading text with full comprehension.
Writing Speed (WS)	The rate at which words or sentences can be generated or copied.

Carroll (1993); McGrew (1997); Flanagan, McGrew, & Ortiz (2000); Flanagan, Ortiz, and Alfonso (2013); McGrew and Flanagan (1998); Schneider and McGrew (2012)

Perceptual Speed (P)		Age Range
CAS-2	Number Detection	4-80+
CAS-2	Planned Connections	5-18
CAS-2	Planned Number Matching	5-18
CAS-2	Receptive Attention	5-18
CTMT	Trial 2	11-74
CTMT	Trial 3	11-74
CTMT	Trial 4	11-74
CTMT	Trial 5	11-74
DAS-II	Speed of Information Processing	6-17
D-KEFS	Trail Making Test: Number-Letter Switching	8-89
D-KEFS	Trail Making Test: Visual Scanning	8-89
ERA	Silent Orthographic Efficiency	4-7
KBNA	Symbol Cancellation	20-89
Leiter-3	Attention Sustained	6-25
Leiter-3	Nonverbal Stroop	3-75
NAB	Numbers and Letter	18-97
TOC	Grapheme Matching	6-17
TOC	Letter Choice	6-17
WAIS-IV	Cancellation	8-89
WAIS-IV	Symbol Search	16-90
WECH	Cancellation	4-69
WECH	Symbol Search	4-90
WISC-IV	Cancellation	6-16
WISC-IV	Symbol Search	6-16
WISC-V	Cancellation	6-16
WISC-V	Cancellation Random	6-16
WISC-V	Cancellation Structured	6-16
WISC-V	Symbol Search	6-16
WJ III NU COG	Decision Speed	4-90+
WJ III NU COG	Pair Cancellation	4-90+
WJ III NU COG	Visual Matching	2-90+
WJ III NU DS	Cross Out	4-90+
WJ IV COG	Letter-Pattern Matching	5-80+
WJ IV COG	Number-Pattern Matching	4-80+
WJ IV COG	Pair Cancellation	3-80+
WPPSI-III	Symbol Search	4-7:3
WPPSI-IV	Bug Search	4-7:7
WPPSI-IV	Cancellation	4-7:7

Task Example: An examinee must rapidly view rows of stimuli and cross out those stimuli that are similar in each row within a specified time limit.



Approximately 40 subtests measure Perceptual Speed (Gs – P)

Information from: *Cross-Battery Assessment Software System* (X-BASS)

Number Facility (N)		Age Range
KTEA-3	Math Fluency	20-89
WIAT-III	Math Fluency - Addition	6-19
WIAT-III	Math Fluency - Multiplication	8-19
WIAT-III	Math Fluency - Subtraction	6-19
WISC-V	Naming Speed Quantity	6-16
WJ III NU ACH	Math Fluency	7-90
WJ III NU ACH Form C	Math Fluency	7-90
WJ IV ACH	Math Facts Fluency	4-90+

Rate of Test-taking (R9)		Age Range
CAS-2	Planned Codes	5-18
CTMT	Trial 1	11-74
D-KEFS	Trail Making Test: Letter Sequencing	8-89
D-KEFS	Trail Making Test: Number Sequencing	8-89
DTVP-A	Visual Motor Search	11-74
DTVP-A	Visual-Motor Speed	11-74
GORT-5	Rate	6-23
KTEA-3	Decoding Fluency	8-25:11
KTEA-3	Word Recognition Fluency	6-25:11
NEPSY-II	Design Fluency	5-12
TVCF	Trails C	8-89
WAIS-IV	Coding	16-90
WECH	Coding	6-90
WISC-IV Integrated	Coding Copying	6-16
WISC-IV	Coding	6-16
WISC-V	Integrated Coding Copying	6-16
WISC-V	Coding	6-16
WNV	Coding	4-21
WPPSI-III	Coding	4-7:3
WPPSI-IV	Animal Coding	4-7:7

8 subtests measure Number Facility (Gs – N)
20 measure Rate of Test Taking (Gs – R9)

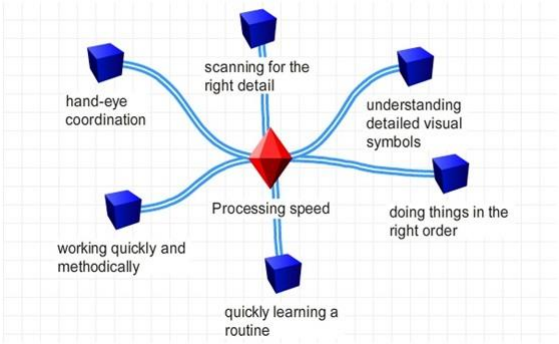
Task Example of R9: An examinee is required to pair numbers with symbols according to a presented key as rapidly as possible.

Reading Speed (RS) and Writing Speed (WS) are narrow Gs abilities that are listed under the academic (IDEA) areas of Reading Fluency and Written Expression in the Cross-Battery Assessment approach, respectively.

Information from: *Cross-Battery Assessment Software System* (X-BASS)

Relations between Gs and Achievement

- ***Gs*** – Perceptual speed (P) abilities are important during all school years, particularly the elementary school years.



Perceptual speed (P) abilities are important during all school years, particularly the elementary school years.

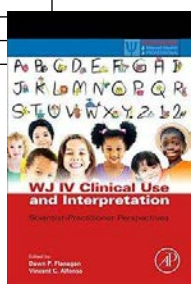
Perceptual speed (P) important during all years, especially the elementary school years for math calculation fluency.

Perceptual speed (P) abilities are important during all school years for basic writing and related to all ages for written expression.

Summary of cognitive-achievement relations across academic skills using the WJ IV

	g	*Gc*	*Gwm*	*Gs*	*Gf*	RQ	*Gv*	*Ga*	LA
Direct Effects of Broad CHC Abilities on Narrow Achievement Factors									
Basic Reading Skills		**Strong**		Moderate				**Strong**	
Reading Rate		Moderate		**Strong**					*Weak*
Reading Comprehension		*Weak*		*Weak*	**Strong**			**Strong**	
Basic Writing Skills		**Strong**	**Strong**	Moderate					
Written Expression				**Strong**			**Strong**		*Weak*
Math Calculation Skills		*Weak*		**Strong**		**Strong**			
Math Applications		**Strong**		Moderate	*Weak*	Moderate	Moderate		
Direct Effects of Broad CHC Abilities on Specific Achievement Tests									
Word Attack								**Strong**	
Word Reading Fluency				**Strong**					
Passage Comprehension		**Strong**							
Reading Vocabulary		**Strong**							
Sentence Writing Fluency				**Strong**					
Writing Samples	**Strong**								
Math Facts Fluency				**Strong**					
Applied Problems						**Strong**			

Note: Only achievement tests with direct influences from broad CHC abilities are included in the table. It is important to note that the indirect influence from *g* was strong across all achievement factors.



Source: **Niileksela, Reynolds, Keith, & McGrew (2016). A special validity study of the WJ IV: Acting on evidence for specific abilities. In D. P. Flanagan & V. C. Alfonso (Eds.), *WJ IV clinical use and interpretation: Scientist-practitioner perspectives*. Academic Press.**

What Combinations of Abilities Are Important for Different Achievements

- Fluid Reasoning – *Gf*
- Crystallized Knowledge – *Gc*
- Short-term Memory – *Gsm*
- Long-term Storage and Retrieval – *Glr*
- Visual Processing – *Gv*
- Auditory Processing – *Ga*
- Processing Speed – *Gs*

Putting the Abilities Together

- Jeopardy Game Show Contestant

- Gc (Gkn)
- Glr/Gs

Putting the Abilities Together

- Quick thinkers; multi-taskers; Fast-paced
  - Emergency Room workers
- Gc (Gkn) + Glr + Gsm-MW + Gs + Gf

Putting the Abilities Together

- Students who Learn Quickly and Excel Academically
  - **Gc** (good fund of knowledge; good vocabulary; communicate well)
  - **Glr** (learning is efficient; info is retrieved fluently)
  - **Gsm + Gf** (able to hold retrieved info; transform it; interact it with new info and draw conclusions based on inductive and deductive reasoning)

See Flanagan, Ortiz, and Alfonso (2013). *Essentials of Cross-Battery Assessment*, 3e

Important Abilities for Learning and Academic Success in Reading

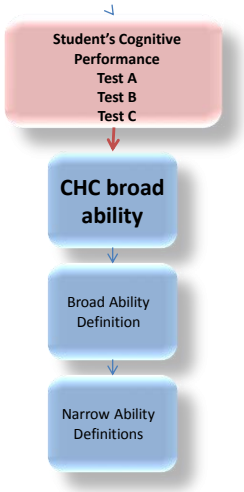
- ***1. Fluid Reasoning (Gf)***
- ***2. Crystallized Knowledge (Gc)***
  - Weaknesses in these abilities *constrain* learning and achievement
- **(Executive Functions** – weaknesses lead to inconsistencies in Learning and Achievement)
- ***3. Short-Term Memory (Gsm) – Working Memory***
- ***4. Long-Term Storage and Retrieval (Glr)***
  - Working Memory, Retrieval Fluency, and Learning Efficiency
  - Weaknesses in these abilities *obstruct* learning and achievement, but can be improved upon, bypassed, or compensated for at least to some degree
- **Important Processes (related to reading)**
  - ***Ga – Phonological Processing (encompasses many skills)***
  - ***Visual Processing/Processing Speed – Orthographic Processing***
    - Train processing deficits to point where they become skill

Important for overall learning and academic success

Important for acquiring basic reading skills

See Flanagan, Ortiz, and Alfonso (2013). *Essentials of Cross-Battery Assessment*, 3e

Strategies, Techniques, Evidence-based Programs, and Supports (STEPS) 7

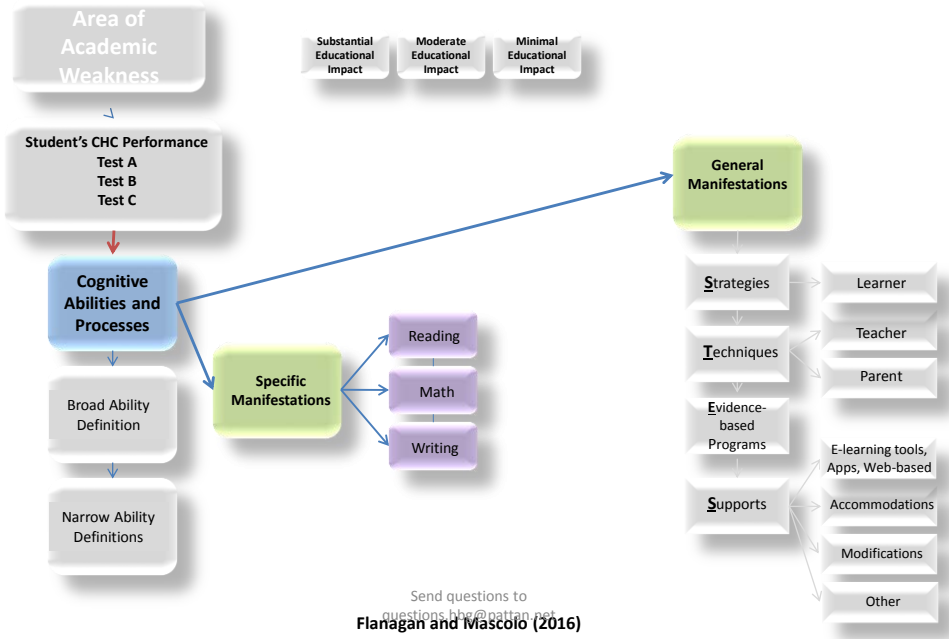


A Student's Cognitive Processing and Ability Strengths and Weaknesses Informs Diagnosis and Intervention

A Comprehensive Evaluation for Suspected SLD Ought to Include Measurement of Cognitive Abilities and Processes within at least Seven CHC Domains

- SLD has neurobiological influences and is defined by specific cognitive processing weaknesses
- Evidence of cognitive-achievement relationships
- **General and Specific Manifestations: Cognitive processing weaknesses manifest in real-world performances (e.g., reading, math, writing)**
- Cognitive processing weaknesses obstruct learning; when identified, steps can be taken to minimize the effects of these weaknesses on the student's ability to access the curriculum
- Some cognitive processes can be remediated

Strategies, Techniques, Evidence-based Programs, and Supports (STEPS)



Flanagan and Mascolo (2016)

Rapid Reference 1.5 General and Specific Manifestations of Fluid Reasoning (Gf) Weaknesses

CHC Broad Cognitive Abilities/ Neuropsychological Functions	Brief Definition	General Manifestations of Cognitive/ Neuropsychological Weakness	Specific Manifestations of Cognitive/ Neuropsychological Weakness
Fluid Reasoning (Gf)	Novel reasoning and problem solving ability to solve problems that are unfamiliar. Processes are minimally dependent on prior learning. Involves manipulating rules, abstracting, generalizing, and identifying logical relationships. Fluid reasoning is evident in inferential reasoning, concept formation, classification of unfamiliar stimuli, categorization, and extrapolation of reasonable estimates in ambiguous situations (Schneider & McGrew, 2012). Narrow Gf abilities include Induction, General Sequential Reasoning (Deduction), and Quantitative Reasoning.	***Difficulties with:*** Higher-level thinking and reasoning Transferring or generalizing learning Deriving solutions for novel problems Extending knowledge through critical thinking Perceiving and applying underlying rules or process(es) to solve problems	***Reading Difficulties:*** Drawing inferences from text Abstracting main idea(s) ***Math Difficulties:*** Reasoning with quantitative information (word problems) Internalizing procedures and processes used to solve problems Apprehending relationships between numbers ***Writing Difficulties:*** Essay writing and generalizing concepts Developing a theme Comparing and contrasting ideas

See Chapter 4 in *Essentials of Cross-Battery Assessment* (Flanagan, Ortiz, & Alfonso, 2013)
See Chapter 1 in *Essentials of Planning, Selecting, and Tailoring Interventions for Unique Learners* (Mascolo, Alfonso, & Flanagan, 2014)

Rapid Reference 1.6 General and Specific Manifestations of Crystallized Intelligence (Gc) Weaknesses

CHC Broad Cognitive Abilities/ Neuropsychological Functions	Brief Definition	General Manifestations of Cognitive/ Neuropsychological Weakness	Specific Manifestations of Cognitive/ Neuropsychological Weakness
Crystallized Intelligence (Gc)	Breadth and depth of knowledge and skills that are valued by one's culture. Developed through formal education as well as general learning experiences. Stores of information and declarative and procedural knowledge. Reflects the degree to which a person has learned practically useful knowledge and mastered valued skills (Schneider & McGrew, 2012). Narrow Gc abilities include General Verbal Information, Language Development, Lexical Knowledge, Listening Ability, Information about Culture, Communication Ability, and Grammatical Sensitivity.	***Difficulties with:*** Vocabulary acquisition Knowledge acquisition Comprehending language or understanding what others are saying Fact-based/informational questions Using prior knowledge to support learning Finding the right words to use/say	***Reading Difficulties:*** Decoding (e.g., word student is attempting to decode is not in his/her vocabulary) Comprehending (e.g., poor background knowledge about information contained in text) ***Math Difficulties:*** Understanding math concepts and the "vocabulary of math" ***Writing Difficulties:*** Grammar (syntax) Bland writing with limited descriptors Verbose writing with limited descriptors Inappropriate word usage ***Language Difficulties:*** Understanding class lessons Expressive language—"poverty of thought"

See Chapter 4 in *Essentials of Cross-Battery Assessment* (Flanagan, Ortiz, & Alfonso, 2013)
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Rapid Reference 1.11 General and Specific Manifestations of Short-Term Memory (Gsm) Weaknesses

CHC Broad Cognitive Abilities/ Neuropsychological Functions	Brief Definition	General Manifestations of Cognitive/ Neuropsychological Weakness	Specific Manifestations of Cognitive/ Neuropsychological Weakness
Short-Term Memory (Gsm)	Ability to hold information in immediate awareness and use or transform it within a few seconds.	***Difficulties with:*** Following multistep oral and written instructions Remembering information long enough to apply it Remembering the sequence of information Rote memorization Maintaining one's place in a math problem or train of thought while writing	***Reading Difficulties:*** Reading comprehension (i.e., understanding what is read) Decoding multisyllabic words Orally retelling or paraphrasing what one has read ***Math Difficulties:*** Rote memorization of facts Remembering mathematical procedures Multistep problems and regrouping Extracting information to be used in word problems ***Writing Difficulties:*** Spelling multisyllabic words Redundancy in writing (word and conceptual levels) Identifying main idea of a story Note-taking

See Chapter 4 in *Essentials of Cross-Battery Assessment* (Flanagan, Ortiz, & Alfonso, 2013)
See Chapter 1 in *Essentials of Planning, Selecting, and Tailoring Interventions for Unique Learners* (Mascolo, Alfonso, & Flanagan, 2014)

Rapid Reference 1.8 General and Specific Manifestations of Long-Term Retrieval (Glr) Weaknesses

CHC Broad Cognitive Abilities/ Neuropsychological Functions	Brief Definition	General Manifestations of Cognitive/ Neuropsychological Weakness	Specific Manifestations of Cognitive/Neuropsychological Weakness
Long-Term Retrieval (Glr)	Ability to store information (e.g., concepts, words, facts), consolidate it, and fluently retrieve it at a later time (e.g., minutes, hours, days, and years) through association. In Glr tasks, information leaves immediate awareness long enough for the contents of primary memory to be displaced completely. In other words, Glr tasks (unlike Gsm tasks) do not allow for information to be maintained continuously in primary memory (Schneider & McGrew, 2012). Glr abilities may be categorized as either "learning efficiency" or "fluency." Learning efficiency narrow abilities include Associative Memory, Meaningful Memory, and Free Recall Memory; fluency narrow abilities involve either the production of ideas (e.g., Ideational Fluency, Associational Fluency), the recall of words (e.g., Naming Facility, Word Fluency), or the generation of figures (e.g., Figural Fluency, Figural Flexibility) (Schneider & McGrew, 2012).	***Difficulties with:*** Learning new concepts Retrieving or recalling information by using association Performing consistently across different task formats (e.g., recognition versus recall formats) Rapid retrieval of information Learning information quickly Paired learning (visual-auditory) Recalling specific information (words, facts) Generating ideas rapidly	***Reading Difficulties:*** Accessing background knowledge to support new learning while reading Slow to access phonological representations during decoding Retelling or paraphrasing what one has read ***Math Difficulties:*** Memorizing math facts Recalling math facts and procedures ***Writing Difficulties:*** Accessing words to use during essay writing Specific writing tasks (compare and contrast; persuasive writing) Note-taking Idea generation/production ***Language Difficulties:*** Expressive—circumlocutions, speech fillers, "interrupted" thought, pauses Receptive—making connections throughout oral presentations (e.g., class lecture)

See Chapter 4 in *Essentials of Cross-Battery Assessment* (Flanagan, Ortiz, & Alfonso, 2013)
See Chapter 1 in *Essentials of Planning, Selecting, and Tailoring Interventions for Unique Learners* (Mascolo, Alfonso, & Flanagan, 2014)

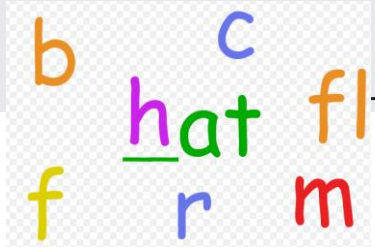
Rapid Reference 1.10 General and Specific Manifestations of Visual Processing (Gv) Weaknesses

CHC Broad Cognitive Abilities/ Neuropsychological Functions	Brief Definition	General Manifestations of Cognitive/ Neuropsychological Weakness	Specific Manifestations of Cognitive/ Neuropsychological Weakness
Visual Processing (Gv)	Ability to analyze and synthesize visual information. The ability to make use of simulated mental imagery (often in conjunction with currently perceived images) to solve problems (Schneider & McGrew, 2012). There are many narrow Gv abilities, some of which include Visualization, Speeded Rotation, Closure Speed, Flexibility of Closure, Visual Memory, and Spatial Scanning.	***Difficulties with:*** Recognizing patterns Reading maps, graphs, charts Attending to fine visual detail Recalling visual information Appreciation of spatial characteristics of objects (e.g., size, length) Recognition of spatial orientation of objects	***Reading Difficulties:*** Orthographic coding (using visual features of letters to decode) Sight-word acquisition Using charts and graphs within a text in conjunction with reading Comprehension of text involving spatial concepts (e.g., social studies text describing physical boundaries, movement of troops along a specified route) ***Math Difficulties:*** Number alignment during computations Reading and interpreting graphs, tables, and charts ***Writing Difficulties:*** Spelling sight words Spatial planning during writing tasks (e.g., no attention to margins, words that overhang a line) Inconsistent size, spacing, position, and slant of letters

See Chapter 4 in *Essentials of Cross-Battery Assessment* (Flanagan, Ortiz, & Alfonso, 2013)
See Chapter 1 in *Essentials of Planning, Selecting, and Tailoring Interventions for Unique Learners* (Mascolo, Alfonso, & Flanagan, 2014)

Rapid Reference 1.7 General and Specific Manifestations of Auditory Processing (Ga) Weaknesses

CHC Broad Cognitive Abilities/ Neuropsychological Functions	Brief Definition	General Manifestations of Cognitive/ Neuropsychological Weakness	Specific Manifestations of Cognitive/ Neuropsychological Weakness
Auditory Processing (Ga)	Ability to analyze and synthesize auditory information. One narrow aspect of Ga is a precursor to oral language comprehension (i.e., parsing speech sounds or Phonetic Coding). In addition to Phonetic Coding, other narrow Ga abilities include Speech Sound Discrimination, Resistance to Auditory Stimulus Distortion, Memory for Sound Patterns (and others related to music).	***Difficulties with:*** Hearing information presented orally, initially processing oral information Paying attention especially in the presence of background noise Discerning the direction from which auditory information is coming Discriminating between simple sounds Foreign-language acquisition	***Reading Difficulties:*** Acquiring phonics skills Sounding out words Using phonetic strategies ***Math Difficulties:*** Reading word problems ***Writing Difficulties:*** Spelling Note-taking Poor quality of writing



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Rapid Reference 1.9 General and Specific Manifestations of Processing Speed (Gs) Weaknesses

CHC Broad Cognitive Abilities/ Neuropsychological Functions	Brief Definition	General Manifestations of Cognitive/ Neuropsychological Weakness	Specific Manifestations of Cognitive/ Neuropsychological Weakness
Processing Speed (Gs)	Speed of processing, particularly when required to focus attention for 1–3 minutes. Usually measured by tasks that require the ability to perform simple repetitive cognitive tasks quickly and accurately. Narrow Gs abilities include Perceptual Speed, Rate-of-Test-Taking, Number Facility, Reading Speed, and Writing Speed (note that the latter two abilities are also listed under other broad CHC domains, including Grw).	***Difficulties with:*** Efficient processing of information Quickly perceiving relationships (similarities and differences between stimuli or information) Working within time parameters Completing simple, rote tasks quickly	***Reading Difficulties:*** Slow reading speed, which interferes with comprehension Need to reread for understanding ***Math Difficulties:*** Automatic computations Computational speed is slow despite accuracy Slow speed can result in reduced accuracy due to memory decay ***Writing Difficulties:*** Limited output due to time factors Labored process results in reduced motivation to produce ***Language Difficulties:*** Cannot retrieve information quickly—slow, disrupted speech; cannot get out thoughts quickly enough Is slow to process incoming information, puts demands on memory store that can result in information overload and loss of meaning

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Rapid Reference 1.12 Manifestations of Attention Weaknesses and Examples of Recommendations and Interventions

CHC Broad Cognitive Abilities/ Neuropsychological Functions	Brief Definition	General Manifestations of Cognitive/ Neuropsychological Weakness	Specific Manifestations of Cognitive/ Neuropsychological Weakness
Attention	Attention is a complex and multifaceted construct used when an individual must focus on certain stimuli for information processing. In order to regulate thinking and to complete tasks of daily living such as schoolwork, it is necessary to be able to attend to both auditory and visual stimuli in the environment. Attention can be viewed as the foundation of all other higher-order processing. Attention can be divided into five subareas: selective/focused attention, shifting attention, divided attention, sustained attention, and attentional capacity (Miller). It is important to identify the exact nature of the attentional problem(s) prior to selecting an intervention, teaching strategies, modifying the curriculum, or making accommodations,	Easily distracted Lacks attention to detail; makes careless mistakes Difficulty discerning demands of a task (e.g., where to begin or how to get started) May only be able to attend to task in short intervals Difficulty changing activities Difficulty applying a different strategy when task demands change Difficulty attending to more than one thing or task at a time Cannot perform well when faced with multiple stimuli or an abundance of detail	***Reading Difficulties:*** Loses his or her place easily Easily distracted while reading Does not pick up important details in text ***Math Difficulties:*** Does not consistently attend to math signs Frequent mistakes on word problems ***Writing Difficulties:*** Has difficulty completing long assignments; difficulty following timelines

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Rapid Reference 1.13 Manifestations of Executive Functioning Weaknesses and Examples of Recommendations and Interventions

CHC Broad Cognitive Abilities/Neuropsychological Functions	Brief Definition	General Manifestations of Cognitive/ Neuropsychological Weakness	Specific Manifestations of Cognitive/ Neuropsychological Weakness
Executive Functioning	*Executive functioning is often understood as two broadly conceptualized areas that are related to the brain's frontal lobes: cognitive control and behavioral/ emotional control. The cognitive* aspects of executive functioning include concept generation (Gc/ Glr); problem solving (Gf); attentional shifting (attention; Gs); planning; organizing; working memory (Gsm); and retrieval fluency (Glr). The *behavioral/emotional* aspects of executive functioning relate to the inhibitory controls of behavior (e.g., impulsivity, regulation of emotional tone, etc.) (see Miller, 2010).	***Difficulty with:*** Learning new activities, generating concepts, and solving problems Identifying goals and setting goals Planning (e.g., begins project without necessary materials; does not allocate sufficient time to complete task) Sequencing (e.g., may skip steps in multistep problems) Prioritizing (e.g., not sure what's important when taking notes) Organization (e.g., loses important papers; fails to turn in completed work; creates unrealistic schedule) Initiation (e.g., has difficulty getting started on tasks, assignments, etc.) Pace (e.g., often runs out of time on seatwork and exams; has difficulty completing homework due to unrealistic timeline) Shifting between activities flexibly; coping with unforeseen events Self-monitoring (e.g., doesn't check to insure that each step was completed; doesn't check work before submitting it) Emotional control (e.g., may exhibit inappropriate or over-reactive response to situations)	***Reading Difficulties:*** Sequencing; telling a story chronologically Prioritizing; extracting main idea and other important information Problem solving; drawing inferences from text ***Math Difficulties:*** Sequencing; remembering order of operations Prioritizing; figuring out what is importing when solving word problems Shifting; attending to math signs on a page ***Writing Difficulties:*** Generating ideas to write about Sequencing a story Prioritizing main events in a story

Source: Adapted from Leslie E. Packer (Schoolbehavior.com); see also Packer and Pruitt's book, *Challenging Kids, Challenged Teachers* (Woodbine Press, 2010),

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You May Consider Using a Parent/Teacher Form to Assist in Documenting General and Specific Manifestations of Cognitive Weaknesses

General and Specific Manifestations of Cognitive Ability Weaknesses in SLD Identification

A specific learning disability (SLD) involves the presence of a cognitive processing weakness in one or more areas that is empirically or logically related to a documented academic weakness. While the primary form of data used to document cognitive ability weaknesses is standardized test scores, establishing ecological validity for a cognitive deficit involves the organization and analysis of additional data. For example, additional data that may be evaluated to support the presence of a cognitive ability weakness include information from behavior rating scales, parent and teacher interviews, classroom observations, prior evaluations, work sample analysis, and/or interviews with current or past teachers, counselors, and other paraprofessionals who have worked with the student. Below is a list of general and specific ways in which cognitive ability deficits manifest in real-world performance, specifically academic performance.

Directions: Complete the checklist below for any area identified as a cognitive ability weakness via standardized testing. Use the following codes next to a check-marked item to denote documentation source (P) = Parent; (T) = Teacher; (O) = Observations; (R) = Records review.[i] More than one code may be used for a check-marked item.

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Fluid Reasoning (Gf) (Check All that Apply):

Refers to a type of thinking that an individual may use when faced with a relatively new task that cannot be performed automatically. This type of thinking includes such things as forming and recognizing concepts (e.g., how are a dog, cat, and cow alike?), identifying and perceiving relationships (e.g., sun is to morning as moon is to *night*), drawing inferences (e.g., after reading a story, answering the question, "What will John do next?"), and reorganizing or transforming information (e.g., selecting one of several pictures to complete a puzzle). Overall, this ability can be thought of as a *problem-solving* type of intelligence. Problem-solving is important for reading comprehension (e.g., making inferences from text), math (e.g., figuring out how to set up a math problem by using information provided in a word problem), and writing, (e.g., writing a persuasive essay).

General Manifestations

- ☐ Higher-level thinking and reasoning
- ☐ Deriving solutions for novel problems
- ☐ Transferring or generalizing learning
- ☐ Extending knowledge through critical thinking
- ☐ Perceiving and applying underlying rules and processes to solve problems

Specific Manifestations

Reading Difficulties

- ☐ Drawing inferences from text
- ☐ Abstracting main ideas
- ☐ Making predictions

Math Difficulties

- ☐ Reasoning with quantitative information (word problems)
- ☐ Internalizing procedures and processes used to solve problems
- ☐ Apprehending relationships between numbers

Writing Difficulties

- ☐ Essay writing and generalizing concepts
- ☐ Developing a theme
- ☐ Comparing and contrasting ideas

NOTES:_____

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Crystallized Intelligence (Gc) (Check All that Apply):

Refers to an individual's knowledge base (or general fund of information) that has built up over time, beginning in infancy. It is like your own personal library or everything you know. Crystallized intelligence involves knowledge of one's culture (e.g., who is the President of the United States?) as well as verbal- or language-based knowledge that has been developed during general life experiences, and formal schooling (e.g., understanding words and their meaning; understanding street signs, knowledge of current events and the history of the United States). Having well developed or good Crystallized Intelligence means that one understands and uses language well, has an average or better vocabulary, has good listening skills, and is able to use language well via verbal expression.

General Manifestations

- ☐ Vocabulary acquisition
- ☐ Knowledge acquisition
- ☐ Finding the right words to use/say
- ☐ Using prior knowledge to support learning
- ☐ Fact-based/informational questions
- ☐ comprehending language or understanding what others are Saying

Specific Manifestations

Reading Difficulties

- ☐ Decoding (e.g., word student is attempting to decode is not in his/her vocabulary)
- ☐ Comprehending (e.g., poor background knowledge about information contained in text)

Math Difficulties

- ☐ Understanding math concepts and the "vocabulary of math"

Writing Difficulties

- ☐ Grammar (syntax)
- ☐ Bland writing with limited descriptors
- ☐ Verbose writing with limited descriptors
- ☐ Inappropriate word usage

Language Difficulties

- ☐ Understanding class lessons
- ☐ Expressive language – "poverty of thought"

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NOTES:_____

Long-Term Storage and Retrieval (Glr) (Check All that Apply):

Refers to an individual's ability to take in and store a variety of information (e.g., ideas, names, concepts) in one's mind and then retrieve it quickly and easily at a later time by using association (e.g., remembering the names of one's teachers and classmates). This ability does not represent *what* is stored in long-term memory or what you know. Rather, it represents the *process* of storing information, which is related to learning efficiency, as well as retrieving information. When someone says, "It's on the tip of my tongue," they are having a hard time retrieving something that they know. Sometimes children have difficulty "finding" information that they know and, therefore, cannot come up with a word or phrase that they learned.

General Manifestations

- ☐ Learning new concepts
- ☐ Paired learning (visual-auditory)
- ☐ Recalling specific information (words, facts)
- ☐ Performing consistently across different task formats (e.g. recognition versus recall formats)
- ☐ Rapid retrieval of information
- ☐ Learning information quickly
- ☐ Generating ideas rapidly
- ☐ Retrieving or recalling information by using association

Specific Manifestations

Reading Difficulties

- ☐ Accessing background knowledge to support new learning while reading
- ☐ Slow to access phonological representations during decoding
- ☐ Retelling or paraphrasing what one has read

Math Difficulties

- ☐ Memorizing math facts
- ☐ Recalling math facts and procedures

Writing Difficulties

- ☐ Accessing words to use during essay writing
- ☐ Specific writing tasks (compare and contrast; persuasive writing)
- ☐ Note-taking
- ☐ Idea generation/production

Language Difficulties

- ☐ Expressive-circumlocutions speech fillers, "interrupted" thought, pauses
- ☐ Receptive – making connections throughout oral presentations (e.g. class lecture)

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NOTES:_____

See form for additional areas (i.e., Gsm, Gv, Ga, and Gs

Manifestations Form

Determination of the severity of educational impact (Note: Decision is typically made by a multidisciplinary team).

☐ **Minimal**. Difficulty in one or two academic areas but the student *is able to function well* when provided with support services (e.g., accommodations).

☐ **Moderate**. Marked difficulties in one or more academic areas and the student is not likely to become proficient without some *intervals of specialized instruction (e.g., Tier II small group)* throughout schooling. *Support services may be needed* across settings in order for activities involving the academic skills to be performed effectively.

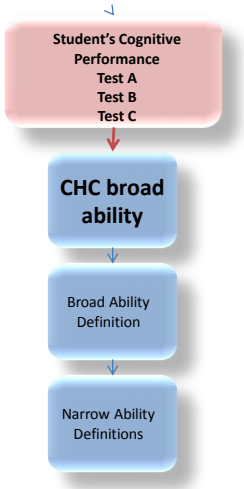
☐ **Substantial**. Deficits in one or more academic areas and the student is not likely to acquire and develop those skills without individualized and specialized instruction (e.g., Tier III, special education) throughout schooling. Even with support services, these students may not be able to perform academic skills effectively.

- ***Assists in understanding how cognitive weaknesses interfere with learning and performance in the classroom***
- ***Assists in obtaining ecological validity for test finds***
- ***Assists in identifying targets for intervention***
- ***Assists in determining severity of educational impact***

You are figuring out the "WHY"

When you know why, "HOW" is made easier

Strategies, Techniques, Evidence-based Programs, and Supports (STEPS)



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- SLD has neurobiological influences and is defined by specific cognitive processing weaknesses
- Evidence of cognitive-achievement relationships
- Cognitive processing weaknesses manifest in real-world performances (e.g., reading, math, writing)
- **Cognitive processing weaknesses obstruct learning; when identified, steps can be taken to minimize the effects of these weaknesses on the student's ability to access the curriculum**
- Some cognitive processes can be remediated

Rapid Reference 1.14 Recommendations That May Facilitate Learning and Aid in Bypassing or Minimizing the Effects of a Fluid Reasoning (Gf) Deficit

Classroom Instruction	Instructional Materials	Environmental	Strategies
Use demonstrations to externalize the reasoning process (think-alouds)	Expanded answer keys containing the "reason" for correct/incorrect choices	Problem-solving charts (hanging or taped to desk)	Use metacognitive strategies (mnemonics that are *memorable* and that *accurately represent* the learning task)
Gradually offer guided practice (e.g., guided questions list) to promote internalization of procedures or process(es)	Guided lists for implementing procedures, formulas	Procedural charts/lists (hanging or taped to desk)	Use tools that help them categorizes objects and concepts to assist in drawing conclusions (e.g., graphic organizers, concept maps)
Offer targeted, explicit feedback	Models/examples	Preferred seating arrangements that provide easy access to a peer model with strong reasoning skills (e.g., for cooperative learning activities)	Listen to and separate the steps in completing a problem from the actual content used in a problem
Offer opportunities for learning formats that allow for reasoning to be modeled for the student (e.g., cooperative learning, reciprocal teaching)	Text features (boldface, italics)		
Compare new concepts to previously learned concepts (same vs. different)	Graphic organizers that allow for a visual depiction of relationships between and among concepts		
Use analogies, similes, metaphors, paired with concrete explanations, to support understanding when presenting tasks (e.g., "We are going to learn our math facts with *lightning speed*, that means we are going to learn them *fast*")	Manipulatives to demonstrate relationships (e.g., part to whole relationships)		

Mascolo, Flanagan, and Alfonso (2014). A systematic method of analyzing assessment results for tailoring interventions (SMAARTI), in Mascolo, Alfonso, & Flanagan, *Essentials of Planning, Selecting, and Tailoring Interventions for Unique Learners* (pp. 3-55). Hoboken, NJ: Wiley.

Recommendations for Fluid Reasoning Gf Deficit

- Develop student's skill in categorizing objects and drawing conclusions
- Use demonstrations to externalize the reasoning process
  - Gradually offer guided practice (e.g., guided questions list) to promote internalization of procedures or processes

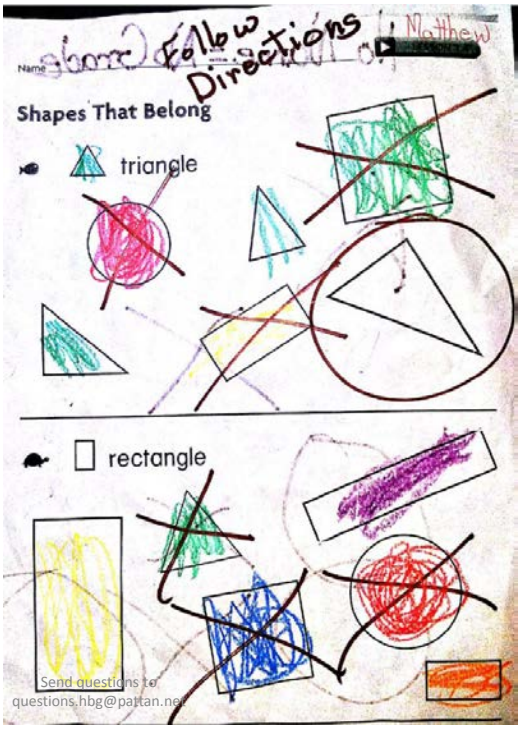
Recommendations for Fluid Reasoning Gf Deficit

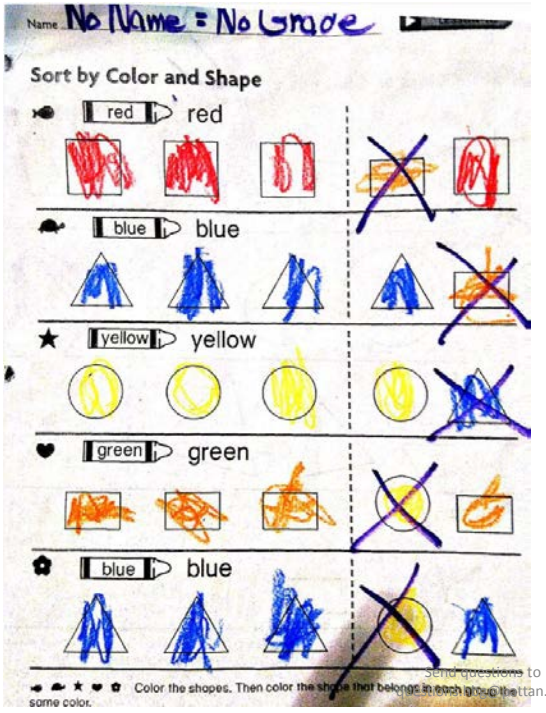
- Targeted feedback
- Cooperative learning
- Think Alouds
- Reciprocal teaching
- Graphic organizers to arrange information in visual format

8

Targeted Feedback

- Feedback to students is important and needs to be *concrete* and *specific*
  - Highlight parts of the task that they executed appropriately
  - Identify where things went "wrong" or off-course
  - Describe how to correct the mistakes
  - Provide opportunity for self-correction and/or practice

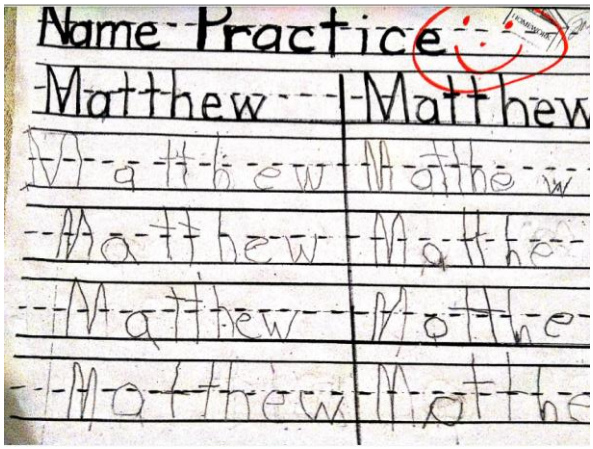




Mom: "Matt, do you know what this says?"
Matt: "No, I can't read."
Mom: "What do you think it says?"
Matt: "I'm bad."

Implications: Matt does not want to go to school. He asked to go back to his previous teacher and class. Said he "hates school".

Unexpectedly, Matt got a New Teacher



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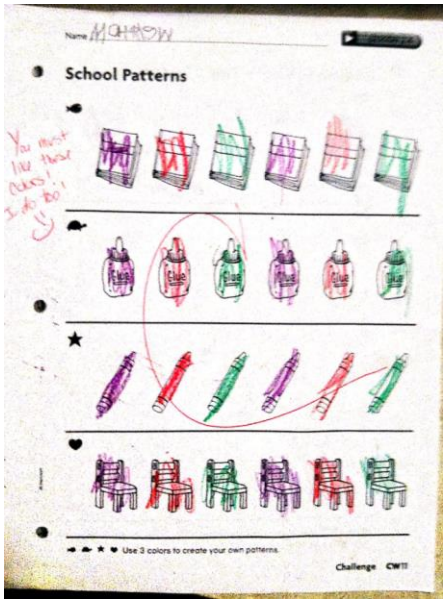
questions.hbg@pattan.net



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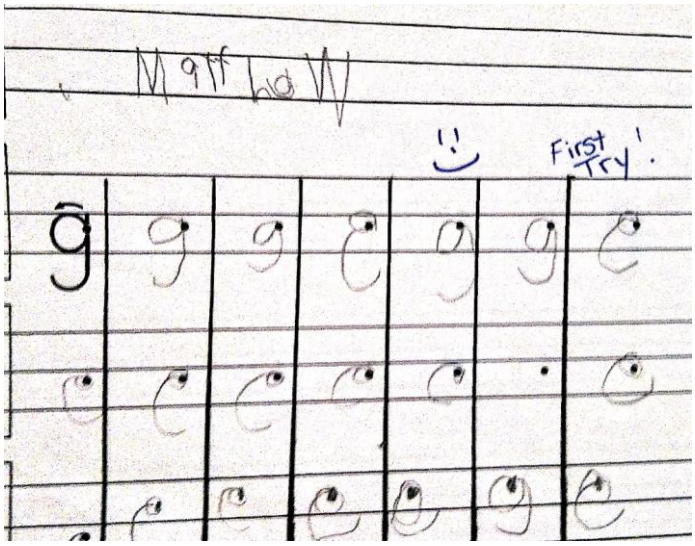

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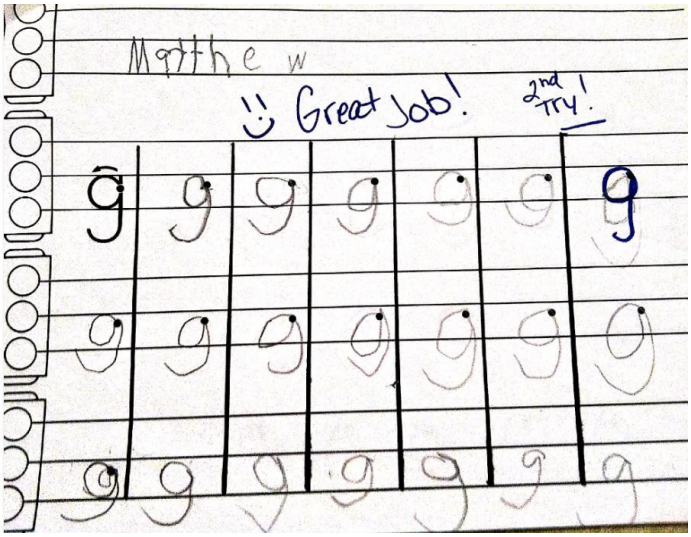
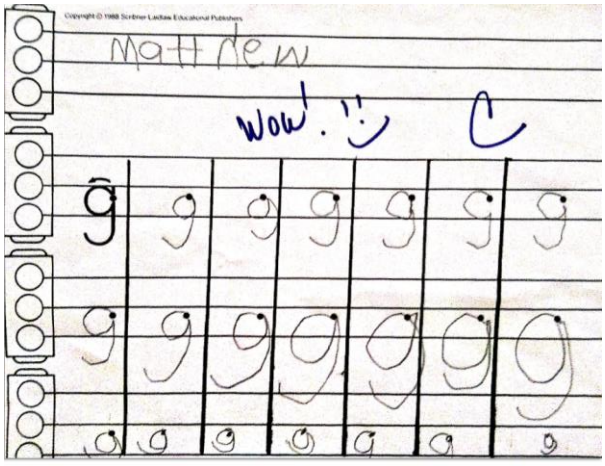
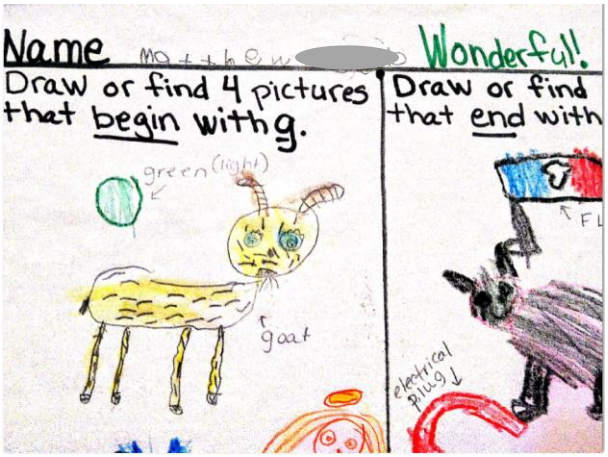

Matthew
Great Job!
2nd TRY!


Matthew
Wow!
C

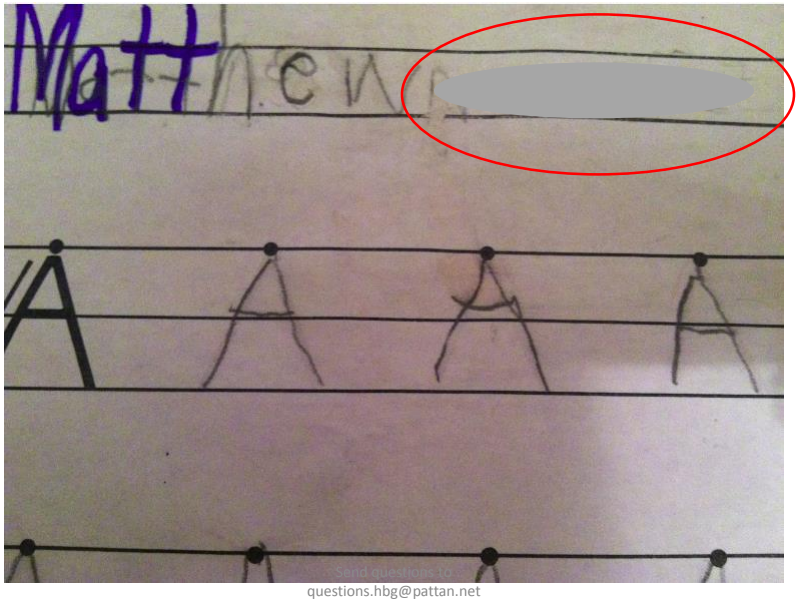
Matt Writes His Last Name and Is Praised



MATT'S TEACHER RETURNS

Send questions to
questions.hbg@pattan.net

Matt is Asked to ERASE his Last Name from his Papers!



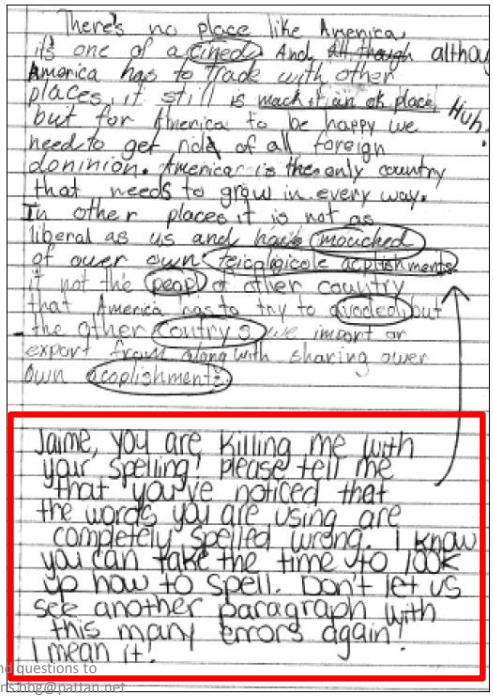
10th grade student with Dyslexia

Source:

mindplay
Understanding Dyslexia

MANUAL

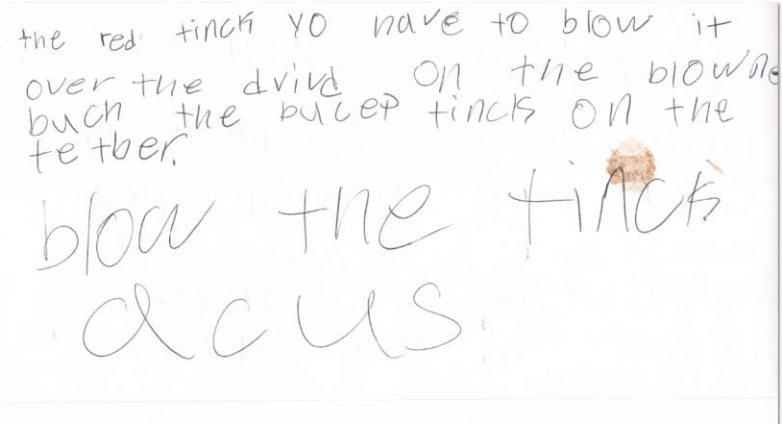
Nancy Mather, Ph.D.
Barbara J. Wendling M.A.


There's no place like America
it's one of a kind And, although
America has to trade with other
places, it still is much it in ok place. Huh,
but for America to be happy we
need to get rid of all foreign
dominion. America is the only country
that needs to grow in every way.
In other places it is not as
liberal as us and have encroached
of over own religious settlements
if not the people of other country
that America has to try to evaded but
the other country's import or
export from along with sharing over
own accomplishments.

Jaime, you are killing me with your spelling! Please tell me that you've noticed that the words you are using are completely spelled wrong. I know you can take the time to look up how to spell. Don't let us see another paragraph with this many errors again! I mean it.

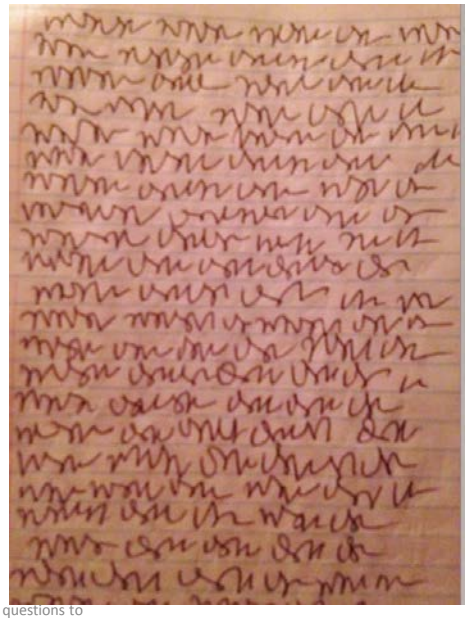
- **Dylan**
- **Age 10, Grade 5**
- **General Education with Supplemental Reading and Math**
- **Reads at end of 1st grade/early 2nd grade level**
  - **Has been receiving "Wilson" for 3 years**
- **Math ability at early 2nd grade level**
- **Writing also significantly below grade level**
- **Receives "speech" weekly, presumably for articulation difficulties**

Task; Grade 5: Do something creative with random objects (e.g., balloon, DVD, whistle), such as tell a story or devise a game

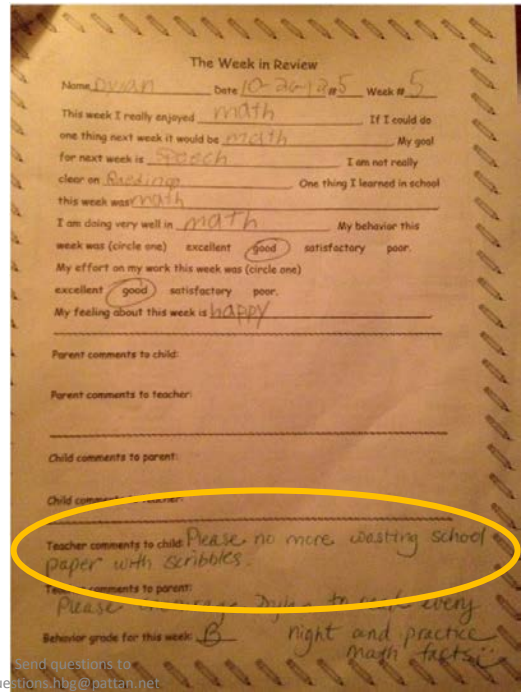


The red thing you have to blow it over the DVD on the balloon. Push the purple thing off the table. Blow the thing across.

•**<u>Assignment</u>: Write a summary of the findings from our science experiment. Write in cursive and use proper grammar and punctuation.**



A Weekly Report from Dylan's Teacher



The Week in Review

Name Dylan Date 10-26-15 Week # 5

This week I really enjoyed math If I could do one thing next week it would be math My goal for next week is Speech I am not really clear on Reading One thing I learned in school this week was math

I am doing very well in math My behavior this week was (circle one) excellent good satisfactory poor.

My effort on my work this week was (circle one) excellent good satisfactory poor.

My feeling about this week is happy

Parent comments to child:

Parent comments to teacher:

Child comments to parent:

Teacher comments to child: Please no more destroy school paper with scribbles.

Behavior grade for this week: B

night and practice math facts

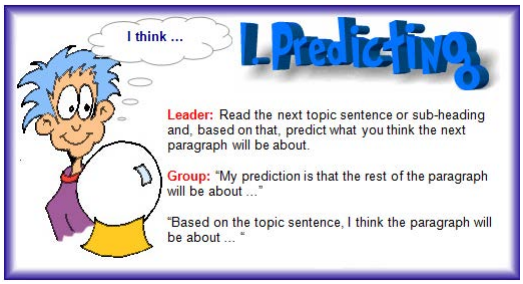
Targeted Feedback is Critical For Student Success

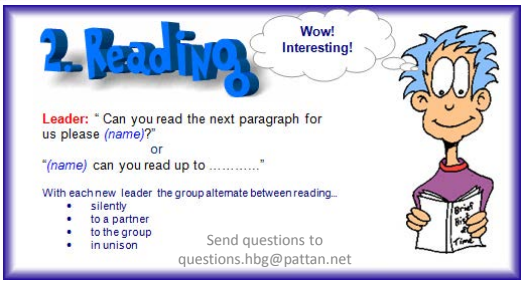
Cooperative Learning

- Can be in pairs or small group
- Students with *Gf* deficits can be matched with students who have good reasoning skills and who are comfortable with "thinking aloud" and contributing to the group
- Important to assign tasks that capitalize upon student's strengths and assist in accomplishing your goal (e.g., student who needs help with reasoning may read well)
- Feedback/Processing of experience is important

Reciprocal Teaching Cards

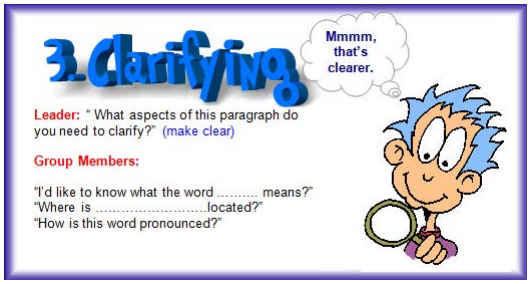
www.adrianbruce.com/reading/room4/recip

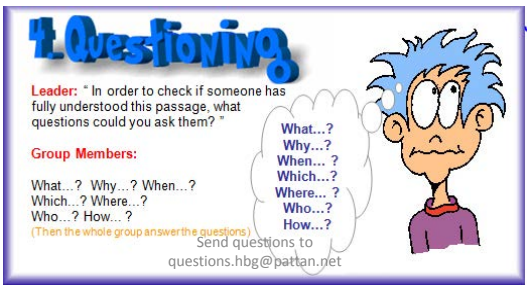




Reciprocal Teaching Cards

www.adrianbruce.com/reading/room4/recip





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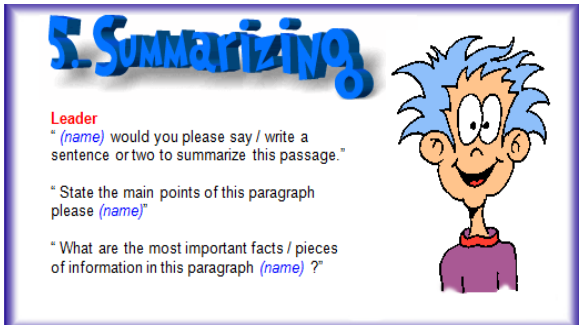
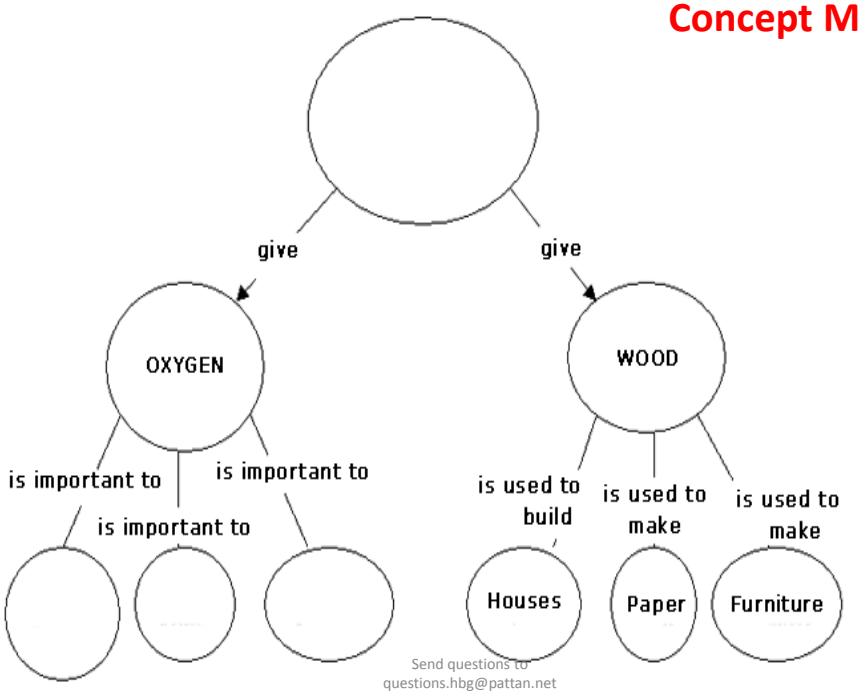


Graphic Organizers

- Make use of graphic organizers (Venn diagrams, concept maps) to help the student
  - Understand the information conceptually through a visual modality
  - More readily link new information to known information
  - Make links from specific to general

Concept Map



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Programs/Techniques for *Gf* Deficits

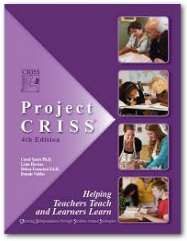
- When selecting a program or a technique to intervene with a student with a *Gf* deficit, it may be helpful to consider one that
  - includes ***explicit strategy instruction***
  - focuses on the application of higher level thinking skills to the reading process (e.g., making predictions, drawing inferences, abstracting, inferring character feelings)
  - is multi-staged and includes modeling up through independent application of the strategy/technique

Project CRISS®
Creating Independence through Student-owned Strategies

Empower Lifelong Learning!

Resource Area

HOME | PROFESSIONAL DEVELOPMENT | PRODUCTS | CALENDAR | PUBLICATIONS & RESEARCH | ABOUT US



Helping Teachers Teach and Learners Learn

Founded in over 30 years of research and classroom practice, Project CRISS provides high quality, practical professional development and support materials for K-16 teaching and learning, including Common Core.

We offer regional, on-site, and online PD!

ANNOUNCEMENTS

CRISS ONLINE! Experience an Introduction to Project CRISS workshop online? 2-hour sessions on Tuesdays, September 23- October 28 starting at 7 PM Eastern (6 Central, 5 Mountain, 4 Pacific). Here's the **registration form**. Need more info? **Contact us!**

Learn about CRISS! Email us for an invitation to a live, 20-minute presentation on Monday, September 29 at 1 PM Eastern/12 PM Central/11 AM Mountain/ 10 AM Pacific. You may also **contact us** to schedule a presentation just for you and your team.

This program focuses on teaching students strategies for reading comprehension

HISTORY OF PROJECT CRISS

Project CRISS started as an action research project conducted by a group of secondary content teachers interested in identifying classroom practices that truly make an impact on student learning. These teachers, led by reading specialist and IRA past president Dr. Carol Santa, scoured the available research on learning (in the fields of education, cognitive psychology, and neuroscience) and tested theories in their classrooms. Those practices which worked became the foundation of Project CRISS. Their early successes garnered recognition and grant awards first in Montana, and then nationally through the U.S. Department of Education National Diffusion Network. As their work spread across the United States, education practitioners contributed their expertise to develop the pedagogical frameworks for CRISS, the toolbox of powerful learning strategies, and the workshops which evolved into the Introduction to Project CRISS workshop (Level I). The original development leaders, Dr. Santa and science and math teacher Lynn Havens, established Project CRISS as a national professional development initiative and private business in 2001. Now in its 4th edition (2012), Project CRISS offers high quality, practical professional development and an array of support materials and curricula for teaching and learning across the United States, Canada, and countries throughout the world.

The Learning Strategies below are from the CRISS - Project, CReating Independence through Student owned Strategies.

Click on a strategy to find out when and how it is used.

Author's Clues and Style	Highlighting	Power Notes with Underlining	Power Notes
Power Paragraphs	Know-What to know Learn	Concept Mapping	Read and Say Something
Authentic Questions	Think-Pair-Share	Sticky Note Discussion	Free-Form Mapping
Character Mapping	Comparison Maps	Venn Diagrams	Story Plans
Two Column Notes	Study Cards	*ADDING MORE SUCCESS*	*& INDEPENDENCE*

USE THESE IN YOUR ACADEMIC CLASSES

Read-and-Say-Something

Read-and-Say-Something works effectively for difficult materials; rather than letting students struggle with the meaning alone, have them read and discuss the ideas with a partner or in a small group.

Introduction, Modeling, and Reflection

1. Have students work in partners or small groups. The leader reads the first paragraph or section of the assignment out loud or all group members read the first section silently.
2. After reading the first section, the student to the right of the leader says something that relates to the information and/or the purpose for reading. S/he may react to ideas, descriptions, images, and/or comment on confusing parts. Others in the group may comment after the first person says something.
3. When discussion about the section ends, or when time is up, the person to the right of the leader (the first say-something person) reads the next section and the process continues.
4. Conversations about the meaning of the article occur naturally. Students conclude the session by writing down questions they want answered by the whole class or other groups.

Reflection

How did Read-and-Say-Something help you understand the ideas in this selection? Were you actively engaged? How did it help you to be metacognitive?

Support and Extensions

- Use this strategy as a way for students to review class notes. Have them read through their notes with a partner and then say something to one another.
- Incorporate Read-and-Say-Something as part of problem solving in mathematics.
- Focus discussions on specific topics. For example, a language arts teacher might have students talk about descriptive writing; a history teacher might have students pay attention to issues regarding human rights.

Concept Mapping (Pre reading, Reading, Post Reading)

Concept Mapping is the way of showing the relationships between ideas. It can be used before, during, and after reading to organize information.

Use Concept Mapping to show what you know about a topic.

OR

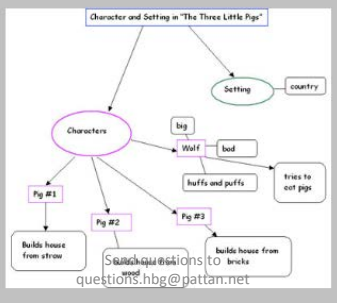
Use concept Mapping to take notes as you reread a selecion.

OR

Use concept Mapping to organize the reading selection after you have read.

OR

Use concept Mapping to organize your thoughts before writing a paragraph or essay.

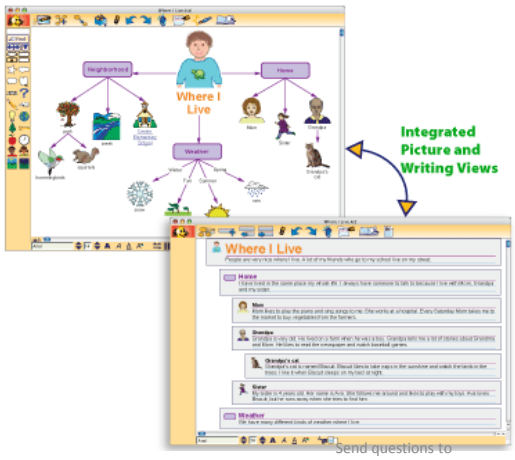


Reading and Writing Examples (Gf)

- Inspiration/Kidspiration software (www.inspiration.com)
  - "Created for K-5 learners, Kidspiration® develops thinking, literacy and numeracy skills using proven visual learning principles. In reading and writing, Kidspiration strengthens word recognition, vocabulary, comprehension and written expression. With new visual math tools, students build reasoning and problem solving skills."

Kidspiration provides a cross-curricular visual workspace for K-5 learners. Students use visual tools combining pictures, text, numbers and spoken words to develop vocabulary, word recognition, comprehension, reasoning and problem solving skills.

Kidspiration works the way students think and learn and the way teachers teach. As students make visual connections, they build fundamental skills in reading, writing, math, science and social studies. Kidspiration offers activities in all curriculum areas, so students use visual learning naturally and confidently.



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SCHOLASTIC

http://www.scholastic.com

12

Reading Comprehension Strategies

Make Connections	Visualize	Ask Questions
What connections do I make as I read? Good readers notice pieces of text that relate to or remind them of: • Their lives, past experiences, and prior knowledge • Other books, articles, movies, songs, or pieces of writing • Events, people, or issues Tips: • That reminds me of… • This made me think of… • I read another book that… • This is different from… • I remember when…	Good readers create pictures in their minds while they read. While reading, note places where you get a clear picture in your mind that helps you understand the text: • I can picture… • I can see the… • I can visualize… • The movie in my head shows… Use your senses to connect the characters, events, and ideas to clarify the picture in your head. • I can taste/hear/smell the… • I can feel the… Send questions to questions.hbg@pattan.net	Good readers ask questions before, during, and after reading to better understand the author and the meaning of the text. Ask questions of the author, yourself, and the text: • What is the author trying to say? • What is the message of this piece? • Do I know something about this topic? • What do I think I will learn from this text? • How could this be explained to someone else? • What predictions do I have about this reading?

Infer	Determine Importance	Synthesize
How do I read between the lines? When the answers are "right there," good readers draw conclusions based on background knowledge and clues in the text. Ask yourself: • I wonder why… • I wonder how… • I wonder if… Find information from the text that might be clues to the answers and use these with your background knowledge for possible answers.	What's the big idea? So what? Good readers look for things that help them identify big ideas and why they are important. Look at text features for clues: • Titles and headings • Bold print • Pictures and captions • Graphs and charts • Chapter objectives and questions Tips: • The big idea is… • Most important information is... • So far I've learned… • The author is saying… • This idea is similar to…	How do I use what I've read to create my own ideas? Good readers combine new information from their reading with existing knowledge in order to form new ideas or interpretations. Synthesis is creating a single understanding from a variety of sources. Tips: • Compare and contrast what I'm reading with what I already know or other sources of information. • Think of new ways to use this information. • Can connections I make across this text help me to create new generalizations or new perspectives?

13

Adapted from the work of Beal, Keene, and Tovani

Rapid Reference 1.15 Factors That May Facilitate Learning and Aid in Bypassing or Minimizing the Effects of a Crystallized Intelligence (Gc) Deficit

Classroom Instructional Factors	Instructional Materials	Environmental Factors	Strategies
Provides an environment rich in language and experiences	Contains chapter Glossaries	Word-of-the-day calendar	Use KWL strategy to increase background knowledge
Incorporates frequent practice with and exposure to words	E-Glossaries available	Word walls	Use context when reading to ascertain meaning
Reads aloud to children	Provides vocabulary building activities (print or online)		Capitalize on opportunities to practice new words (listening for their use in television shows and other media, purposely using them in conversation)
Varies reading purpose (leisure, information)	Contains tools for priming background knowledge (e.g., Harcourt)	Distraction-free seating	Engage in activities such as word searches containing related terms (e.g., travel terms) and crosswords (note: puzzlemaker.com can create customized puzzles)
Works on vocabulary building	Includes story starters	Closed doors	Write a new word and its definition along with a drawing
Teaches morphology	Includes text features (boldface, italics)	Closed windows	
Capitalizes on opportunities to define words within instruction (e.g., "the *composition* of igneous rock, that is, *what it is made* of, is. . .")	Availability of video clips		

Mascolo, Flanagan, and Alfonso (2014). A systematic method of analyzing assessment results for tailoring interventions (SMAARTI), in Mascolo, Alfonso, & Flanagan, *Essentials of Planning, Selecting, and Tailoring Interventions for Unique Learners* (pp. 3-55). Hoboken, NJ: Wiley.

Gc Continued

Rapid Reference 1.15 Factors That May Facilitate Learning and Aid in Bypassing or Minimizing the Effects of a Crystallized Intelligence (Gc) Deficit

Includes supportive modalities (e.g., visuals, gestures) to increase understanding of language used	Audio glossaries
Embeds instruction within a meaningful context (e.g., relating words to learner experiences, increasing listening ability through game-like format)	Dictionaries
Develops vocabulary through naturalistic extension of language (e.g., if a student asks, "Can I *start* my work," the teacher might respond, "Yes, you can *begin* your work," naturally building synonym knowledge)	Thesaurus
Uses extension and expansion strategies (Mather, Lynch, & Richards, 2001)	Encyclopedias
	Use vocabulary cartoons (Burchers, 2000)
	Use text talks

Florida Center for Reading Research

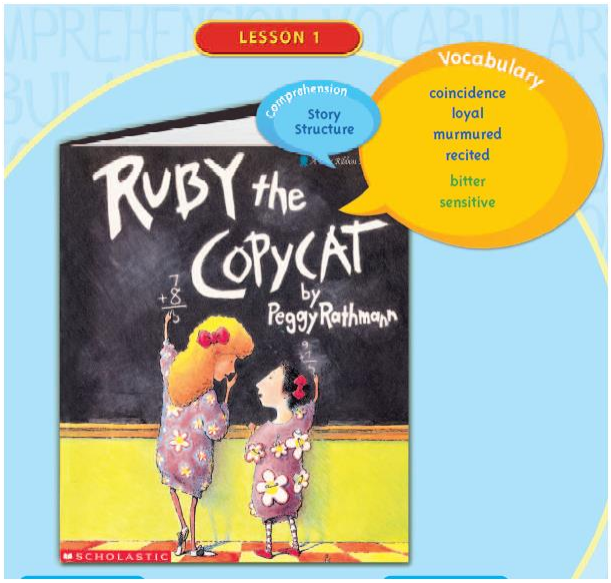
Text Talk

What is Text Talk?

Text Talk is an oral language instruction program intended for all students in grades K-3. It is designed to supplement a school's core reading program with 20 minutes of daily whole or small group instruction delivered by the teacher. The goal of the program is to develop the student's ability to construct meaning of sophisticated vocabulary words within the context of read-alouds and explicit vocabulary instruction. These vocabulary words and ideas are contextualized with explicit descriptions of how the words are used in the story and through interactive discussions.

The *Text Talk* instructional approach was developed by Drs. Isabel L. Beck and Margaret G. McKeown based on findings from their many years of research. These findings are depicted in their book, Bringing Words to Life which describes the rationale and methods for teaching children rich, robust vocabulary words. These words are not ordinarily found in their speaking vocabulary but would most likely be in their conceptual lexicon and appear in a variety of texts. Described as Tier 2 words in their book, Beck and McKeown underscore the importance of providing students repeated opportunities to hear and use these new vocabulary words in different contexts. The instructional strategies discussed in Bringing Words to Life are applied in the *Text Talk* program.

http://teacher.scholastic.com/products/texttalk/overview/readaloud.htm



LESSON 1 Organizer

Sessions	Focus	Instruction	Standards & Objectives
Read Aloud Sessions 1 & 2	Develop Language & Comprehension	Read aloud *Ruby the Copycat*. Use the Text Talk Notes to scaffold and monitor comprehension.	• Responds to open-ended questions about the story with substantive sentences • Describes the story characters
Vocabulary Sessions 3 & 4	Introduce Vocabulary coincidence p. 7 loyal p. 17 bitter murmured p. 19 recited p. 18 sensitive Develop Vocabulary	Contextualize and explain vocabulary words and provide examples. Ask children to think about examples and to provide their own.	• Applies vocabulary words in multiple contexts
Return to the Story Session 5	Integrate Vocabulary & Comprehension Review Assess Maintain	Review and assess vocabulary words. Use them to enhance story comprehension and in shared writing. Discuss character traits in *Ruby the Copycat*.	• Uses new vocabulary words to show understanding of story characters • Demonstrates use of new and previously taught vocabulary in writing and daily conversation

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"What a coincidence!" said Miss Hart. STOP

A coincidence! Miss Hart is saying that two things happened at the same time by accident. • *Clarify vocabulary*

What just happened that Miss Hart says is a coincidence? (Ruby said she was a flower girl in her sister's wedding, just like Angela had been.) • *Clarify story ideas*

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Gc Recommendations

- Provide an environment rich in language and experiences
- Frequent practice with and exposure to words
- Read aloud to children
- Vary reading purpose (leisure, information)

What Do You Do for *Gc* Weakness?

- Enrich
- Relate
- Create
- Ratify
- Multidisciplinary curricula

*Information on this slide was presented by **Elaine Fletcher-Janzen** at the 3rd annual assessment conference, Fordham University. New York, NY (May, 2011).*

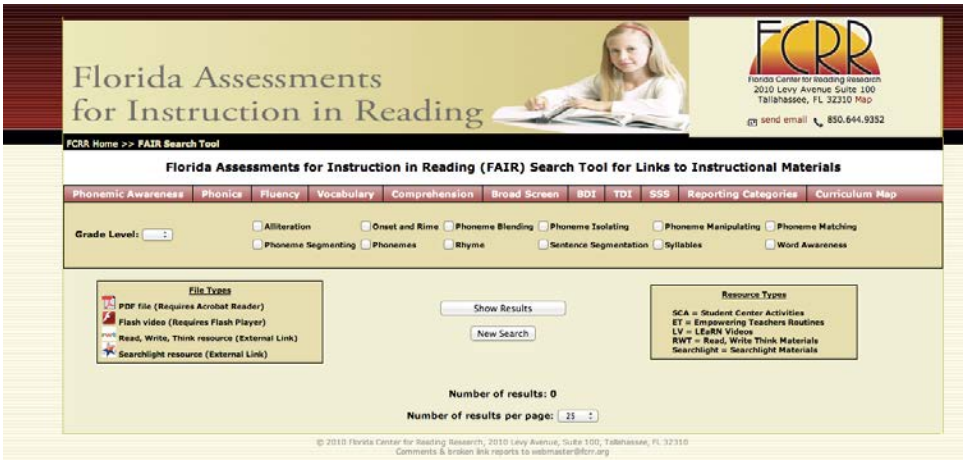
Recommendations for Gc (Verbal Ability) Deficit

- Work on vocabulary building
- Activities to build listening skills
- Explicitly teach listening strategies
- Teach morphology

Programs/Techniques for Gc (Verbal Ability) Deficits

- When selecting a program or a technique to intervene with a student with a Gc deficit, it may be helpful to consider one that
  - includes some sort of **vocabulary building**
  - includes **supportive modalities** to increase understanding of language used (e.g., visuals, gestures)
  - **embeds instruction within a meaningful context** (e.g., relating words to learner experiences, communicating word meanings with visuals, increasing listening ability through game-like format)

http://www.fcrr.org/



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Advanced Phonics

Morpheme Structures

AP.018

Affix Fit

14

Objective

The student will blend base words with affixes.

Materials

- Base word cards (Activity Master AP.018.AM1a - AP.018.AM1b)
- Affix cards (Activity Master AP.018.AM2)
- Student sheet (Activity Master AP.018.SS1)
- Paper bags
  Label bags (i.e., base words and affixes).
- Timer
- Pencils

Activity

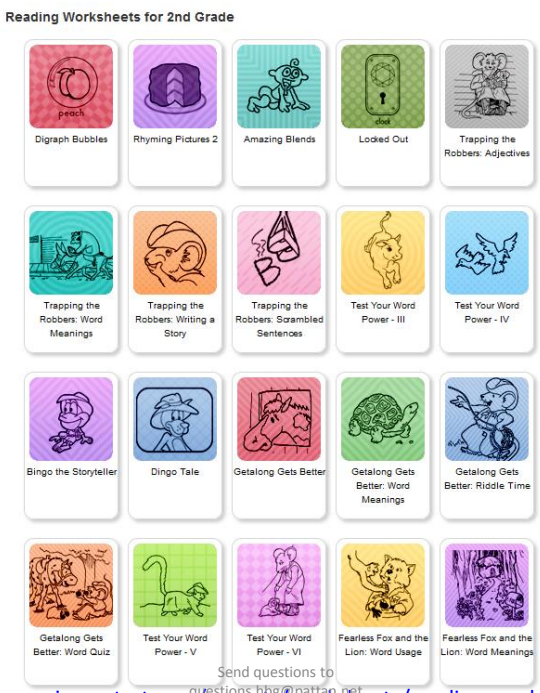
Students combine base words and affixes to make new words.

1. Place base word cards in bag labelled *base words*. Place affix cards in bag labelled *affixes*. Provide students with a timer. Provide each student with a student sheet.
2. Students each choose five cards from the *base words* bag and five cards from the *affixes* bag. Record selected base words and affixes on student sheet.
3. Set the timer for three minutes.
4. Use the cards to make as many words as possible. Record words as they are made on the student sheet. Read words aloud after timer rings.
5. Place words and affixes back in the bags and select new cards from the bags and continue to make new words.
6. Teacher evaluation

Send questions to
questions.hbg@pattan.net

http://www.jumpstart.com/parents/worksheets/reading-worksheets

Send questions to
questions.hbg@pattan.net



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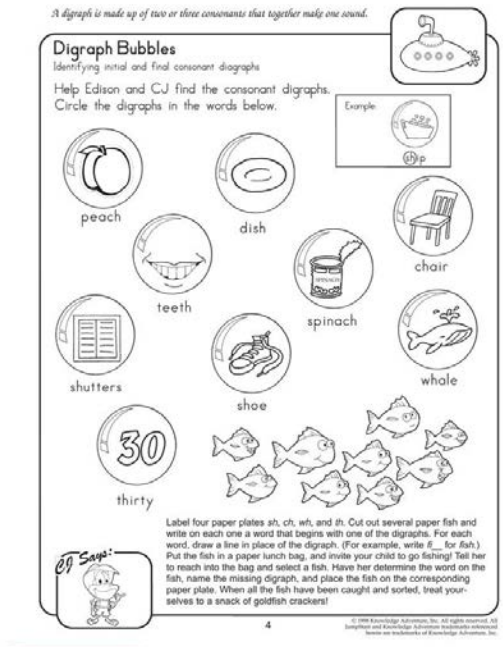

http://www.jumpstart.com/parents/worksheets/reading-worksheets

http://www.vocabulary.co.il/english-language-games/

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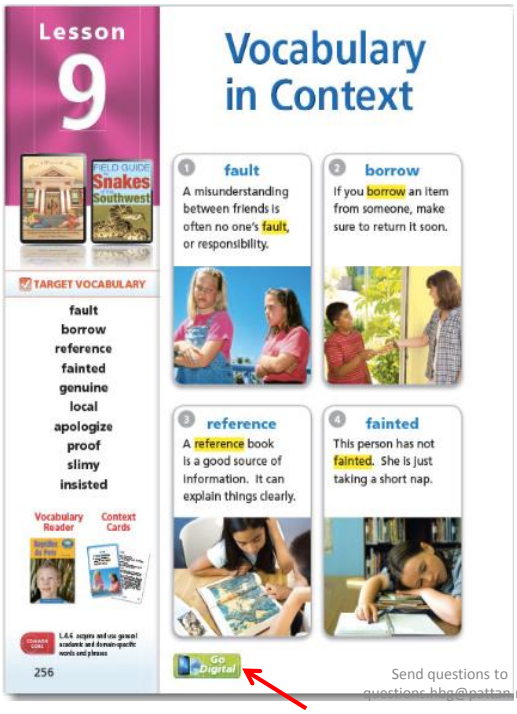

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Instructional Supports for Building Gc (VL) in the General Ed Classroom

[hmhco/journeys]

Finding Assistive Technology

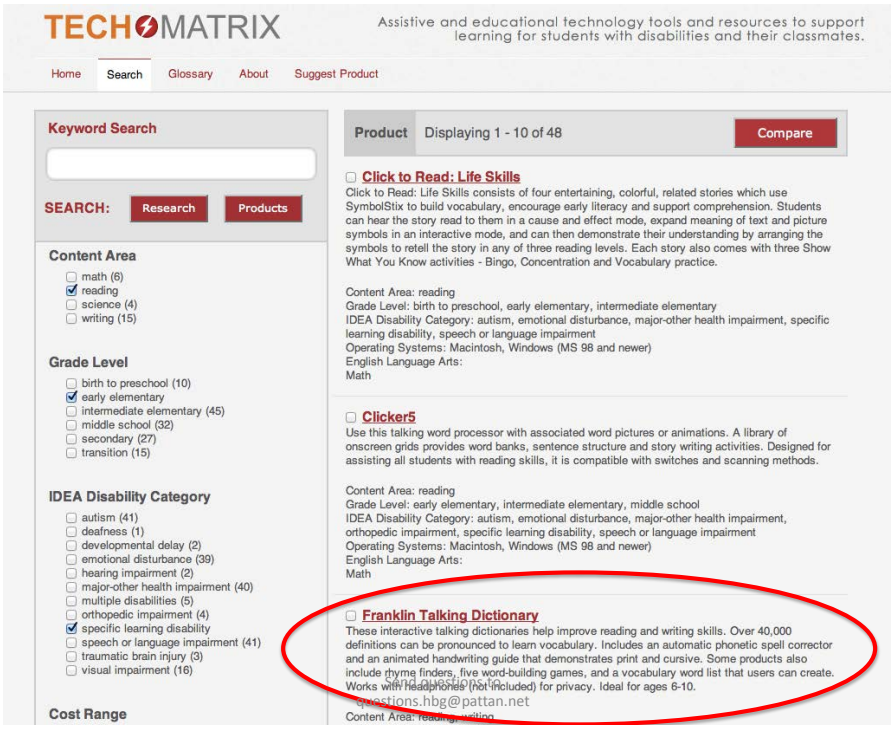
For Educators

As Matthew Lynch discusses in *Education Week*'s "Assistive Technology: A Necessity for Student Success," there have been great strides in recent years to improve available technologies. To learn more about what's available, there are several websites that provide information about specific technologies and guidance on finding appropriate tools. TechMatrix, funded through a grant by the U.S. Department of Education and maintained by the American Institutes for Research (AIR), is a searchable database of over 400 assistive and educational technology tools and resources. The products are searchable by content area, grade level, IDEA disability category, and the type of instructional support. TechMatrix also provides a useful consumer guide for school administrators looking to purchase assistive and learning technologies and aggregates research articles on the theory and practice of using technology to improve student learning.

For Parents

For parents and families, the FCTD hosts a resource review database listing hundreds of assistive and instructional technology resources including books, articles, research, and other materials. Common Sense Media has an online resource and downloadable guide, "Power Up! Apps for Kids with Special Needs and Learning Differences." Graphite, a service of Common Sense Media, also maintains a collection of reviews of Great Special Ed Apps and Sites recommended by educators and experts working with children with special needs and learning differences.

http://www.edutopia.org/assistive-technology-resources#graph2



Power Up! Apps for Kids with Special Needs and Learning Differences

A fresh look at learning

If your child has a special need or learning difference, you've come to the right place. Common Sense Media gets lots of requests for product recommendations from parents whose kids struggle with traditional learning. Some of their kids have a hard time with schoolwork; others have trouble staying on task or find it difficult to express their feelings.

Our hope for you and your kids

No matter which hurdles your kid faces, the apps and other media included in Power Up can give them an added boost. We don't expect an app to be a complete solution, of course. Working with kids who face challenges requires lots of time, attention, and patience on the part of a parent, teacher, or other adult caregiver. Our goal is to offer you a host of fun, well-designed apps that were recommended and tested by field experts. We hope they can become a part of your toolkit as you work with your child.

About the categories

Apps are arranged by challenge area and difficulty level. For each challenge area, we've included an informational overview with a list of typical challenges that kids face, help for choosing apps that match kids' needs, and further resources. You'll also find Power Tips with ideas for other activities you can do.

We've done our homework

Lots of work went into creating this guide. Our team spent several months surveying research, conducting interviews, and field testing products with field leaders, experts, teachers, and parents. In addition, Gayl Bowser, an expert in the field of special needs and technology, helped select products and authored the guide.

https://www.commonsensemedia.org/sites/default/files/uploads/interactive-guide/special-needs-full-guide.pdf

Communication | Social Interaction | Organization | **Reading** | Math | Motor Skills

Reading – Challenges Overview

Reading and writing skills are necessary for school, work, and life, but many kids struggle to master them. For kids with a learning difference or poor coordination in their hands, learning to read and write can be particularly difficult. Some kids also have mild vision problems that affect how their eyes move across a page or how well they can see small print. Nearly 62 million (or 1 in 5) Americans are dyslexic (The Big Picture: Rethinking Dyslexia, 2012). Here, we provide a list of common signs of reading and writing challenges and offer tips on how to help kids with those challenges. We also have tips for choosing apps to improve reading and writing skills and a list of related resources.

Common challenges

- Reading or spelling words that other kids their age can recognize and spell
- Learning numbers, the alphabet, days of the week, colors, and shapes
- Making their eyes follow the line of words on a page
- Remembering what they just read

Common signs

- Are reluctant to read and write, and read slowly and with much effort
- Confuse letter names and sounds
- Have messy, unreadable, or very large handwriting
- Write letters backwards or upside down when they're in third or fourth grade
- Confuse basic words like was and want or left and felt

Ways to help

- Give directions verbally as well as in writing
- Break down directions into small steps; give only one or two instructions at a time
- Encourage kids to spell by speaking each sound aloud
- Focus on the child's strengths, not weaknesses
- Try not to expect reading or writing beyond kids' abilities

What to look for in an app

- Opportunities to practice letter or word recognition and expand vocabulary
- Tools that read words aloud and highlight words as they're read
- Settings that allow for gradual increase in length or complexity of words/passages
- Keyboards that read each letter, word, or sentence aloud as a child types
- Automatic spell checking that tells kids when they misspell a word
- Predictive text, which gives kids options to select from a few word choices

Learn more

- **LD Online** – parents and teachers can find authoritative guidance on ADD/ADHD, dyslexia, dysgraphia, and other reading and writing challenges
- **Yale Center for Dyslexia and Creativity** – current research, advocacy, and information about dyslexia
- **National Dissemination Center for Children with Disabilities** – article "Should I Be Concerned About Reading Difficulties?" provides a guide to identifying common signs of dyslexia at different ages
- **The Big Picture: Rethinking Dyslexia** – documentary that explores the hidden gifts of dyslexics; official selection award at many film festivals, including Sundance

Our sources

- **Yale Center for Dyslexia and Creativity**
- **National Dissemination Center for Children with Disabilities**
- **University of Michigan Health System**

Experts consulted

- Melinda Techler, speech language pathologist and reading specialist
- Amy Martini, reading recovery teacher, Ravenswood City School District
- Gayl Bowser, independent assistive technology consultant

Check out the online guide: www.commonsense.org/guide/special-needs

Communication | Social Interaction | Organization | **Reading** | Math | Motor Skills

BEGINNER

A host of imaginative apps and other media can help kids learn to read and write. Kids can learn early skills like tracing letters and sounding out words or make up cartoon stories about their own lives and interests. Touch-sensitive screens and audio feedback give kids an extra boost as they start to develop reading and writing skills.

Bob Books #1 - Reading Magic

This great interactive book has kids drag letters to the right place below a picture as the letters and words are sounded out. Kids will delight as the black-and-white screen changes to color and drawings animate. Adults can customize settings to suit kids' phonics knowledge and reading level.

FirstWords: Deluxe

Each screen gives kids an object and a word to spell. They have to drag and drop letters into the right slots. When the word is complete, a voice spells and says the word, and the next word appears. Lots of options let adults tailor the experience to match kids' skills and preferences.

Go Go Games

Kids learn to notice differences and to focus on details. Three different games show a set of objects and ask kids to match two that look the same -- an essential skill for kids with reading challenges. Kids practice noticing colors, patterns, and sizes of objects to make a match.

Check out the online guide: www.commonsense.org/guide/special-needs

Send questions to questions.hbg@pattan.net

Communication | Social Interaction | Organization | **Reading** | Math | Motor Skills

INTERMEDIATE

These digital picks can help kids learn to read and write. Kids can find a challenge in reading-comprehension questions or build vocabulary through fun web and mobile activities.

Phonics Genius

This flashcard-style app helps kids learn words by letter sounds. Kids learn how to listen and look for letter sounds and piece them together to form words. For a more personalized learning experience, kids can record their own voice.

Smiley Sight Words

Some words can't be illustrated with pictures or sounded out according to phonics rules, so kids need to learn them by sight. This app includes about 85% of these essential words used in early reading materials. Adults can check progress reports after each session.

Word Wizard - Talking Movable Alphabet with Spell Check and Fun Spelling Tests

For kids who are just learning to spell and work with letters, try this fun speaking, spelling, sentence practice, and phonics tool. Key features include spelling word lists and the option to create custom study lists. It's a great way for kids with reading challenges to create their own lists.

POWER TIP

As you read books with kids, help them keep track of any new or unfamiliar words they encounter. Encourage them to practice writing the words using *iA Writer* or create custom spelling lists with *Word Wizard*.

Check out the online guide: www.commonsense.org/guide/special-needs

Send questions to questions.hbg@pattan.net

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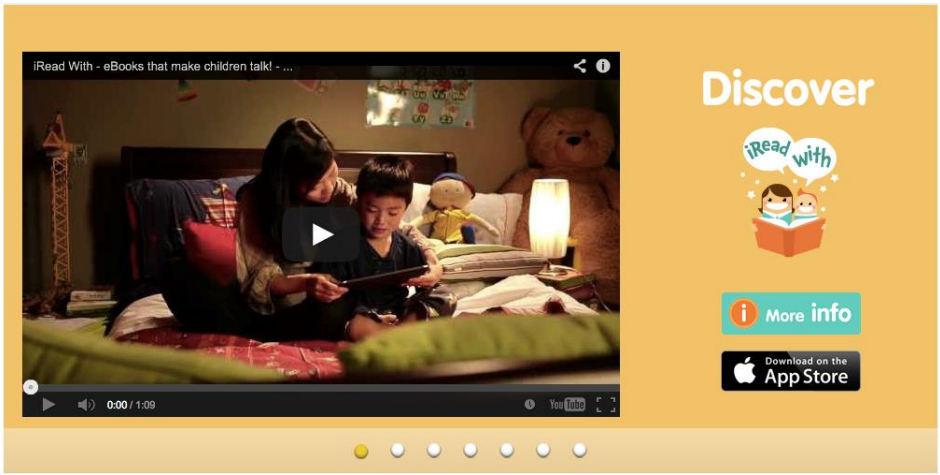
eBooks that make children talk!

An innovative Shared Reading method designed with McGill University Child Phonology Lab

www.ireadwith.com



eBooks for children – Read & Talk Apps – Kids Books

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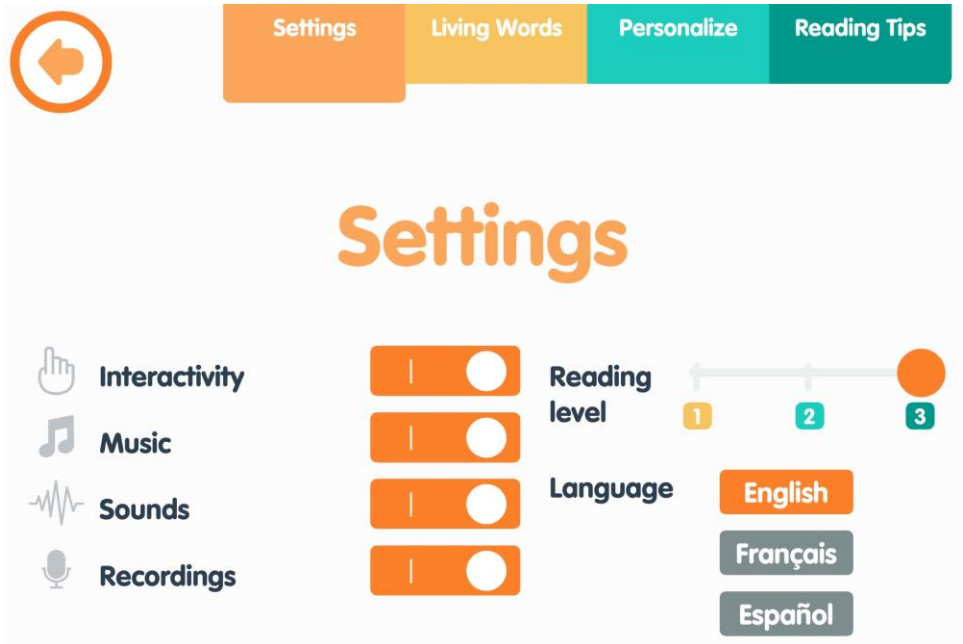
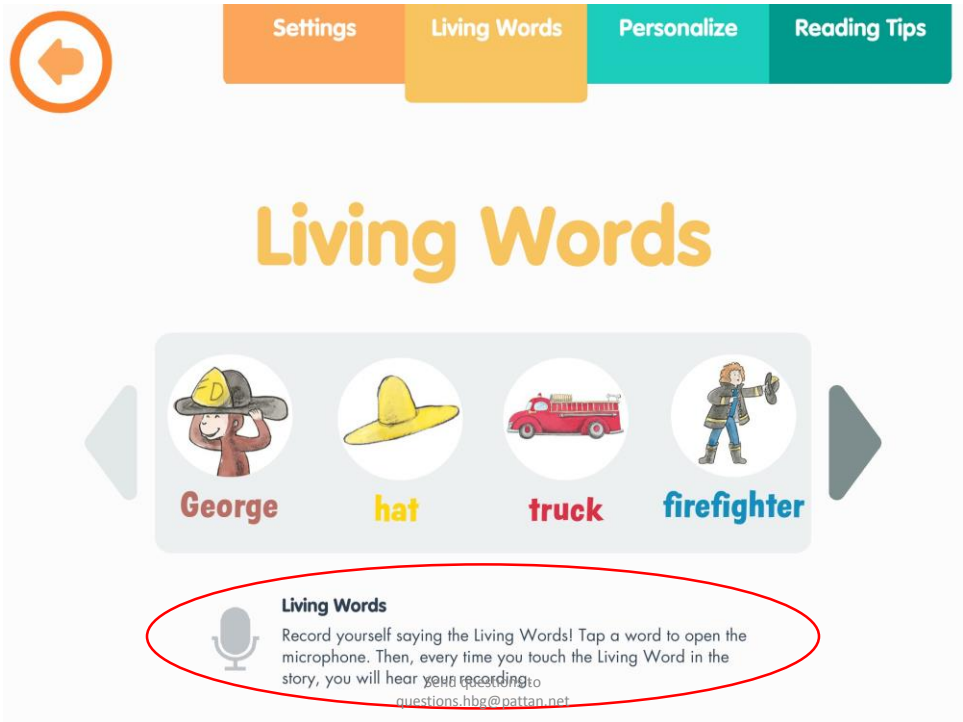


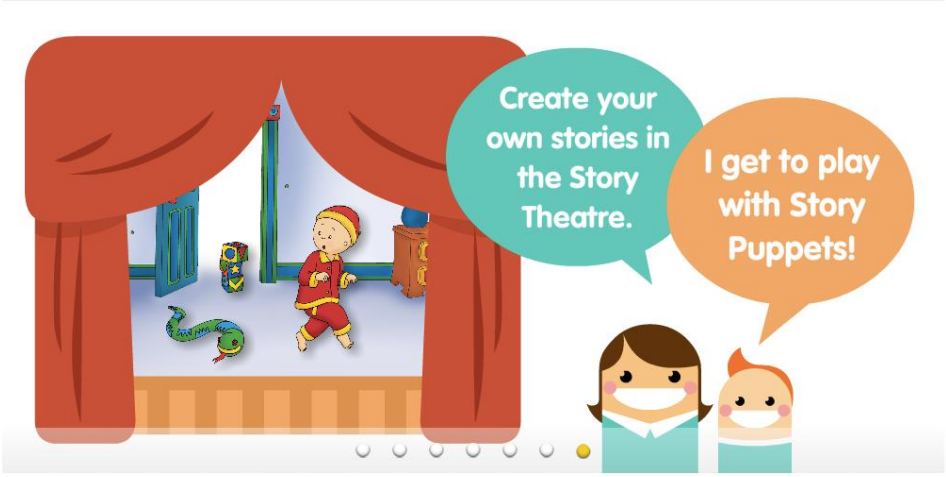
You can select the reading level, language, music, sounds, recordings

Send questions to
questions.hbg@pattan.net



Words have visuals

Send questions to
questions.hbg@pattan.net



eBooks for children – Read & Talk Apps – Kids Books

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Send questions to
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Reading Start

Dialogic Reading Technique

PROMPT your child to speak
"What is this?"

EVALUATE the response
"That's right"

EXPAND on the response
"It's a hungry caterpillar"

REPEAT the prompt
"Can you say *caterpillar*?"

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Reading Start

Prompts

COMPLETION prompts
"I do not like green eggs and ham,
I do not like them _____"

RECALL prompts
"Can you tell me what happened to Horton?"

OPEN-ENDED prompts
"What's happening in this picture?"

WH-prompts
"What's the name of the elephant in this story?"

DISTANCING prompts
"Do you remember when we went to the grocery store last week? Which of these fruits did we see?"

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questions.hbg@pattan.net

Rapid Reference 1.20 Factors That May Facilitate Learning and Aid in Bypassing or Minimizing the Effects of a Short-Term Memory (Gsm) Deficit

Classroom Instructional Factors	Instructional Materials	Environmental Factors	Strategies
Offers repetition of information	Practice guides	Color-coded Information	Apply rote strategies (e.g., basic rehearsal, simple repetition) for information to be learned in the short-term
Reviews information and newly presented concepts often	Guided study	Math-facts tables (e.g., multiplication)	Encourage use of relational strategies (e.g., mnemonics)
Delivers information in manageable parts	Online review	Written schedules	Use elaborative rehearsal (associating new information with prior knowledge)
Evidences use of consistent instructional routines	Flash cards	Visual schedules (e.g., pictures)	Semantic rehearsal (creating a sentence using things to be remembered)
Uses meaningful stimuli to assist with encoding and allow for experiential learning (i.e., learning while doing)	Multisensory materials to facilitate encoding	Written reminders (homework)	Chunking
Provides opportunities for repeated practice and review			Paraphrasing
Provides supports (e.g., lecture notes, guided notes, study guides, written directions) to supplement oral instruction			Visual mnemonics (imagery, pegwords, loci, keyword method; Dehn)

Mascolo, Flanagan, and Alfonso (2014). A systematic method of analyzing assessment results for tailoring interventions (SMAARTI), in Mascolo, Alfonso, & Flanagan, *Essentials of Planning, Selecting, and Tailoring Interventions for Unique Learners* (pp. 3-55). Hoboken, NJ: Wiley.

Build Sight Words

Go to: http://www.mrsperkins.com/dolch.htm

Print Flash Cards

Use folding-in technique (builds confidence)

Pre-primer	Primer	First
a	all	after
and	am	again
away	are	an
big	at	any
blue	ate	as
can	be	ask
come	black	by
down	brown	could
find	but	every
for	came	fly
funny	did	from
go	do	give
help	eat	going
here	four	had
I	get	has
in	good	her
is	have	him
it	he	his
jump	into	how
little	like	just
look	must	know
make	new	let
me	no	live
my	now	may
not	on	of
one	our	old
play	out	once

Build Sight Words: Good Visual Ability (Gv); Difficulty with Memory (Gsm)

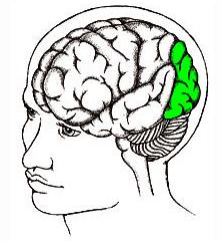
Carl needs strategies for Gsm deficits
(memory span; working memory)

- **Give Directions in Multiple Formats:**
  - visual and verbal
  - encourage him to paraphrase directions and explain what they mean
  - give examples of what needs to be done

Glenda Thorne, Ph.D., "10 Strategies to Enhance Students' Memory"; CLD.org

Carl needs strategies for Gsm deficits (memory span; working memory)

- **Teach Students to Over-learn Material**
  - several error-free repetitions are needed to solidify the information
- **Teach Students to Use Visual Images and Other Memory Strategies**



Glenda Thorne, Ph.D., "10 Strategies to Enhance Students' Memory"; CLD.org

Visual Images Used to Aid Vocabulary Development

- Reading
  - Vocabulary Cartoons II (Burchers, 2000)
    - Target word and definition are included along with a cartoon that reinforces the words meaning in a visual format
    - Grades 3+

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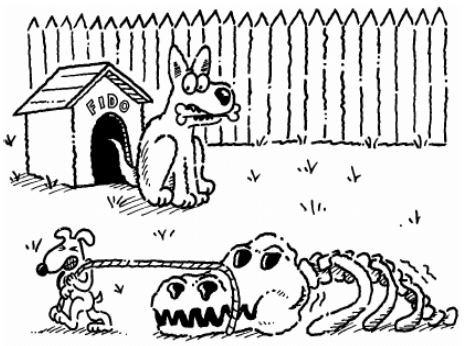
COLOSSAL
(kuh LOS ul) *adj.*
enormous, gigantic; huge in size, extent or degree

Sounds like: **FOSSIL**



"A COLOSSAL FOSSIL."

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ABDUCT
(ab DUCT)
to kidnap or carry off by force

Sounds like: **DUCK**

"ABDUCTED DUCKS."

- The Evil Knight planned to **ABDUCT** the queen when she came alone to the village.

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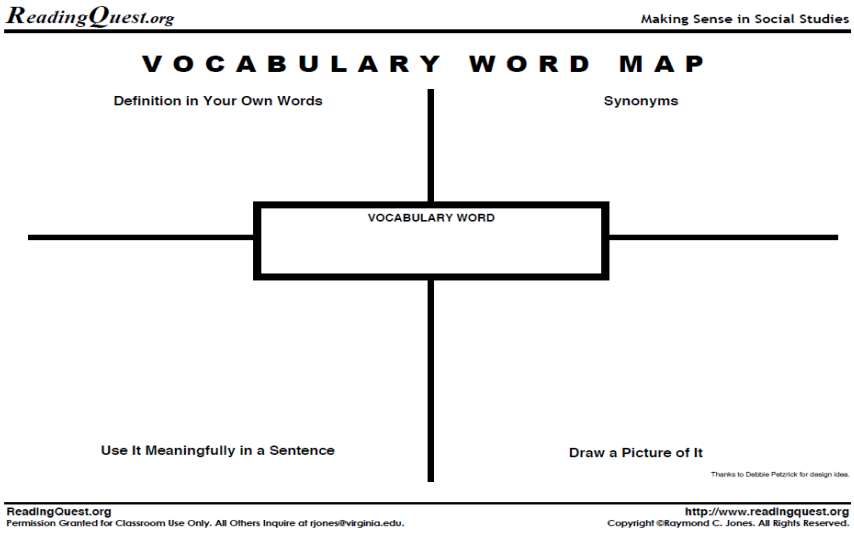
Sight Word Development Aided by Visual Images and Multiple Associations



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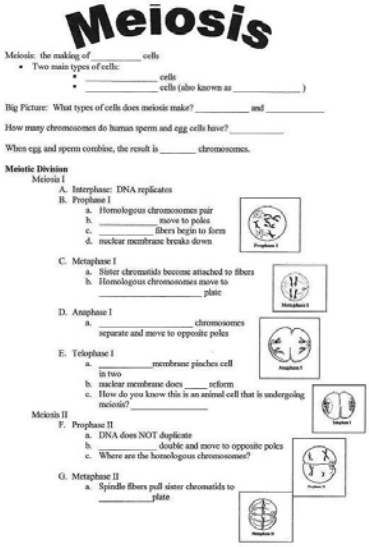
Strategies for Gsm deficits (memory span; working memory)

- **Give Teacher-Prepared Handouts Prior to Class Lectures:**
  - brief outline
  - guided notes
  - partially completed graphic organizer that the student would complete during the lecture


Meiosis

Meiosis: the making of _____ cells
- Two main types of cells:
  - _____ cells
  - _____ cells (also known as _____)

Big Picture: What types of cells does meiosis make? _____ and _____

How many chromosomes do human sperm and egg cells have? _____

When egg and sperm combine, the result is _____ chromosomes.

Meiotic Division

Meiosis I

A. Interphase: DNA replicates

B. Prophase I
   a. Homologous chromosomes pair
   b. _____ move to poles
   c. _____ fibers begin to form
   d. nuclear membrane breaks down

C. Metaphase I
   a. Sister chromatids become attached to fibers
   b. Homologous chromosomes move to _____ plate

D. Anaphase I
   a. _____ chromosomes separate and move to opposite poles

E. Telophase I
   a. _____ membrane pinches cell in two
   b. nuclear membrane does _____ reform
   c. How do you know this is an animal cell that is undergoing meiosis? _____

Meiosis II

F. Prophase II
   a. DNA does NOT duplicate
   b. _____ double and move to opposite poles
   c. Where are the homologous chromosomes?

G. Metaphase II
   a. Spindle fibers pull sister chromatids to _____ plate

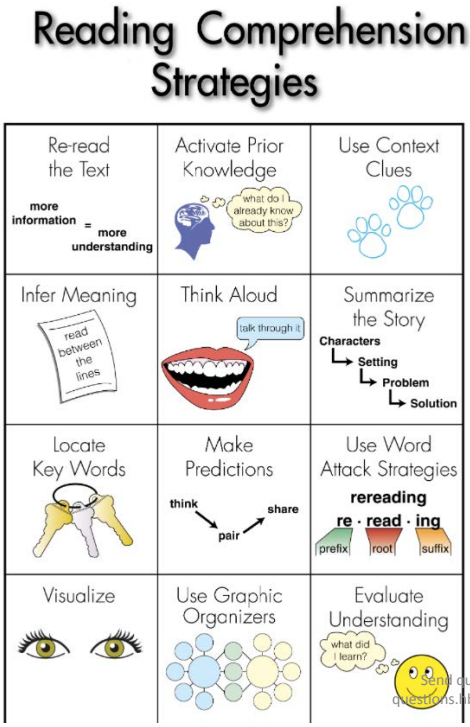
Send questions to questions.hbg@pattan.net

Glenda Thorne, Ph.D., "10 Strategies to Enhance Students' Memory"; CLD.org

Strategies for Gsm deficits (memory span; working memory)

- **Teach Students to Be Active Readers:**
  - students should underline, highlight, or jot key words down in the margins
  - To consolidate this information in long-term memory, they can make outlines or use graphic organizers

Glenda Thorne, Ph.D., "10 Strategies to Enhance Students' Memory"; CLD.org



Teach Students how to be Active Readers

Reading Comprehension Strategies (with visuals)

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What Good Readers Do

Before reading
- Read title
- Look over text features
- Set a purpose for reading
- Activate background knowledge

After Reading
- Reflect what you read
- Paraphrase
- Check predictions

During Reading
- Visualize
- Monitor comprehension
- Make connections
- Make and check predictions
- Analyze characters
- Reread confusing parts
- Infer meanings
- Ask and answer questions
- Mentally paraphrase

Strategies for Gsm deficits (memory span; working memory)

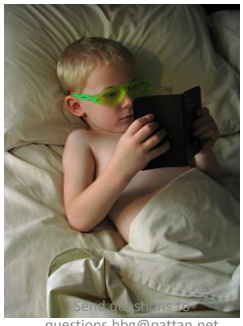
- **Help Students Develop Cues When Storing Information:**
  - HOMES can be used to represent the names of the Great Lakes – Huron, Ontario, Michigan, Erie and Superior

- **Prime the Memory Prior to Teaching/Learning:**
  - discuss the vocabulary and the overall topic before a reading comprehension task is given. This will allow them to focus on the salient information and engage in more effective depth of processing.

Glenda Thorne, Ph.D., "10 Strategies to Enhance Students' Memory"; CLD.org

Strategies for Gsm deficits

- **Review Material Before Going to Sleep:**
  - information studied this way is better remembered
  - any other task that is performed after reviewing and prior to sleeping (such as getting a snack, brushing teeth, listening to music) interferes with consolidation of information in memory



Glenda Thorne, Ph.D., "10 Strategies to Enhance Students' Memory"; CLD.org

Rapid Reference 1.17 Factors That May Facilitate Learning and Aid in Bypassing or Minimizing the Effects of a Long-Term Retrieval (Glr) Deficit

Classroom Instructional Factors	Instructional Materials	Environmental Factors	Strategies
Uses close-ended questions, yes/no, true/false	Guided lists for implementing procedures, formulas	Procedural charts	Organizes material to be learned using visual aids (e.g., diagrams, flowcharts), auditory aids (e.g., chunking), or other tangibles (e.g., flash cards)
Uses consistent instructional routines	Practice guides	Word walls	Makes connections by relating material to be learned to oneself
Offers repeated practice with and review of newly presented information	Online review	Desk organizers	Relates concepts to be learned to one another via tools such as a concept map
Teaches memory strategies and encourages their use (verbal rehearsal to support encoding, use of mnemonic devices; Dehn, 2010)	Glossaries (electronic, audio, printed)	External memory aids (lists, audible timers)	Creates a schedule for distributed practice of material to be learned
Uses multiple modalities when teaching new concepts (pair written or visual with verbal information) to support dual recoding (Dehn, 2010)	Study guides	Calendars with visual references to due dates	Plans for regular review of material
Limits the amount of new material to be learned; introduces new concepts gradually and with a lot of context	Review sheets	Visual reminders (Post-its, color-coded systems)	Rehearses material to be learned via recitation, repetition

(continued)

Mascolo, Flanagan, and Alfonso (2014). A systematic method of analyzing assessment results for tailoring interventions (SMAARTI), in Mascolo, Alfonso, & Flanagan, *Essentials of Planning, Selecting, and Tailoring Interventions for Unique Learners* (pp. 3-55). Hoboken, NJ: Wiley.

Academic Manifestations (Glr)

- Language
  - Expressive – circumlocutions, speech fillers, "interrupted" thought, pauses
  - Receptive – making connections throughout oral presentations (e.g., class lecture)

Interventions for *Glr*

- **Active learning** *(Marzano, et al., 2001)*
- **Rehearsal, overlearning, elaboration** *(Squire & Schacter, 2003)*
- **Mnemonics** *(Wolfe, 2001)*
- **Visual representation** *(Greenleaf & Wells-Papanek, 2005)*
- **Organizational strategies**

Wendling and Miller (2010)

Glr Recommendations

- Repeated practice with and review of newly presented information
- Teach memory strategies (verbal rehearsal to support encoding, use of mnemonic devices)
- Use multiple modalities when teaching new concepts (pair written with verbal information)
- Limit the amount of new material to be learned; introduce new concepts gradually and with a lot of context
- Make associations between newly learned and prior information explicit
- Use lists to facilitate recall (prompts)

Glr Recommendations

- Expand vocabulary to minimize impact of word retrieval deficits
- Build in wait-time for student when fluency of retrieval is an issue
- Provide background knowledge first before asking a question to “prime” student for retrieval

Programs/Techniques for Glr Deficits

- When selecting a program or a technique to intervene with a student with a Glr deficit, it is helpful to ensure that it
  - includes encoding strategies (e.g., mnemonics, visuals)
  - uses some form of strategy instruction for accessing information

Reading and Writing Intervention Examples (Glr)

- Reading
  - Teaching text structure which, “organizes the reader’s thinking, and enhances understanding and recall of the information” (Wendling & Mather, 2009, p. 108)

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questions.hbg@pattan.net

Reading and Writing Examples (Glr)

- Story Map
  - Type of graphic organizer that can be used to teach narrative text structure
  - Focuses on 4 elements including (1) characters and their personalities/ motivations; (2) main problem; (3) characters' attempts to problem solve; (4) outcome/conclusion

Advanced Story Map Worksheet (Adapted from Gardill & Jitendra, 1999)

Student: _____ Date: _____ Class: _____

Story Name: _____

1. Who is the central character? _____
2. What is the main character like? (Describe his/her key qualities or personality traits).
   _____
   _____
3. Who is another important character in the story? _____
4. What is this other important character like? _____
   _____
5. Where and when does the story take place? _____
   _____
6. What is the major problem that the main character is faced with? _____
   _____
7. How does the main character attempt to solve this major problem? _____
   _____
8. What is the twist, surprise, or unexpected development that takes place in the story?
   _____
   _____
9. How is the problem solved or not solved?
   _____
   _____
10. What is the theme or lesson of the story?

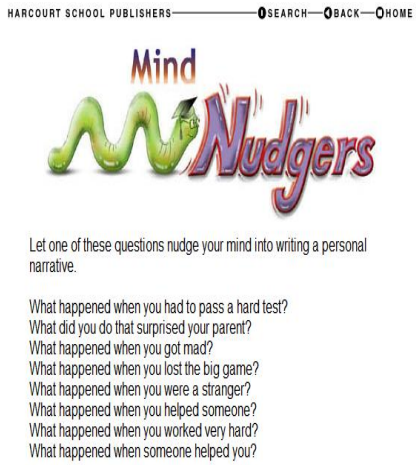
Reading and Writing Examples (Glr)

- Writing
  - Use programs with generated word banks so that the retrieval demands during writing are lessened and vocabulary is indirectly expanded by having the student use target words in sentences

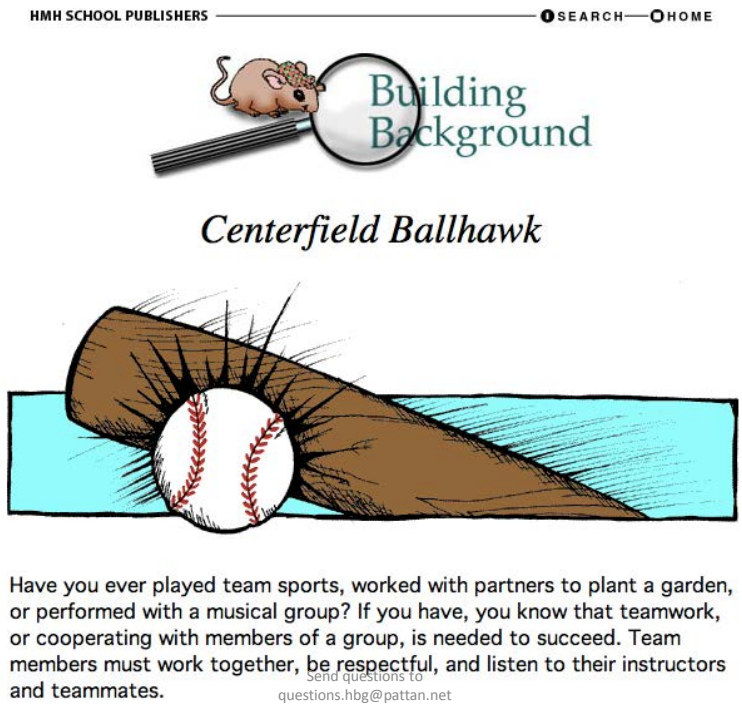
Using Instructional Materials (Glr)

- Use chapter terms such as *"word banks"* for writing activities to facilitate retrieval
- Use *chapter previews* to "prime" background knowledge and help student make associations
- Use *online tools* (e.g., writing prompts)

Harcourt Language (Grade 4)



Mind Nudgers serve as helpful "priming" tools (e.g., retrieval weakness and student needs to think of topic for free journal writing)



Read the sentences below. Click and drag the sentences into the correct bin. Decide which statements show **Good Teamwork** and which show **Poor Teamwork.**

After sorting the statements, decide how you can be a better team player. Think of other ways to improve your teamwork skills. Work with a classmate to make a poster about teamwork.

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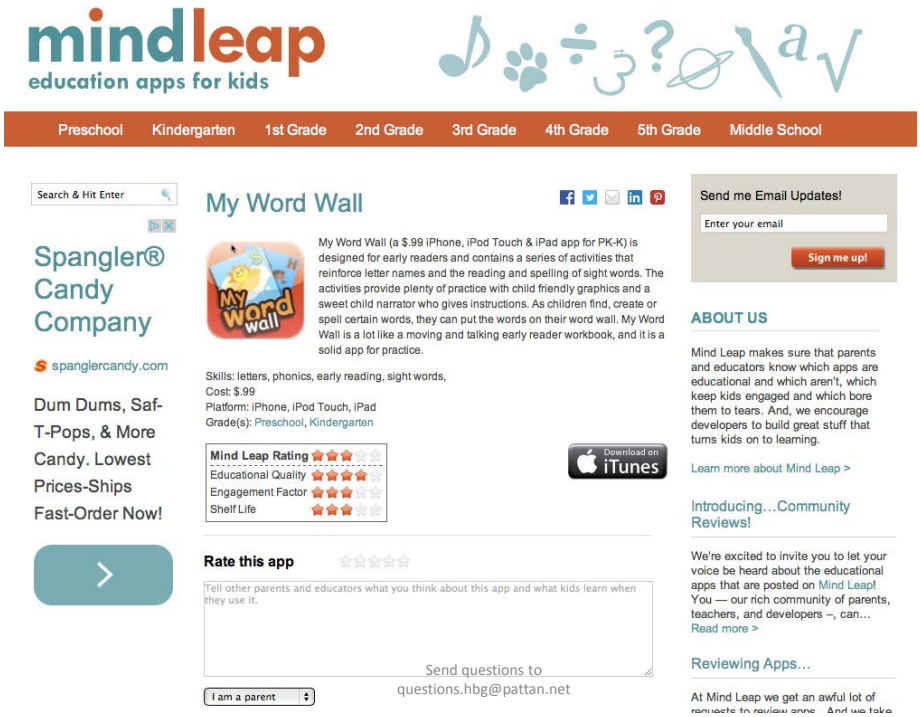
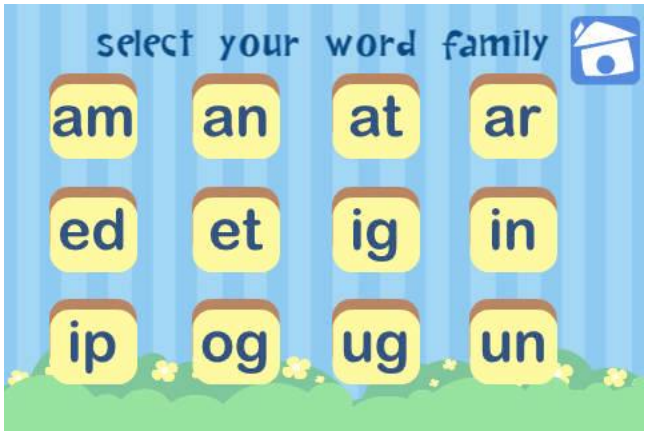


My Word Wall: Word Families



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My Word Wall: Multisensory

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My Word Wall: Activities

My Word Wall: Review

KinderTown Review

My Word Wall is a first-rate phonics app. With loads of activities and games, your beginning reader will have a great time practicing spelling, phonics and overall wordplay. Your child will engage in six activities that work on identifying beginning sounds, word puzzles, word families, matching words to pictures, and general vocabulary building. Directions are given in each game and there are no hints as the games are designed for your child to also discover the answers with out "buzzing" every error made.

Source: www.mykindertown.com

App Resources for Parents

KinderTown has App resources for parents. You can sort by age, device, price

Stuck on a tricky word?
Franklin Public Schools, MA

Eagle Eye	**Look at the Pictures** • Look at the picture for clues.
Lips the Fish	**Get your Lips Ready** • Say the first few sounds. • Read to the end of the sentence and say it again.
Stretchy Snake	**Stretch it Out** • Stretch the word out slowly. • Put the sounds together.
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Flip the Dolphin	**Flip the Vowel** • Try the short vowel sound. • Try the long vowel sound.
Tryin' Lion	**Try it Again** • Try to reread the sentence. • Try a word that makes sense. • Try to switch b/d.
Helpful Hippo	**Ask for Help** • Ask for help after you have tried all of the other strategies.

Reading Decoding Strategies

(with visuals)

Rapid Reference 1.19 Factors That May Facilitate Learning and Aid in Bypassing or Minimizing the Effects of a Visual Processing (Gv) Deficit

Classroom Instructional Factors	Instructional Materials	Environmental Factors	Strategies
Provide oral explanation for visual concepts	Video clips	Color-coded Information	Uses orthographic strategies for decoding (e.g., word length, shape of word); Uses "cover-copy-compare" technique—go to: http://www.amblesideprimary.com/ambleweb/lookcover/lookcover.html
Reviews spatial concept and supports comprehension through use of hands-on activities and manipulatives (e.g., using models to demonstrate the moon's orbital path).	Enlarged text (via online zoom feature or alternative print copy of textbook, worksheet)	Preferential seating aimed at allowing the student to access visual material (e.g., smart board) manipulatives, visual aids, and other materials to support learning	Capitalizes on intact or strong auditory skills during learning/studying (e.g., uses phonemic skills for decoding tasks)
Provides verbal label for visual representations (e.g., "The shaded red bars represent women's votes, the green bars represent men's votes)	Highlights margins during writing tasks	Assigned note-taking buddy	Pairs visual information with verbal (mnemonics)
Provides written copies of oral instructions, lectures	Provides direct handwriting practice	Readers or scribes, where needed	Labels visual charts/graphs with verbal labels
Auditory cueing to supplement visual information/cues (e.g., "Look at the bar graph for weekly sales")	Provides visual supports (graphic organizers, graph paper)	Reduce visual distraction	Highlights or color codes important information

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Gv Continued

Rapid Reference 1.19 Factors That May Facilitate Learning and Aid in Bypassing or Minimizing the Effects of a Visual Processing (Gv) Deficit

	Provides graph-paper to assist with number alignment	Alternative lighting (natural light, non-fluorescent lighting)	Uses aids to support visual tracking (finger, index card, ruler)
	Books on tape		Spaces items on a page
	Text-to-speech technology (screen and text readers)		Uses applications or supports that allow for enlargement of fonts
	Reading/scanning pens		Uses note-taking strategies (e.g., Cornell, outlining)

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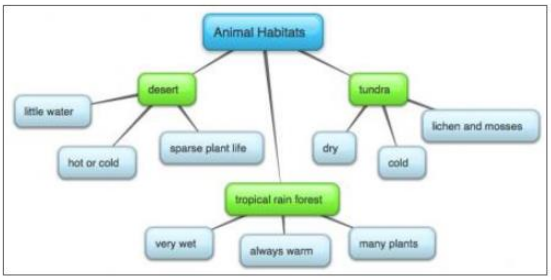
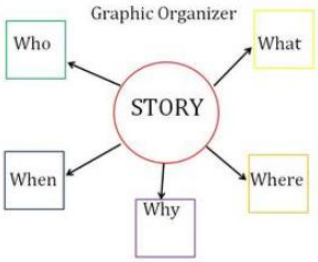
Bubbl.us





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Reading and Writing Examples (Gv)

- Writing
  - Cover, Copy, and Compare

trace, copy, recall: spelling
– short o words

trace	copy	recall
chopping		
product		
knock		
jogging		
dodging		
cotton		
forgotten		

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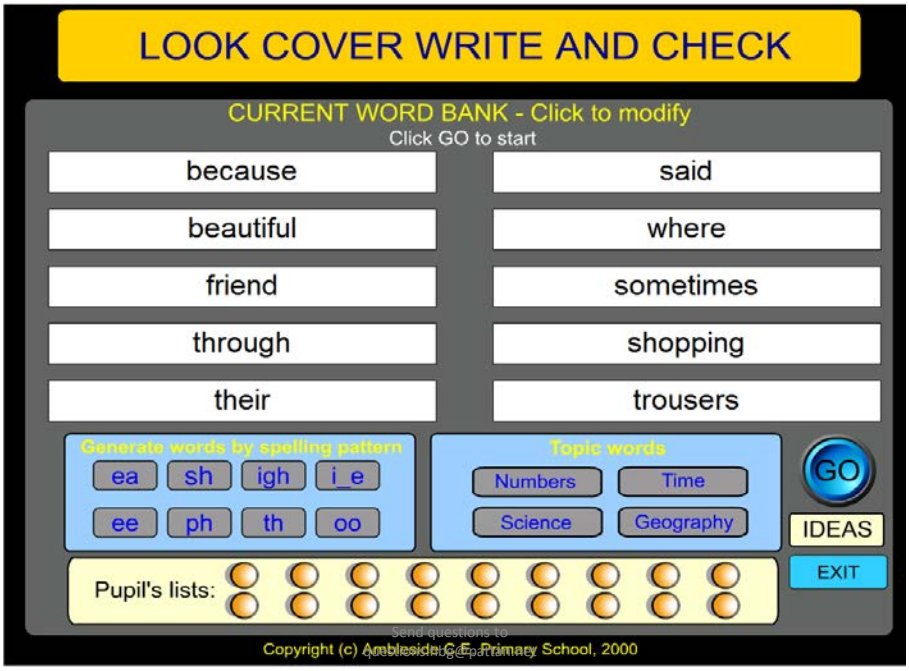
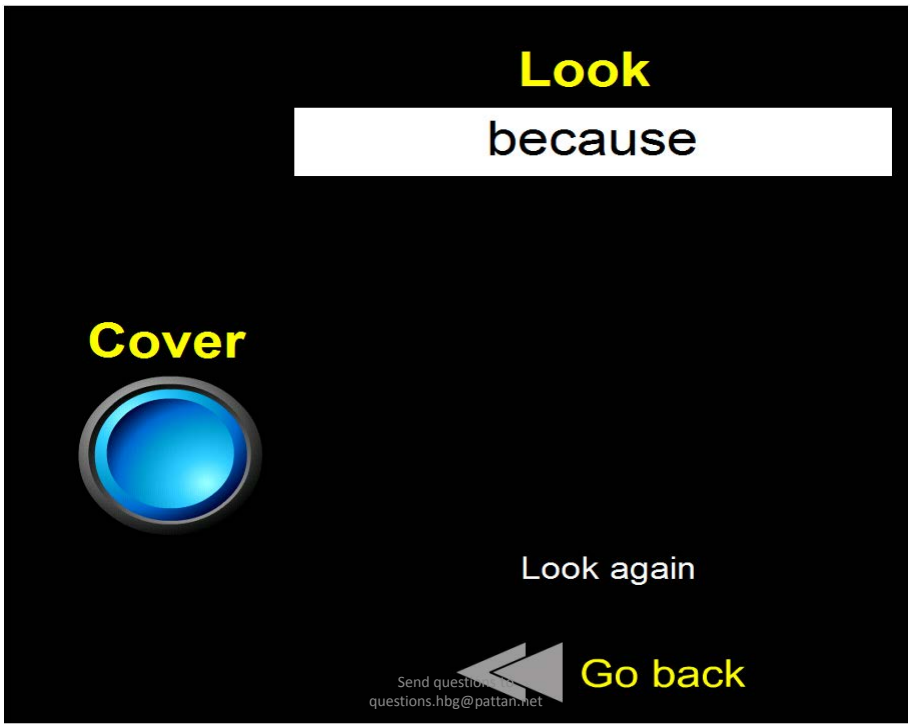
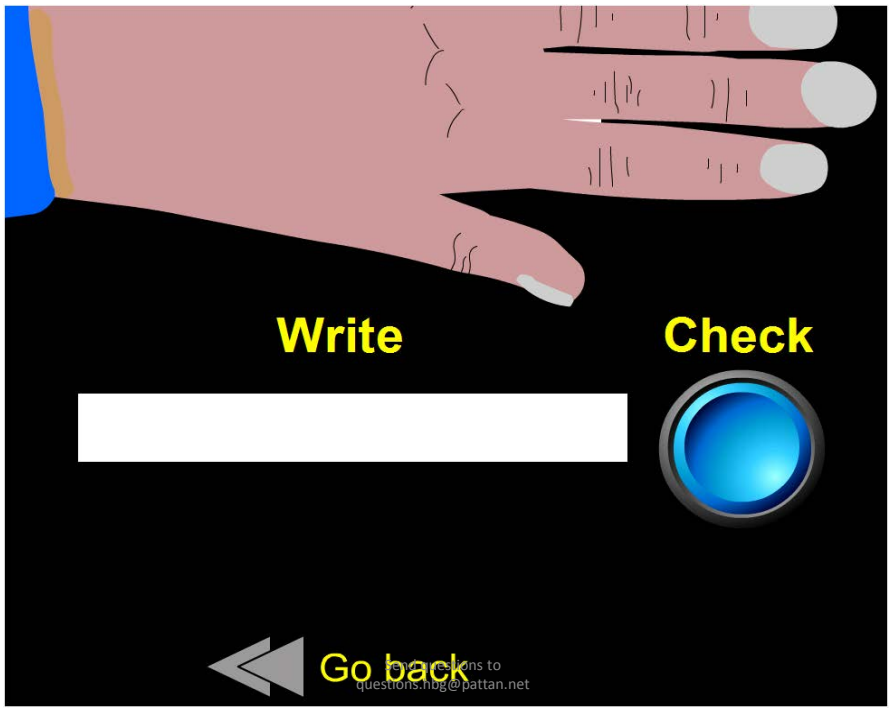
http://www.amblesideprimary.com/ambleweb/lookcover/lookcover.html






Write
Check
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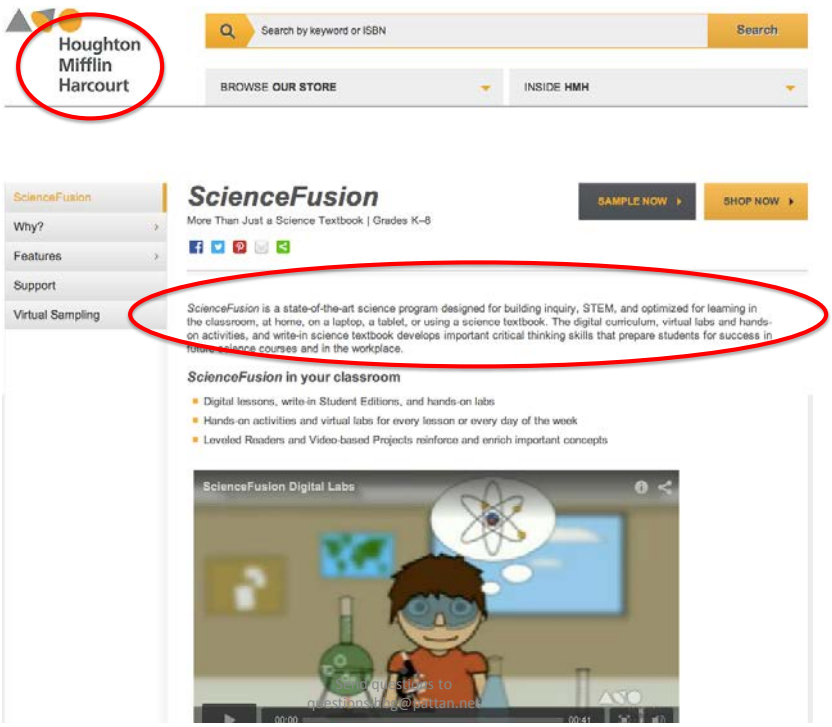
Houghton
Mifflin
Harcourt
Search by keyword or ISBN
Search
BROWSE OUR STORE
INSIDE HMH
ScienceFusion
Why?
Features
Support
Virtual Sampling
ScienceFusion
More Than Just a Science Textbook | Grades K–8
SAMPLE NOW
SHOP NOW
ScienceFusion is a state-of-the-art science program designed for building inquiry, STEM, and optimized for learning in the classroom, at home, on a laptop, a tablet, or using a science textbook. The digital curriculum, virtual labs and hands-on activities, and write-in science textbook develops important critical thinking skills that prepare students for success in future science courses and in the workplace.
ScienceFusion in your classroom
Digital lessons, write-in Student Editions, and hands-on labs
Hands-on activities and virtual labs for every lesson or every day of the week
Leveled Readers and Video-based Projects reinforce and enrich important concepts
ScienceFusion Digital Labs
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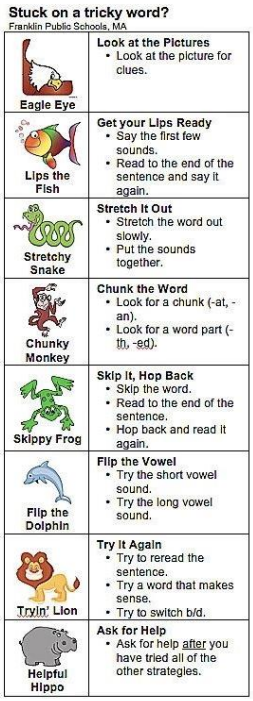

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Franklin Public Schools, MA

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Helpful Hippo	**Ask for Help** • Ask for help after you have tried all of the other strategies.

Reading Decoding Strategies

(with visuals)

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How to Use Instructional Materials

- Visual Features of texts (maps, graphs, models)
- Graphic Organizers online
- “Using Tables, Charts, and Graphs” in Harcourt Science text

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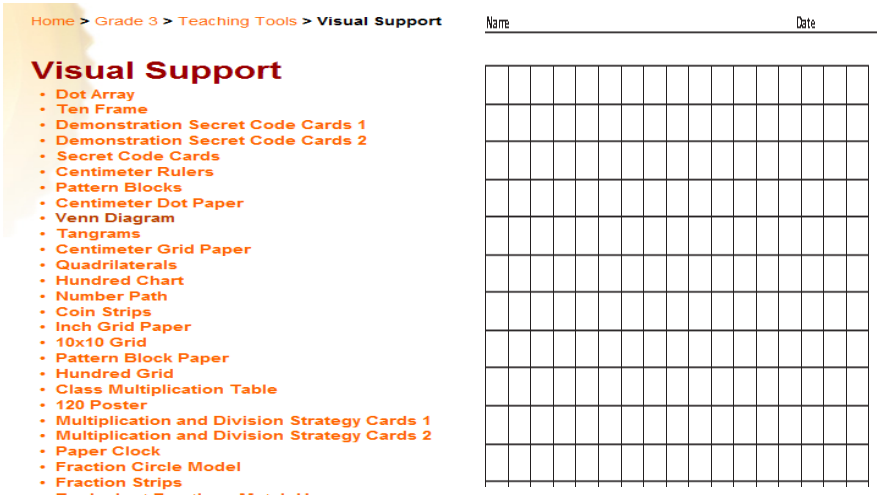
Houghton Mifflin Math Expressions

Send questions to
questions.hbg@pattan.net

Houghton Mifflin Math Expressions



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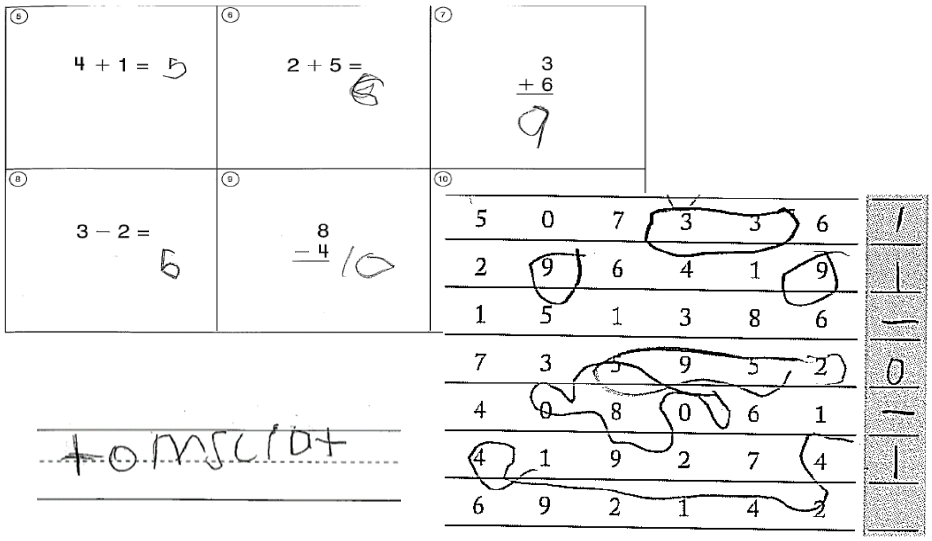
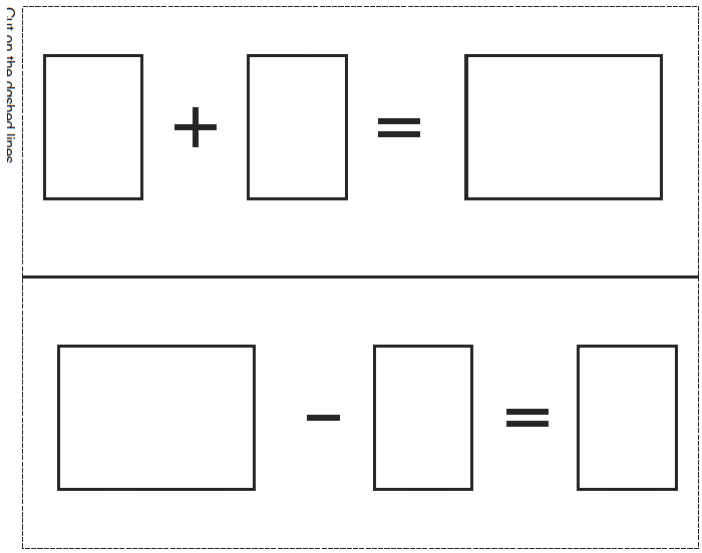
Johnny has perceptual-motor, graphomotor difficulties – OT intervention seems warranted; needs visual supports





Rapid Reference 1.16 Factors That May Facilitate Learning and Aid in Bypassing or Minimizing the Effects of an Auditory Processing (Ga) Deficit

Classroom Instructional Factors	Instructional Materials	Environmental Factors	Strategies
Enunciates sounds in words in an emphatic manner when teaching new words for reading or spelling	Video clips	Rules for talking and listening	Use comprehension monitoring (e.g., Does the word I heard/read make sense in context?)
Uses instructional techniques (e.g., work preview/text preview) to clarify unknown words	Read aloud texts/ features	Spelling lists	Engage in self-advocacy (e.g., asking for information to be repeated and/or clarified in regard to the misheard part)
Provides instructional supports (e.g., guided notes) during note-taking activities	Audio glossaries	Closed doors	Physically positioning oneself toward/close to the speaker
Builds in time for clarification questions related to "missed" or "misheard" items during lecture	Supplement oral instructions with written instructions	Closed windows	Attending to speaker's mouth and/or gestures, facial expressions, during the delivery of information
Shortens instructions	Phonemic awareness activities	Distraction-free seating	Recording notes via audio methods to allow a mechanism for being able to fill in notes for completeness
Makes an effort to minimize background noise via the use of instructional commands (e.g., work quietly, refrain from talking with your neighbor)	Electronic textbooks	Noise minimizers (carpet, noise-reducing headphones)	Following along with written directions/text during the provision of oral instruction
Repeats or rephrases questions asked by other students to ensure that all students "hear" the question that is associated with the teacher's given response	Guided notes, graphic organizers	Preferential seating (close to teacher, away from heaters, fans)	Practicing spelling lists with visually based techniques
Emphasizes sight-word reading		Localize sound source for student by standing closer when delivering instructions	Use visualization strategies to remember things
Pauses when delivering oral instruction to allow time for student to process auditory information			Use written mediums (e.g., email, text) to preserve content/integrity of information communicated

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Help for students, parents and teachers

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Audiobooks Can Help Your Child Become a Better Reader and a More Effective Learner

If your child is having trouble learning to read or is struggling to keep up with homework, audiobooks can be a powerful tool that can improve reading comprehension, boost confidence, save time on schoolwork and lead to better grades.

Become a better reader with audiobooks

Listening to an audiobook while visually following the text can improve reading skills in dyslexic students.

By engaging multiple senses, listening along with the text can improve reading comprehension, increase vocabulary, and improve fluency.

Find out how »

Become a better learner with audiobooks

When reading assignments take too long, audiobooks can help your child finish homework faster.

Dyslexic students find themselves spending hours longer than their peers doing homework because they're bogged down with reading assignments. Instead of struggling with **decoding** words on the page, your child can focus on getting the information they need with audiobooks.

Get started »

An expert's opinion

Dr. Sally Shaywitz, one of the world's leading authorities on dyslexia, explains how audio textbooks from Learning Ally help people with this pervasive learning difference.

View details »

Rapid Reference 1.18 Factors That May Facilitate Learning and Aid in Bypassing or Minimizing the Effects of a Processing Speed (Gs) Deficit

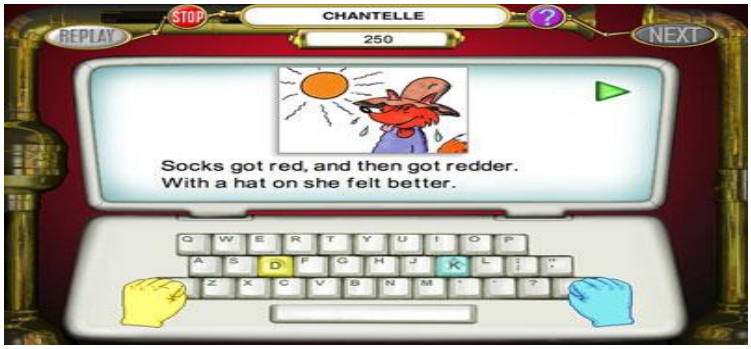
Classroom Instructional Factors	Instructional Materials	Environmental Factors	Strategies
Focuses on features of work products that are unrelated to time parameters (e.g., quality or accuracy of a response)	Practice guides	Clocks	Plan for long-term projects by using a realistic schedule that allows for consistent movement toward completion
Repeated practice	Online review	Written schedules	Preview important parts of text (end-of-chapter questions, title, subtitles, glossary of terms) to facilitate reading speed
Offers speed drills		Desk organizers	Apply planning and time management strategies
	Use computer activities that require quick, simple decisions		Use techniques such as skimming and scanning for reading activities
Extended time	Books on tape		Use an outlining strategy for note-taking
Reduces the quantity of work required (including homework)	Online activities/games (e.g., http://www.arcademicskillbuilders.com/games/)		
Increases wait-times both after questions are asked and after responses are given			
Choral repeated reading			

Reading and Writing Examples (Gs)

- Writing
- Wordy Qwerty from Talking Fingers

The overall purpose of ***Wordy Qwerty: Foundations for Reading and Writing Fluency***, is to improve phonological and morphological sensitivity, to develop a deeper understanding of how words are constructed in English, and to provide reading and writing activities with helpful feedback, in order to increase fluency and comprehension in reading and writing. **Wordy Qwerty** has 20 lessons, with six activities per lesson, that present the following foundations for fluency:

Increasing Fluency in Writing



Write Stories: In these cleverly illustrated 8-line rhymes, children hear and see the first line, and have to type out the second line after it is dictated. They can see and hear the dictated line as often as they need, but get more points if they remember the sentence and try to spell the words correctly. These little stories are full of words that require using the spelling rule just presented.

www.arcademics.com

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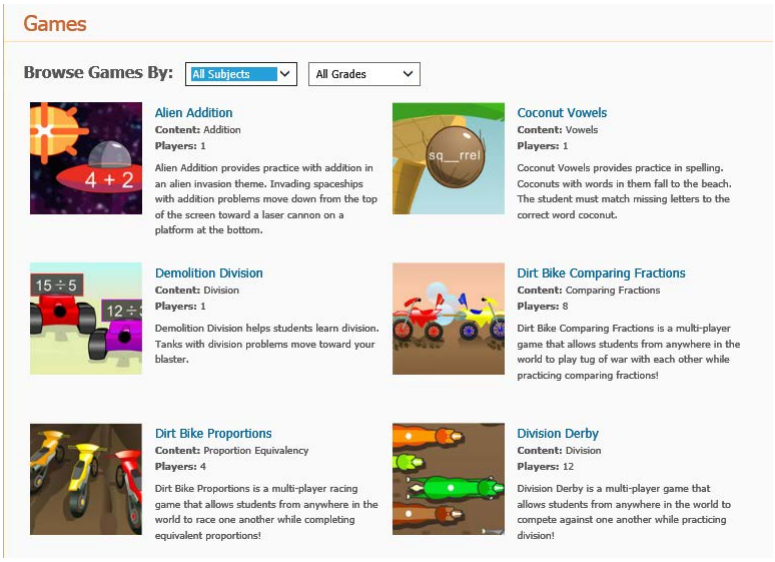

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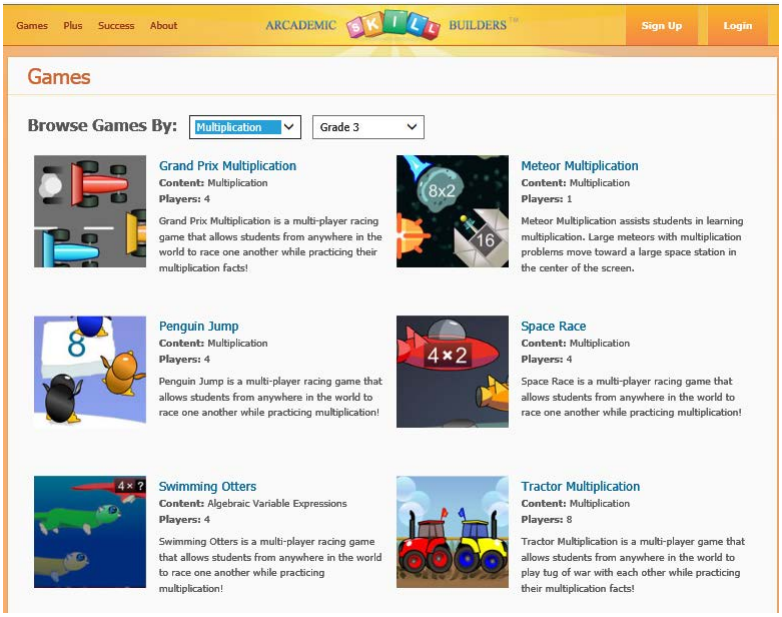

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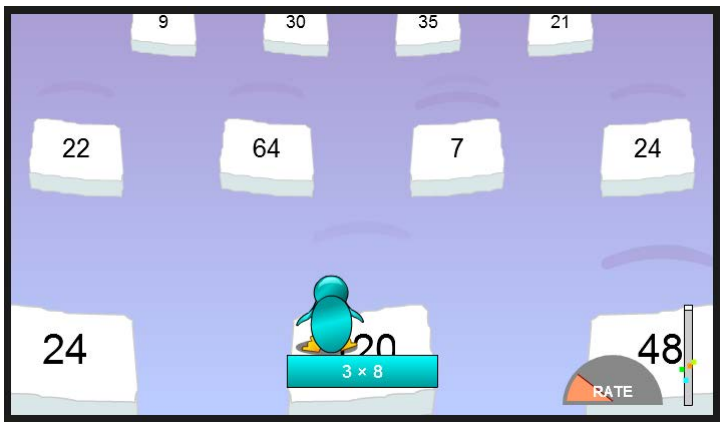

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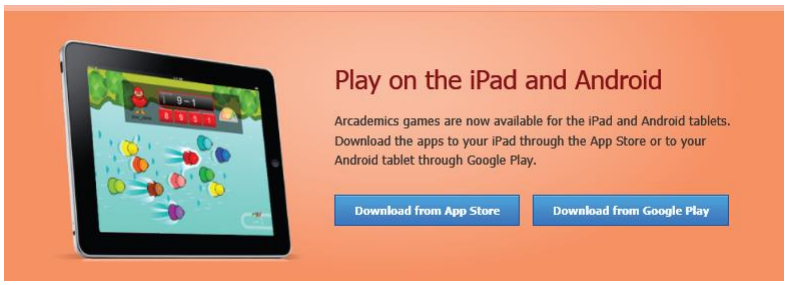

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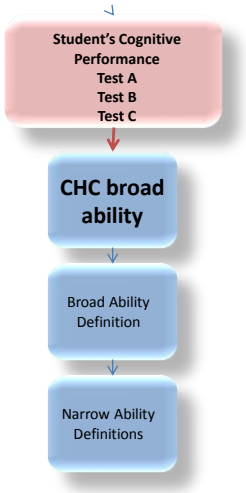
Strategies, Techniques, Evidence-based Programs, and Supports (STEPS)



A Student's Cognitive Processing and Ability Strengths and Weaknesses Informs Diagnosis and Intervention

A Comprehensive Evaluation for Suspected SLD Ought to Include Measurement of Cognitive Abilities and Processes within at least Seven CHC Domains

- SLD has neurobiological influences and is defined by specific cognitive processing weaknesses
- Evidence of cognitive-achievement relationships
- Cognitive processing weaknesses manifest in real-world performances (e.g., reading, math, writing)
- Cognitive processing weaknesses obstruct learning; when identified, steps can be taken to minimize the effects of these weaknesses on the student's ability to access the curriculum
- **Some cognitive processes can be remediated**

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Flanagan, 2016, NASP W02

Remediation of Cognitive Processes

- ***Phonological processing*** – areas of the brain normally involved in phonological processing associated with no activation prior to intervention; substantial increase in activation and improved reading skills after intervention

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Flanagan, 2016, NASP W02

Dyslexia-specific brain activation profile becomes normal following successful remedial training

P.G. Simos, PhD, J.M. Fletcher, PhD, E. Bergman, MD, J.I. Breier, PhD, B.R. Foorman, PhD, E.M. Castillo, PhD, R.N. Davis, MA, M. Fitzgerald, BA and A.C. Papanicolaou, PhD

Objectives: To examine changes in the spatiotemporal brain activation profiles associated with successful completion of an intensive intervention program in individual dyslexic children.

Methods: The authors obtained magnetic source imaging scans during a pseudoword reading task from eight children (7 to 17 years old) before and after 80 hours of intensive remedial instruction. All children were initially diagnosed with dyslexia, marked by severe difficulties in word recognition and phonologic processing. Eight children who never experienced reading problems were also tested on two occasions separated by a 2-month interval.

Results: Before intervention, all children with dyslexia showed distinctly aberrant activation profiles featuring little or no activation of the posterior portion of the superior temporal gyrus (STGp), an area normally involved in phonologic processing, and increased activation of the corresponding right hemisphere area. After intervention that produced significant improvement in reading skills, activity in the left STGp increased by several orders of magnitude in every participant. No systematic changes were obtained in the activation profiles of the children without dyslexia as a function of time.

Conclusions: These findings suggest that the deficit in functional brain organization underlying dyslexia can be reversed after sufficiently intense intervention lasting as little as 2 months, and are consistent with current proposals that reading difficulties in many children represent a variation of normal development that can be altered by intensive intervention.

Neural deficits in children with dyslexia ameliorated by behavioral remediation: Evidence from functional MRI

Elise Temple[†‡], Gayle K. Deutsch[§], Russell A. Poldrack[¶], Steven L. Miller[‖], Paula Tallal[‖‡‡], Michael M. Merzenich[‖††], and John D. E. Gabrieli[†§]

Abstract

Developmental dyslexia, characterized by unexplained difficulty in reading, is associated with behavioral deficits in phonological processing. Functional neuroimaging studies have shown a deficit in the neural mechanisms underlying phonological processing in children and adults with dyslexia. The present study examined whether behavioral remediation ameliorates these dysfunctional neural mechanisms in children with dyslexia. Functional MRI was performed on 20 children with dyslexia (8–12 years old) during phonological processing before and after a remediation program focused on auditory processing and oral language training. Behaviorally, training improved oral language and reading performance. Physiologically, children with dyslexia showed increased activity in multiple brain areas. Increases occurred in left temporo-parietal cortex and left inferior frontal gyrus, bringing brain activation in these regions closer to that seen in normal-reading children. Increased activity was observed also in right-hemisphere frontal and temporal regions and in the anterior cingulate gyrus. Children with dyslexia showed a correlation between the magnitude of increased activation in left temporo-parietal cortex and improvement in oral language ability. These results suggest that a partial remediation of language-processing deficits, resulting in improved reading, ameliorates disrupted function in brain regions associated with phonological processing and produces additional compensatory activation in other brain regions.

Remediation of Cognitive Processes

- ***Orthographic processing*** – individuals in orthographic processing interventions showed reliable change (reading/spelling), normalization of brain activation, and treatment-specific response to brain areas associated with orthographic processing.

Flanagan, 2016, NASP W02

Individual fMRI activation in orthographic mapping and morpheme mapping after orthographic or morphological spelling treatment in child dyslexics

Todd L. Richards[a], Elizabeth H. Aylward[a], Virginia W. Berninger[b], Katherine M. Field[a], Amie C. Grimme[a], Anne L. Richards[a, d], William Nagy[c]

Journal of Neurolinguistics
Volume 19, Issue 1, January 2006, Pages 56–86

Abstract

Four sets of word-form tasks were administered during fMRI scanning to 18 child dyslexics and 21 controls to identify unique brain activation associated with four kinds of mapping—orthographic, morpheme with and without phonological shift, and phoneme—before treatment, and to measure the effect on each kind of mapping after orthographic and morphological spelling treatment (to which dyslexics were randomly assigned). Dyslexics and/or controls showed significant pretreatment activation in group maps in 18 brain regions during one or more of the mapping tasks. Average fMRI z-scores were used to determine for each kind of fMRI mapping which of the 18 brain areas (a) differentiated dyslexics and controls before treatment; (b) showed significant pre- to post-treatment activation change in dyslexics; (c) showed post-treatment 'normalization' of activation; and (d) changed differently for dyslexics as a function of the kind of treatment received. Dyslexics in orthographic treatment showed reliable change, normalization, and treatment-specific response in right inferior frontal gyrus and right posterior parietal gyrus. Implications of the findings of the combined group map and individual (region of interest) analyses for neurolinguistics, including assessment, treatment and brain plasticity, and the role of different word forms in spelling at a specific developmental stage, are discussed.

Growth in Phonological, Orthographic, and Morphological Awareness in Grades 1 to 6

Virginia W. Berninger · Robert D. Abbott · William Nagy · Joanne Carlisle

Journal of Psycholinguistic Research
April 2010, Volume 39, Issue 2, pp 141-163

Abstract Growth curve analyses showed that (a) word-level phonological and orthographic awareness show greatest growth during the primary grades but some additional growth thereafter, and (b) three kinds of morphological awareness show greatest growth in the first three or four grades but one—derivation—continues to show substantial growth after fourth grade. Implications of the findings for the role of three kinds of linguistic awareness—phonological, orthographic, and morphological—in learning to read and spell words are discussed. A case is made that phonological awareness, while necessary, is not sufficient for learning to read English—all three kinds of linguistic awareness that are growing during the primary grades need to be coordinated and applied to literacy learning. This finding and a review of the research on linguistic awareness support the conclusion that the recommendations of the National Reading Panel need to be amended so that the research evidence supporting the importance of both orthographic and morphological awareness, and not only phonological awareness, is acknowledged. Moreover, evidence-based strategies for teaching each of these kinds of linguistic awareness and their interrelationships need to be disseminated to educational practitioners.

Remediation of Cognitive Processes

- ***Working Memory Capacity*** – Individual differences in working memory capacity are correlated with the structural integrity of white matter pathways connecting domain general regions with the frontoparietal network; working memory training produces measureable growth in connectivity; working memory training increases the integrity of white matter (e.g., Takeuchi et al., 2010).

The Journal of Neuroscience, March 3, 2010 • 30(9):3297–3303 • 3297

Cognitive Intervention -> Structural Changes in Brain -> Improved Working Memory Capacity

Development/Plasticity/Repair

Training of Working Memory Impacts Structural Connectivity

Hikaru Takeuchi,[1] Atsushi Sekiguchi,[2] Yasuyuki Taki,[1] Satoru Yokoyama,[2] Yukihito Yomogida,[2,3] Nozomi Komuro,[4] Tohru Yamanouchi,[4] Shozo Suzuki,[4] and Ryuta Kawashima[1,2,5]

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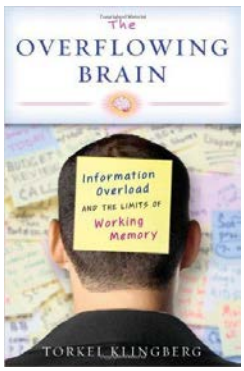
Working memory is the limited capacity storage system involved in the maintenance and manipulation of information over short periods of time. Individual capacity of working memory is associated with the integrity of white matter in the frontoparietal regions. It is unknown to what extent the integrity of white matter underlying the working memory system is plastic. Using voxel-based analysis (VBA) of fractional anisotropy (FA) measures of fiber tracts, we investigated the effect of working memory training on structural connectivity in an interventional study. The amount of working memory training correlated with increased FA in the white matter regions adjacent to the intraparietal sulcus and the anterior part of the body of the corpus callosum after training. These results showed training-induced plasticity in regions that are thought to be critical in working memory. As changes in myelination lead to FA changes in diffusion tensor imaging, a possible mechanism for the observed FA change is increased myelination after training. Observed structural changes may underlie previously reported improvement of working memory capacity, improvement of other cognitive functions, and altered functional activity following working memory training.

Klingberg asserts that ***Working Memory Capacity*** can be increased in his book



Evidence from Cogmed: Results from meta-analysis show highly significant effects of working memory training on improving visuospatial WM and verbal WM and these effects remain significant over time (Shinaver, Entwistly, & Soderqvist, 2014)

Flanagan, 2016, NASP W02

Applied Neuropsychology: Child
Volume 3, Issue 3, 2014
Special Issue: Executive Functioning II: Treatment

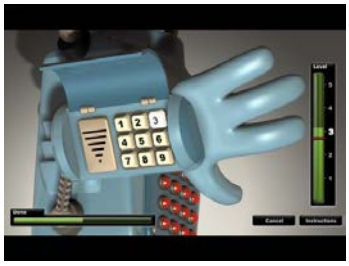
ARTICLES

Cogmed WM Training: Reviewing the Reviews

DOI: 10.1080/21622965.2013.875314
Charles S. Shinaver III[a], Peter C. Entwistle[b*] & Stina Söderqvist[c]
pages 163-172

Publishing models and article dates explained

Published online: 10 Jul 2014



- **WM is improved using working memory training**
- **Attention is improved following working memory training**
- **Cogmed has a significant impact on visual-spatial and verbal working memory and these effects generalize to improved sustained attention up to 6 months**
- **Evidence of improved academics following Cogmed training – but more controlled studies needed before making strong and specific claims**

Flanagan, 2016, NASP W02

Effect of Cognitive Processing Assessments and Interventions on Academic Outcomes: Can 200 Studies Be Wrong?

Burns, 2016, *Communiqué*

Excerpts from Article

- 203 studies across seven meta-analyses
- Largest effect size reported was .58 *for cognitively focused interventions (e.g., long-term memory, planning, processing speed, working memory, visual-spatial processing) compared to no intervention*
- Relationship between student RTI and IQ showed an average effect size of .35
- "IQ tells us very little about how well a student will respond to intervention"

Comments

- Characteristics of these studies (demographics, basic stats: e.g., medians, ranges of effect sizes) are not reported; reader cannot, therefore, review information critically
- Not all studies showed small effects for cognitively focused interventions
- IQ mediates RTI (hasn't changed in 70+ years)
  - **Monroe (1939)** – The rate of progress under remedial instruction was found to be a function of the child's intelligence (among other variables, such as number of hours of training, severity of the disability, supervision of the remedial techniques)
  - **Fuchs and Young (2006)** – IQ often mediates or influences the effectiveness of reading instruction such that it is more or less effective for children with higher versus lower IQs.
- "IQ tells us very little about how well a student will respond to intervention" – What type of intervention?
  - Sound-symbol correspondence? Then yes
  - Advanced Mathematics? Then probably not true (no studies)
  - **Correlation between COG-*g* and ACH-*g* is .83** (.77 - .94; S.B., Kaufman et al., 2012; *Intelligence*)

Flanagan, 2016, NASP W02

Effect of Cognitive Processing Assessments and Interventions on Academic Outcomes: Can 200 Studies Be Wrong?

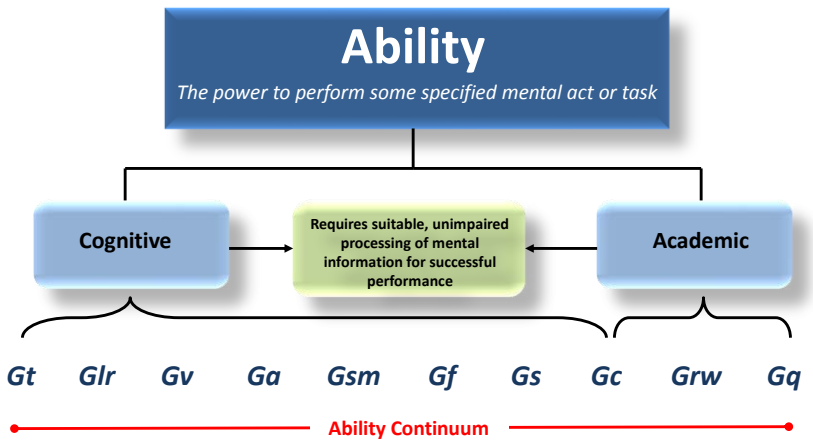
Burns, 2016, *Communiqué*

Conclusion from Article

- "The effect sizes for remediating academic deficits by intervening directly for the reading and mathematics deficit dwarf the effects of remediating assumed underlying cognitive deficits" (p. 27).

Comments

- No one has disagreed with or questioned this finding in the past 20 years.
- Some abilities and processes are more amenable to intervention than others.
- See ability continuum



Note: Definition of "ability" from Carroll (1993). Placement of abilities *roughly* follows the developmental growth curves for the seven CHC factors presented in the *WJ IV Technical Manual* (McGrew, LaForte, & Schrank, 2014)

Effect of Cognitive Processing Assessments and Interventions on Academic Outcomes: Can 200 Studies Be Wrong?

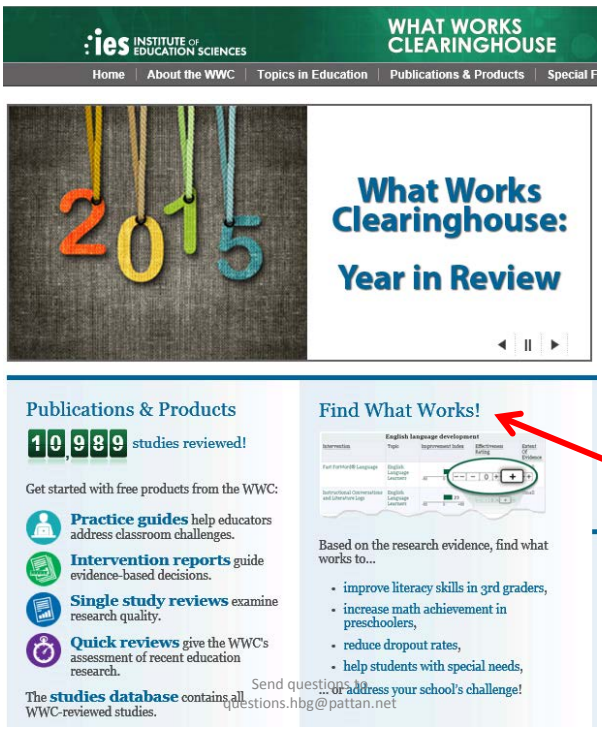
Burns, 2016, *Communiqué*

Conclusion from Article

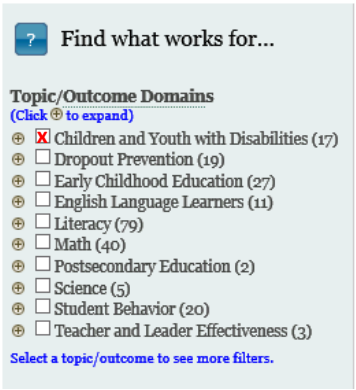
- Burns stated, "School psychologists should help school personnel keep focused on that which we know works" (p. 27).

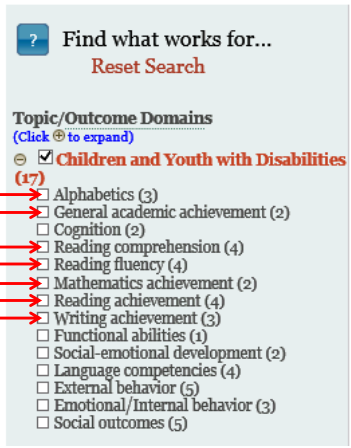
Comments

- ***What works for students with specific learning disabilities?***



http://ies.ed.gov/ncee/wwc/





Are Five Studies and Four "Potentially Positive" Interventions Enough?

Summary of What *May* Work for Students with Learning Disabilities

Academic Area	Intervention	# of Studies Meets Standards	# of Studies Meets Standards with Reservations	Number of Students	Grade	Improvement Index	Effectiveness Rating	Extent of Evidence
Alphabetics	Lindamood (LiPs)	1		50	4	9	Potentially Positive	Small
General Academic Achievement	-	0	-	-	-	-	-	-
Reading Comprehension	Peer-Assisted Learning Strategies	1	1	60	2-6	26	Potentially Positive	Small
Reading Fluency	Lindamood (LiPs)	Same as above		50	4	17	Potentially Positive	Small
Reading Fluency	Peer-Assisted Learning Strategies	Same as above	Same as above	60	2-6	15	Potentially Positive	Small
Reading Achievement		0	-	-	-	-	-	-
Writing Achievement	Read Naturally	1		20	4-6	13	Potentially Positive	Small
Writing Achievement	Spelling Mastery	2		70	2-4	28	Potentially Positive	Small
Math Achievement	Lindamood (LiPs)	Same as above		50	4	9	Potentially Positive	Small

***Note*: Data gathered from the What Works Clearinghouse Website:** http://ies.ed.gov/ncee/wwc/

Are Five Studies with "Potentially Positive" Interventions Enough?
Summary of What ***May*** Work for Students with Learning Disabilities

- **Alphabetics, Reading Fluency, Math Achievement**
  - What Works: *Lindamood*; effectiveness is potentially positive; 50 students in grade 4 (***one study***)
- **Reading Comprehension and Reading Fluency**
  - What Works: *Peer-Assisted Learning Strategies*; effectiveness is potentially positive; 60 students in grades 2-6 (***one study***)
- **Writing Achievement**
  - What Works: *Read Naturally*; effectiveness is potentially positive; 20 students in grades 4-6 (***one study***)
  - *Spelling Mastery*; effectiveness is potentially positive; 70 students in grades 2-4 (***two studies***)
- **Reading Achievement and General Academic Achievement**
  - What Works: No studies reported
- ***Evidence for what works for students with learning disabilities is extremely limited***

Flanagan, 2016, NASP W02

Send questions to questions.hbg@pattan.net

Effect of Cognitive Processing Assessments and Interventions on Academic Outcomes: Can 200 Studies Be Wrong?

Burns, 2016, *Communiqué*

Conclusions from Article

- School psychologists trained in an aptitude-by-treatment interaction tradition … should consider ways to more effectively support the children they serve.
- Warns that clinical beliefs may be overshadowing research data.

Comments

- Is the assumption that many school psychologists are trying to train cognitive processes (other than phonological and perhaps orthographic)? Who is doing that?
- Burns has taken the stance that because there is limited support for ATIs, cognitive assessment data are irrelevant in planning interventions…and perhaps just irrelevant period.
- Burns cited an "in press" meta-analysis that he conducted on the utility of neuropsychological test data for intervention planning – found no utility. No mention of how the data were used to inform intervention, however.

Flanagan, 2016, NASP W02

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Purpose of Cognitive Assessment

General

- To inform diagnosis
- To inform intervention

Specific

- To understand specific cognitive strengths and weaknesses and how they interact with the child's educational environment and impact the child's ability to access the curriculum

Aptitude-by-Treatment Interaction: Déjà Vu All Over Again

Misconception

- Because most cognitive deficits cannot be remediated (i.e., poor evidence for ATIs), there is little value in conducting cognitive assessments (see Burns, 2016).

Reality

- When cognitive processing and ability weaknesses are supported by ecological validity evidence, specific and tailored educational strategies, accommodations, and instructional modifications assist in minimizing the effects of those weaknesses on the student's ability to access the curriculum (see Mascolo, Alfonso, & Flanagan, 2014).

An Example of How Cognitive Processing Weaknesses Inform Intervention

Working Memory Deficit

- Standardized test data suggest a deficit in working memory capacity
- Student unable to take notes and concentrate on meaning of lesson/instruction simultaneously
- Notes are incomplete; limits ability to study; cannot rely on memory of content presented because information was not encoded
- Results in poor test performance

Accommodation

- Guided notes
- Minimizes effects of working memory deficit on student's ability to access curriculum/instruction
- Able to allocate limited working memory capacity to encoding information because note-taking is substantially reduced
- Complete set of notes to study from
- Results in better test performance

Skill-by-Treatment Interaction

Misconception

- There's an abundance of evidence-based academic interventions that have been demonstrated to improve outcomes *for students with specific learning disabilities*

Reality

- Very limited evidence
- No evidence for many academic skills at many grade levels *for students with specific learning disabilities* *(Source:* http://ies.ed.gov/ncee/wwc/)

Cognitive Tests in Perspective

It is not hard to identify struggling children after they have already fallen behind in school—no IQ test is needed for that. The trick is to prevent problems before they occur. Cognitive ability tests can help us prioritize scarce resources so that children most likely to fall behind are better able to keep up and succeed.

Joel Schneider (2016). Overview. In D.P. Flanagan & V.C. Alfonso, *Essentials of WISC-V Assessment*. Hoboken, NJ: Wiley. Publication expected late Summer 2016.

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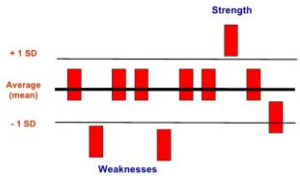
Third Option - PSW



- Requires an understanding of contemporary theory
- Requires an understanding of the theoretical constructs that are measured by cognitive batteries
- Requires understanding of cognitive processes and abilities related to achievement
- May require cross-battery assessment to assess all the abilities and processes considered important based on referral and to follow up on aberrant test performances
- Requires understanding of what SLD is and is not

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An Operational Definition of SLD
Flanagan, Ortiz, Alfonso, and Mascolo

- **Definition first presented in 2002**
- **Revised and updated in 2006**
- **Updated in 2007**

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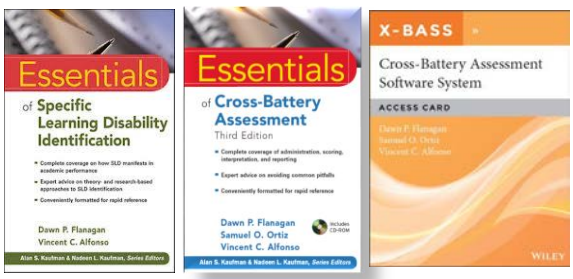
questions.hbg@pattan.net
D. P. Flanagan, 2016

An Operational Definition of SLD
Flanagan, Ortiz, Alfonso, and Mascolo

- **Revised and updated in 2011**
- **Updated and Renamed in 3e of Essentials of XBA3**: ***Dual Discrepancy/Consistency (DD/C)***
- **Expanded in 2015 to Include Latest Tests (e.g., WJ IV) in X-BASS**



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The Dual Discrepancy/Consistency (DD/C) Operational Definition of SLD

Level	Nature of SLD[1]	Focus of Evaluation	Examples of Evaluation Methods and Data Sources	Criteria for SLD	SLD Classification and Eligibility
I	Difficulties in one or more areas of academic achievement, including (but not limited to)[2] Basic Reading Skill, Reading Comprehension, Reading Fluency, Oral Expression, Listening Comprehension, Written Expression, Math Calculation, Math Problem Solving.	**Academic Achievement:** Performance in specific academic skills [e.g., *Grw-R (reading decoding, reading fluency, reading comprehension; Grw-W (spelling, written expression; Gq (math calculation, math problem solving; Gc (communication ability, listening ability*].	Response to quality instruction and intervention via progress monitoring, performance on norm-referenced, standardized achievement tests, evaluation of work samples, observations of academic performance, teacher/parent/student interview, history of academic performance, data from other members of Multidisciplinary Team (MDT) (e.g., speech-language pathologist, interventionist, reading specialist).	Performance in one or more academic areas is *weak or deficient*[3] (despite attempts at delivering quality instruction) as evidenced by converging data sources.	Necessary
II	SLD does not include a learning problem that is the result of visual, hearing, or motor disabilities; of intellectual disability; of social or emotional disturbance; or of environmental, educational, cultural, or economic disadvantage.	**Exclusionary Factors:** Identification of potential primary causes of academic skill weaknesses or deficits, including intellectual disability, cultural or linguistic difference, sensory impairment, insufficient instruction or opportunity to learn, organic or physical health factors, social/emotional or psychological disturbance.	Data from the methods and sources listed at Levels I and III. Behavior Rating Scales; medical records; prior evaluations; interviews with current or past counselors, psychiatrists, etc.	Performance is not *primarily* attributed to these exclusionary factors, although one or more of them may contribute to learning difficulties. [Consider using the ***Exclusionary Factors Form***, which may be downloaded from www.crossbattery.com under "resources."]	
III	A disorder in one or more of the basic psychological/neuro-psychological processes involved in understanding or in using language, spoken or written; such disorders are presumed to originate from central nervous system dysfunction.	**Cognitive Abilities & Processes:** Performance in cognitive abilities and processes (e.g., *Gv, Ga, Glr, Gsm, Gs*), specific neuropsychological processes (e.g., attention, executive functioning, orthographic processing; RAN; RAS) and learning efficiency (e.g., associative memory; free recall memory, meaningful memory).	Performance on norm-referenced tests, evaluation of work samples, observations of cognitive performance, task analysis, testing limits, teacher/parent/student interview, history of academic performance, records review.	Performance in one or more cognitive abilities and/or neuropsychological processes (related to academic skill deficiency) is *weak or deficient*[3] as evidenced by converging data sources.	

Flanagan, Oritz, & Alfonso (2013). ***Essentials of Cross-Battery Assessment, 3rd Edition***. Hoboken, NJ: Wiley.

The Dual Discrepancy/Consistency (DD/C) Operational Definition of SLD (Continued)

IV	The specific learning disability is a discrete condition differentiated from generalized learning failure by generally average or better ability to think and reason and a learning skill profile exhibiting significant variability, indicating processing areas of strength and weakness.	**Pattern of Strengths and Weaknesses (PSW) Marked by a Dual-Discrepancy/Consistency (DD/C)** Determination of whether academic skill weaknesses or deficits are related to specific cognitive area(s) of weakness or deficit; pattern of data reflects a below average aptitude-achievement *consistency* with otherwise average or better ability to think and reason.	Data gathered at all previous levels as well as any additional data following a review of initial evaluation results (e.g., data gathered for the purpose of hypothesis testing; data gathered via demand analysis and limits testing).	Circumscribed below average aptitude-achievement *consistency* (i.e., related cognitive processes and academic skills are generally about 1SD below the mean or lower); circumscribed ability-achievement and ability-cognitive aptitude *discrepancies*, with cognitive areas of strength represented by standard scores that are generally ≥90 (include SEM around score); clinical judgment supports the impression that the student's overall ability to think and reason will enable him or her to benefit from tailored or specialized instruction/intervention, compensatory strategies, and accommodations, such that his or her performance rate and level will likely approximate more typically achieving, non-disabled peers. Use the Cross-Battery Assessment Software System (X-BASS; Ortiz, Flanagan, & Alfonso, 2015) to conduct the PSW analysis.	Sufficient For SLD Identification
V	Specific learning disability has an adverse impact on educational performance.	**Special Education Eligibility**[4] Determination of Least Restrictive Environment (LRE) for delivery of instruction and educational resources.	Data from all previous levels and MDT meeting, including parents.	Student demonstrates significant difficulties in daily academic activities that cannot be remediated, accommodated, or otherwise compensated for *without* the assistance of individualized special education services.	Necessary for Special Education Eligibility

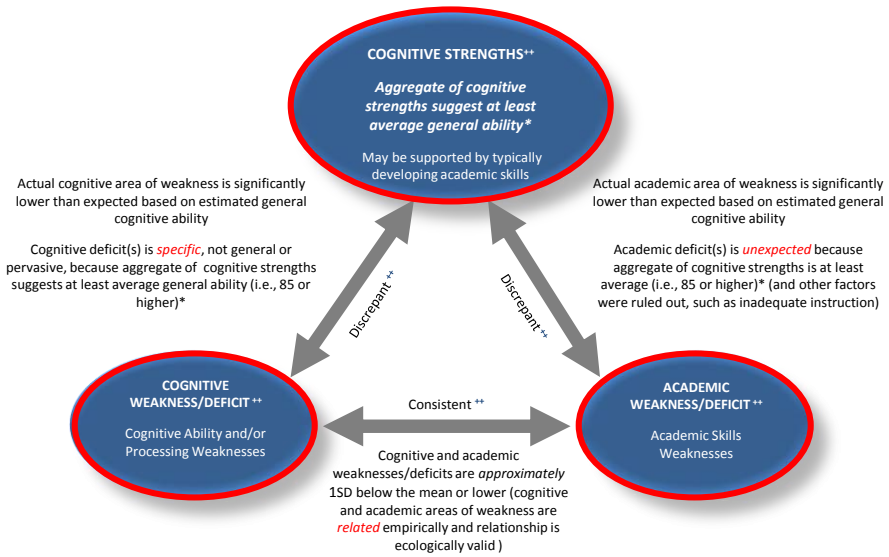
[1]This column includes concepts inherent in the federal definition (IDEA, 2004), Kavale, Spaulding, and Beam's (2009) definition, Harrison and Holmes' (2012) consensus definition, and other prominent definitions of SLD (see Sotelo-Dynega, Flanagan, & Alfonso, 2011 for a summary). Thus, all prominent SLD markers are included in this column.
[2]Poor spelling with adequate ability to express ideas in writing is often typical of dyslexia and/or disgraphia. Even though IDEA 2004 includes only the broad category of written expression, poor spelling and handwriting are often symptomatic of a specific writing disability and should not be ignored (Wendling & Mather, 2009).
[3]Weak performance is typically associated with standard scores in the 85-89 range, whereas deficient performance is often associated with standard scores that are around 1SD below the mean or lower. Interpretations of weak or deficient performance based on standard scores that fall in these ranges are bolstered when they have ecological validity (e.g., when there is evidence that the abilities or processes identified as weak or deficient manifest in everyday classroom activities that require these abilities and processes).
[4]The major specific learning disability may be accompanied by secondary learning difficulties that also may be considered when planning the more intensive, individualized special education instruction directed at the primary problem. For information on linking assessment data to intervention, see Mascolo, Flanagan, and Alfonso (2014).

Flanagan, Oritz, & Alfonso (2013). ***Essentials of Cross-Battery Assessment, 3rd Edition***. Hoboken, NJ: Wiley.

"Third Method" Alternative Research-Based Approaches to SLD Identification (PSW Methods)

- Cognitive – academic approaches:
  - *Flanagan, Oritz, Alfonso, & Mascolo (2002-Present)*
    - *Dual-Discrepancy/Consistency (within the context of an Operational Definition of SLD and a broader approach to "best practices" in CHC-based assessment) – automated in X-BASS*
  - *Naglieri, 1999, 2013*
    - *Discrepancy/Consistency (PASS Model; CAS-2 battery) – battery specific*
  - *Hale & Fiorello, 2004, 2011*
    - *Concordance-discordance model (based on neuropsych theory within the context of an hypothesis testing approach) – not automated*
  - *Milt Dehn – software (intra-individual analysis of 11 specific processes) – may be used as part of a PSW analysis*
  - *WISC-V – two discrepancy comparisons for PSW – automated in WIAT-III, KTEA-III scoring programs*

Conceptual Similarities Among Alternative Research-based (PSW) Approaches to SLD

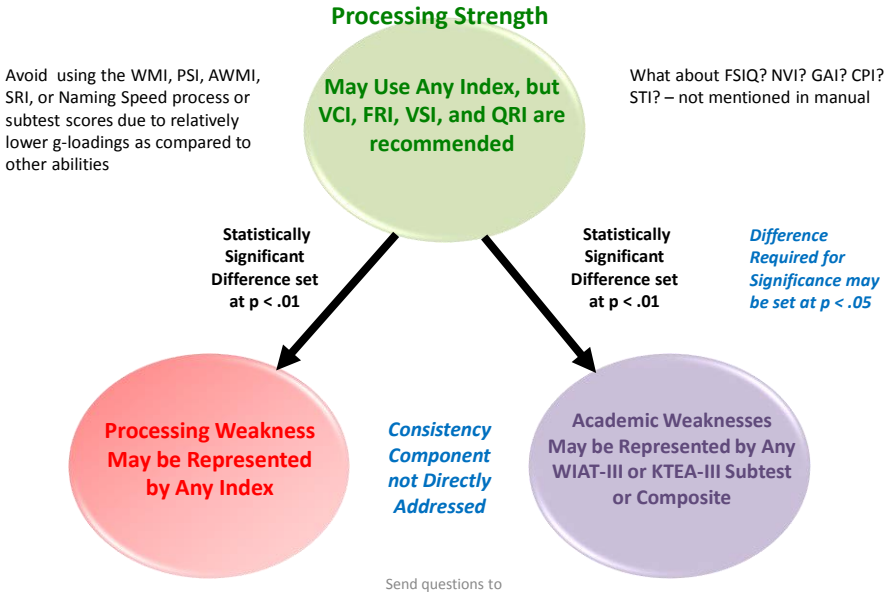


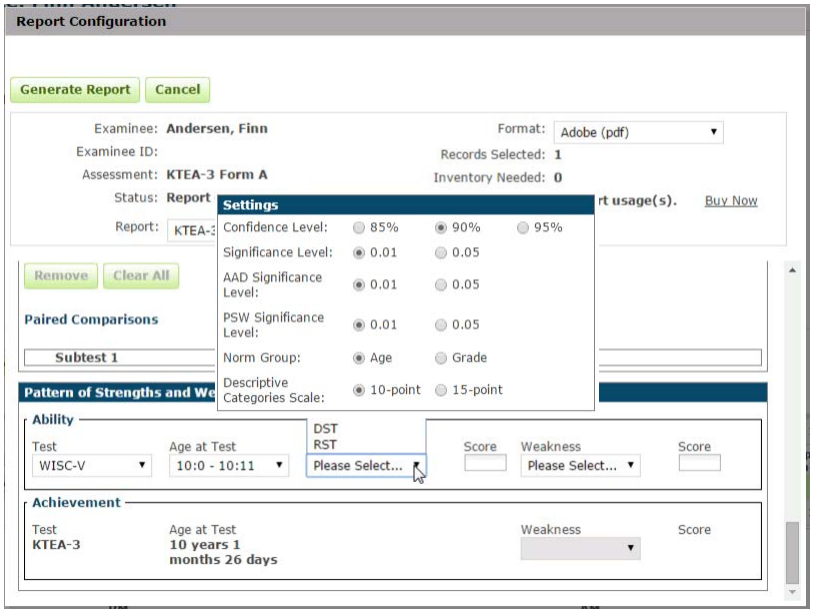
Sources: Flanagan, Ortiz, Alfonso, and Mascolo (2002, 2006); Flanagan, Ortiz, and Alfonso (2013); Flanagan, Fiorello, and Ortiz (2010)
*Unique to Flanagan et al. model (2007; 2013; 2015; 2016)
++Criteria vary across models

Methodological and Statistical Requirements for the PSW Analysis According to **WISC-V Technical and Interpretive Manual** (p. 183)

- The scores within each of the following comparisons must be significantly different (discrepant) to fit the model's criteria for SLD identification:
  - **Processing strength vs. achievement weakness**
  - **Processing strength vs. processing weakness**
- A third score comparison requiring consistency between the achievement weakness and the processing weakness ***is not included*** because it is not a statistical requirement of the model for identifying an SLD

Third Method WISC-V PSW Model





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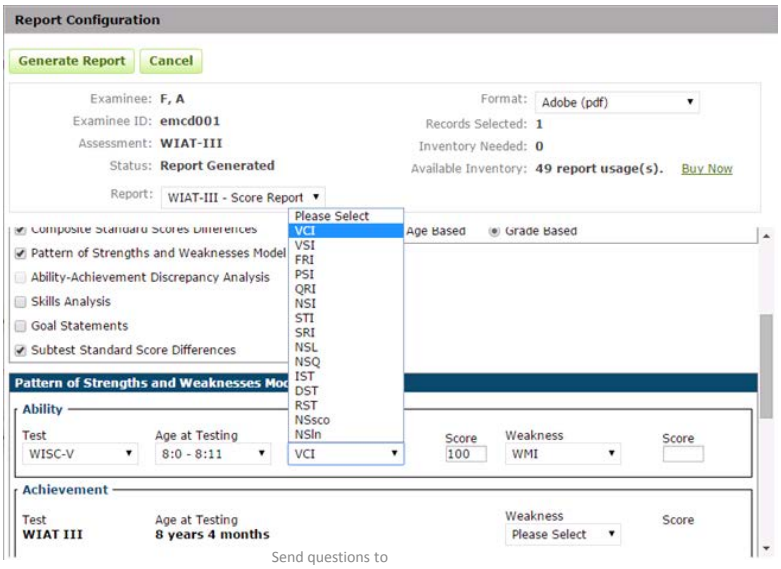
Need KTEA-3 or WIAT-III to Conduct PSW Analysis via Q-Global Score Reports



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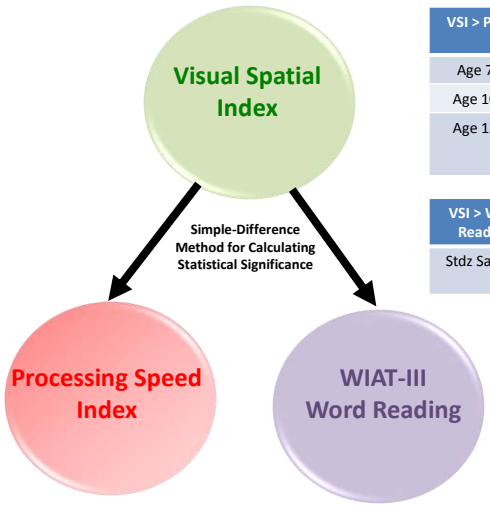
Third Method WISC-V PSW Model



VSI > PSI	P < .05/.01	Base Rate	Difference needed for Base Rate of ≤ 10%
Age 7	13/17 points	23/16%	22 points
Age 10	14/18 points	22/15%	22 points
Age 13	15/19 points	19/14%	22 points

VSI > Word Reading	P < .05/.01	Base Rate	Difference needed for Base Rate of ≤ 10%
Stdz Sample	10/13 points	>25%/20-25%	23 points

Use of Simple-Difference Method in SLD Identification will Over-Identify Students

PATTERN OF STRENGTHS AND WEAKNESSES ANALYSIS

Area of Achievement Weakness	WIAT-III	Basic Reading: 85
Area of Processing Weakness	WISC-V	VSI: 81
Area of Processing Strength	WISC-V	VCI: 100

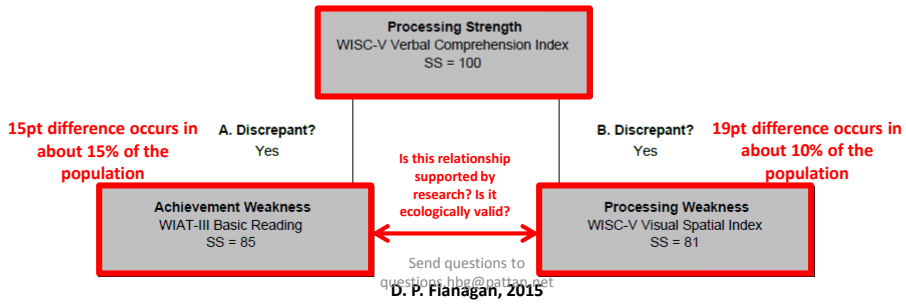
	Comparison	Relative Strength Score	Relative Weakness Score	Difference	Critical Value .05	Significant Difference Y/N	Supports SLD hypothesis? Yes/No
A	Processing Strength/ Achievement Weakness	100	85	15	9.00	Y	Yes
B	Processing Strength/ Processing Weakness	100	81	19	12.00	Y	Yes

The PSW model is intended to help practitioners generate hypotheses regarding clinical diagnoses. The analysis should always be used within a comprehensive evaluation that incorporates multiple sources of information.

Occurs in 20% of the population

Occurs in > 25% of the population

Pattern of Strengths and Weaknesses Model



Limitations of the PSW Model Recommended for Use with the WISC-V

- Not theoretically driven
- No mention of NVI, GAI, CPI, and STI in the model
- Allows for VCI as a processing weakness, but VCI is Vocabulary Knowledge
- Because two subtests (e.g., VSI) can be used to represent a cognitive processing strength, SLD may be identified in students who have more pervasive cognitive weaknesses, not specific cognitive weaknesses
- Despite having completed 20-40 subtests, only three scores, or approximately 5-6 subtests are considered in the PSW analysis – what about everything else?
- Any score may be considered a weakness (e.g., a score of 105 may be considered a weakness for an individual who is in the superior range in some areas)
- Simple-difference method is not considered the best method for examining score differences for purposes of SLD determination
- Below Average Aptitude (Processing)-Achievement Consistency Component of PSW model is not directly addressed

Introduction and Functionality of the PSW-A Component of X-BASS

- Entering scores and interpreting output, step-by-step
- Guidance on selecting scores for entry into the program

Go to: www.crossbattery.com

To view Video Tutorials of X-BASS

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questions.hbg@pattan.net

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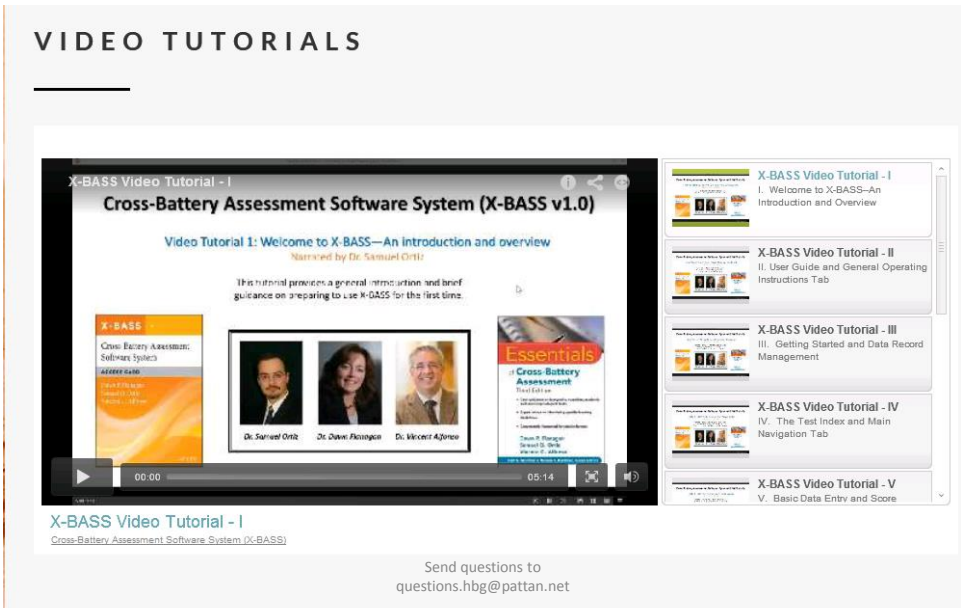

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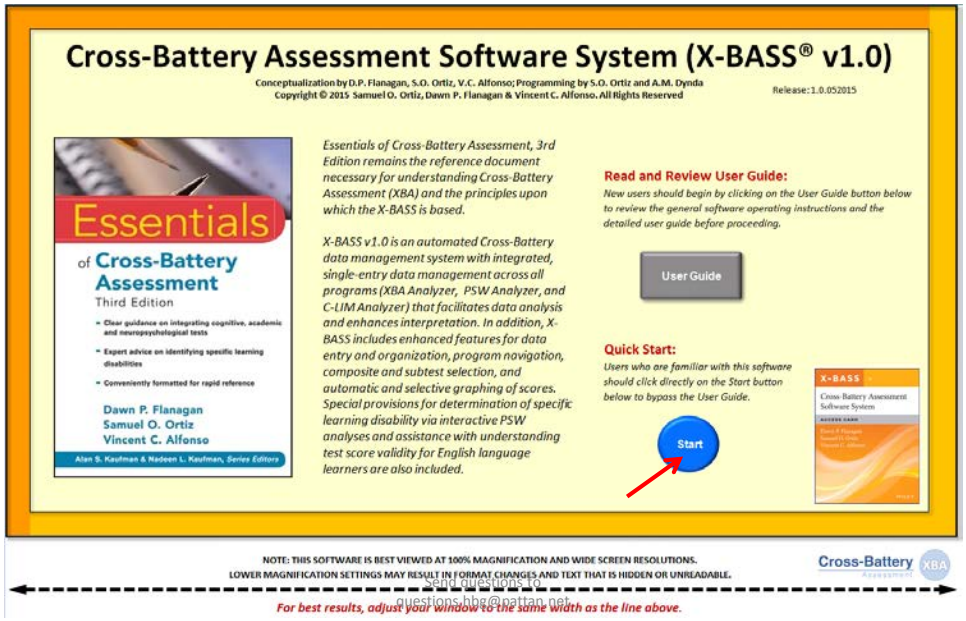
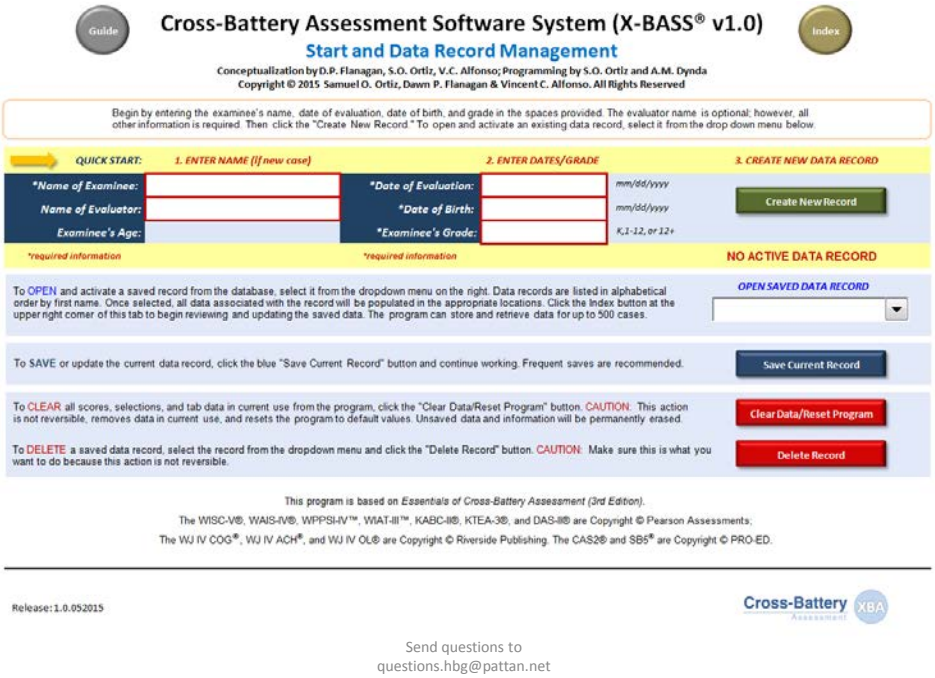
X-BASS Welcome Screen





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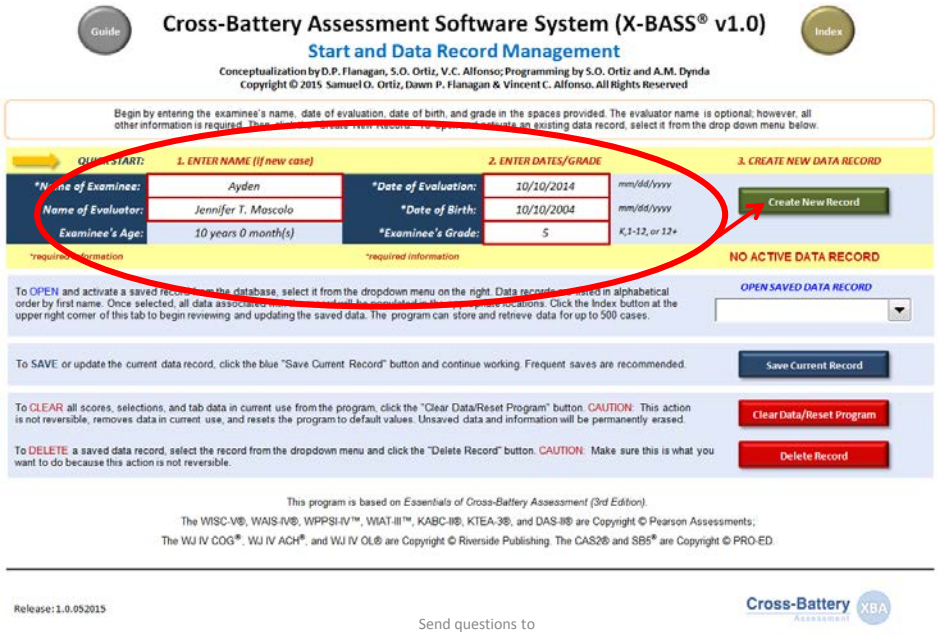
Guide
Cross-Battery Assessment Software System (X-BASS® v1.0)
Index
Start and Data Record Management
Conceptualization by D.P. Flanagan, S.O. Ortiz, V.C. Alfonso; Programming by S.O. Ortiz and A.M. Dynda
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Begin by entering the examinee's name, date of evaluation, date of birth, and grade in the spaces provided. The evaluator name is optional; however, all other information is required. Then click the "Create New Record." To open and activate an existing data record, select it from the drop down menu below.
QUICK START:
1. ENTER NAME (if new case)
2. ENTER DATES/GRADE
3. CREATE NEW DATA RECORD
*Name of Examinee:
Ayden
*Date of Evaluation:
10/10/2014
mm/dd/yyyy
Name of Evaluator:
Jennifer T. Mascolo
*Date of Birth:
10/10/2004
mm/dd/yyyy
Examinee's Age:
10 years 0 month(s)
*Examinee's Grade:
5
K,1-12, or 12+
Create New Record
*required information
*required information
NO ACTIVE DATA RECORD
To OPEN and activate a saved record from the database, select it from the dropdown menu on the right. Data records are located in alphabetical order by first name. Once selected, all data associated with the record will be populated in the appropriate locations. Click the Index button at the upper right corner of this tab to begin reviewing and updating the saved data. The program can store and retrieve data for up to 500 cases.
OPEN SAVED DATA RECORD
To SAVE or update the current data record, click the blue "Save Current Record" button and continue working. Frequent saves are recommended.
Save Current Record
To CLEAR all scores, selections, and tab data in current use from the program, click the "Clear Data/Reset Program" button. CAUTION: This action is not reversible, removes data in current use, and resets the program to default values. Unsaved data and information will be permanently erased.
Clear Data/Reset Program
To DELETE a saved data record, select the record from the dropdown menu and click the "Delete Record" button. CAUTION: Make sure this is what you want to do because this action is not reversible.
Delete Record
This program is based on Essentials of Cross-Battery Assessment (3rd Edition).
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Cross-Battery XBA
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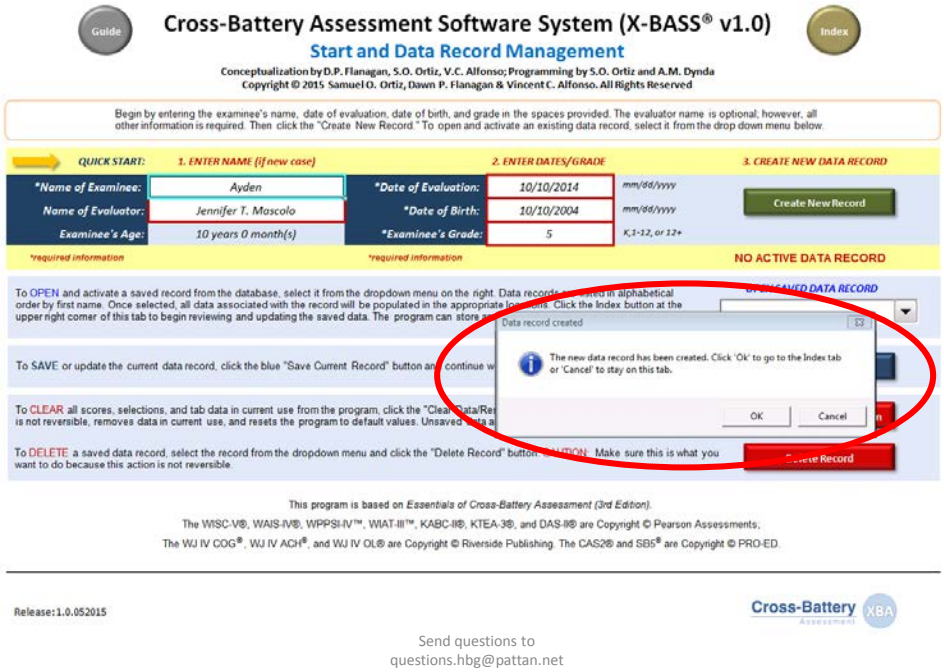
Guide
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QUICK START:
1. ENTER NAME (if new case)
2. ENTER DATES/GRADE
3. CREATE NEW DATA RECORD
*Name of Examinee:
Ayden
*Date of Evaluation:
10/10/2014
mm/dd/yyyy
Name of Evaluator:
Jennifer T. Mascolo
*Date of Birth:
10/10/2004
mm/dd/yyyy
Examinee's Age:
10 years 0 month(s)
*Examinee's Grade:
5
K,1-12, or 12+
Create New Record
*required information
*required information
NO ACTIVE DATA RECORD
To OPEN and activate a saved record from the database, select it from the dropdown menu on the right. Data records are located in alphabetical order by first name. Once selected, all data associated with the record will be populated in the appropriate locations. Click the Index button at the upper right corner of this tab to begin reviewing and updating the saved data. The program can store
Data record created
The new data record has been created. Click 'Ok' to go to the Index tab or 'Cancel' to stay on this tab.
OK
Cancel
To SAVE or update the current data record, click the blue "Save Current Record" button and continue w
To CLEAR all scores, selections, and tab data in current use from the program, click the "Clear Data/Res is not reversible, removes data in current use, and resets the program to default values. Unsaved
To DELETE a saved data record, select the record from the dropdown menu and click the "Delete Record" button. CAUTION: Make sure this is what you want to do because this action is not reversible.
Delete Record
This program is based on Essentials of Cross-Battery Assessment (3rd Edition).
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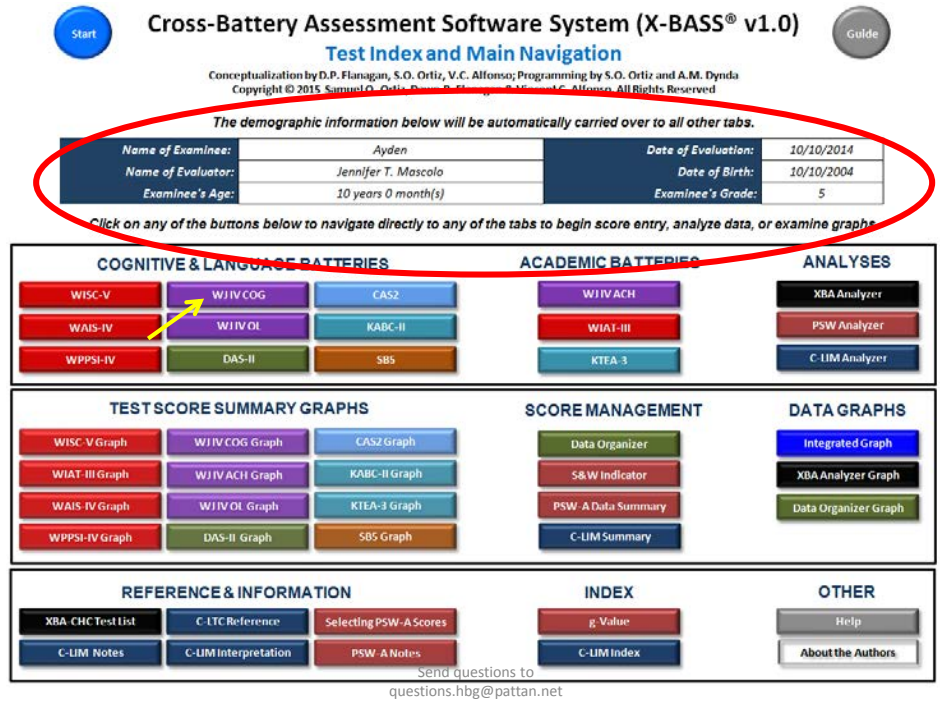

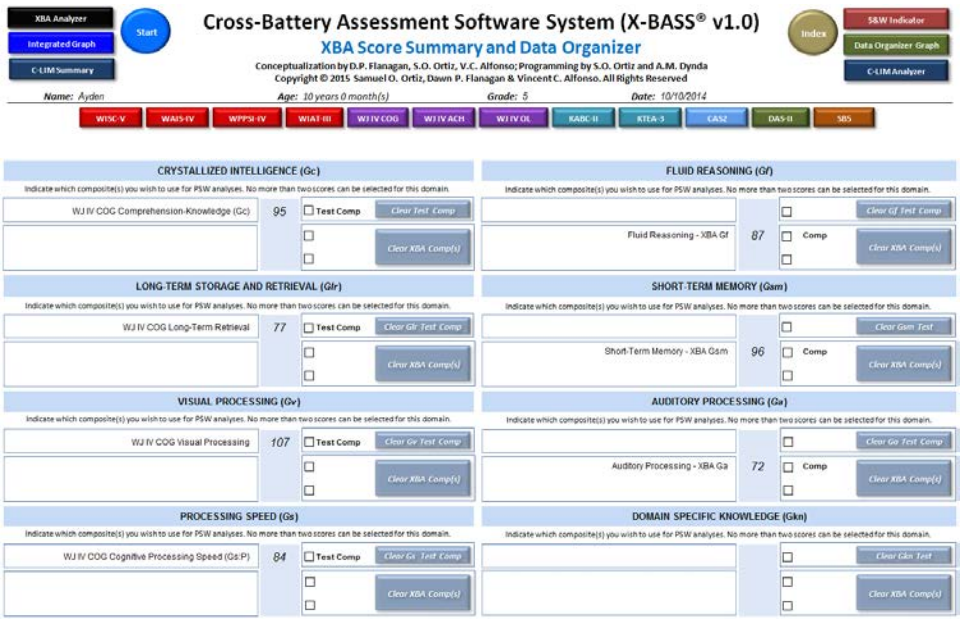

7 CHC Estimates Have Been Transferred to the Data Organizer Tab

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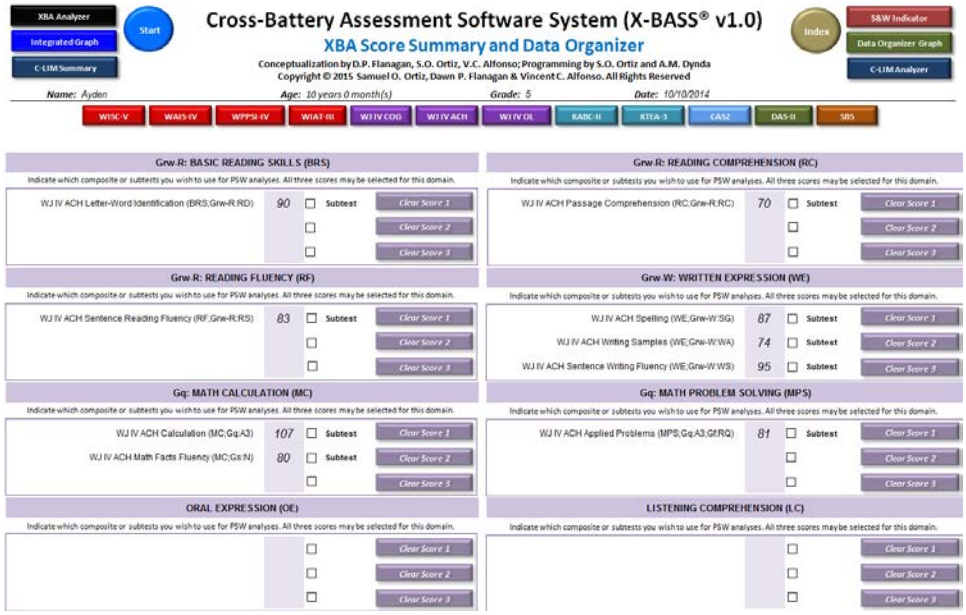
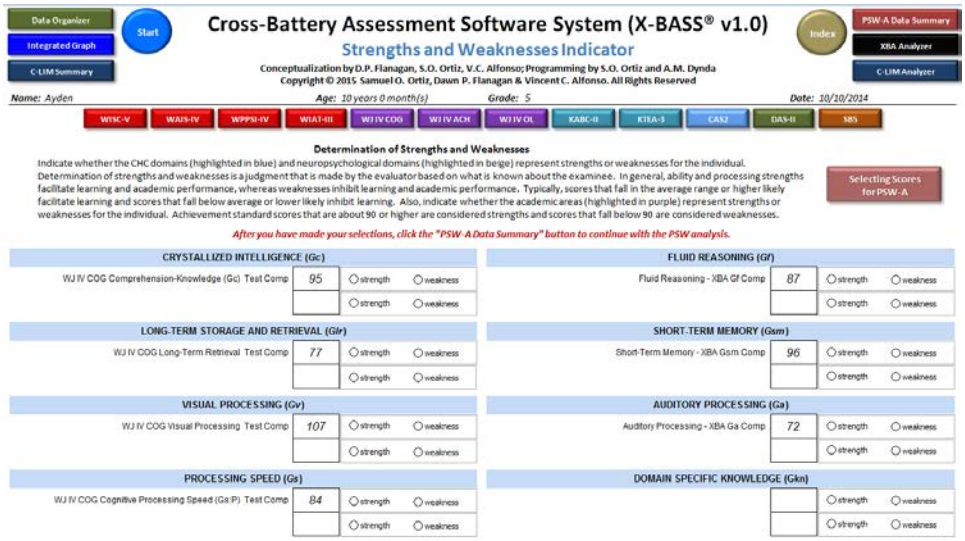
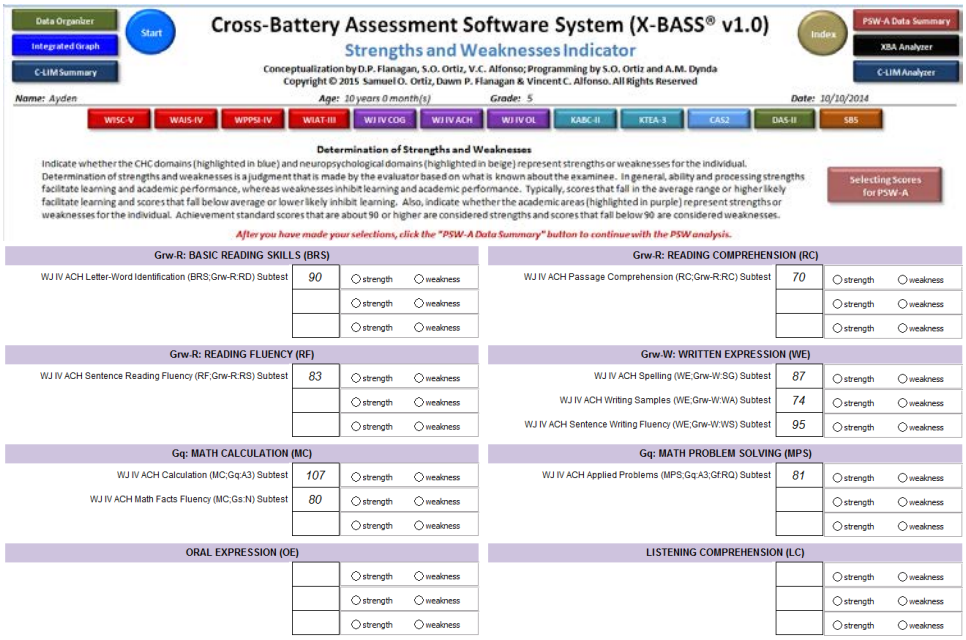


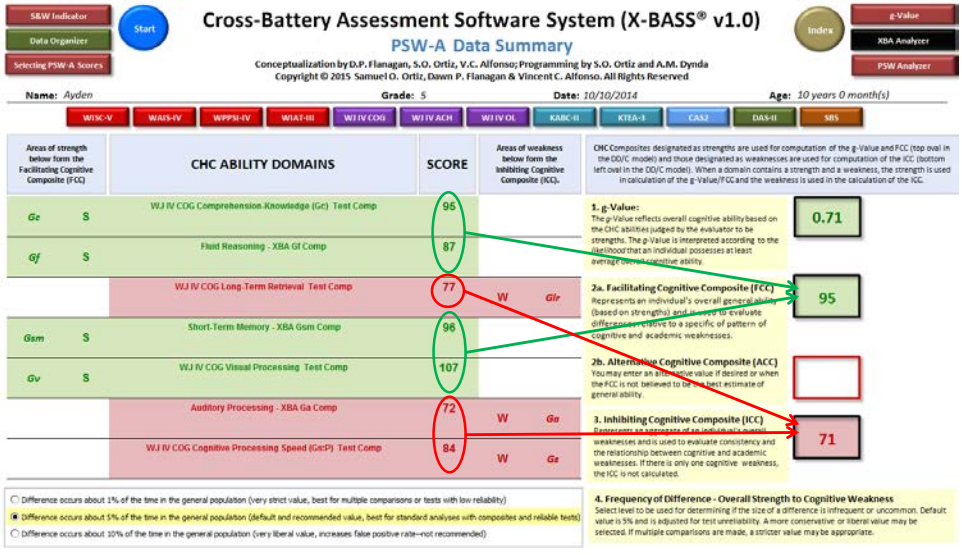
9 Achievement Subtest Scores Have Been Transferred to the Data Organizer Tab



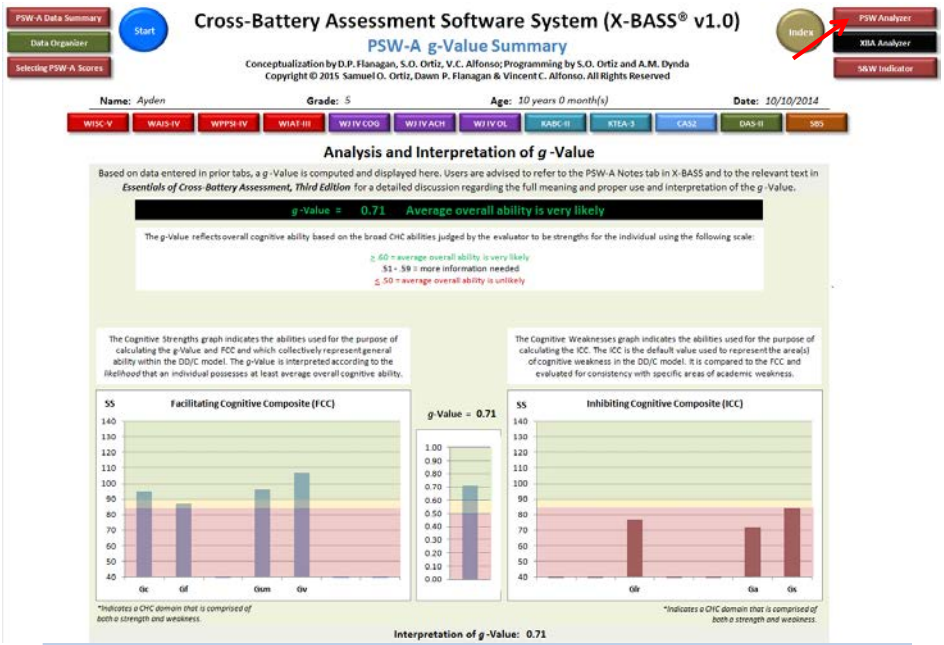
When determining cognitive areas of strength and weakness, consider whether an ability or process likely *facilitates or inhibits* overall learning and specific academic skill acquisition and development



When determining academic areas of strength and weakness, consider other data sources, such as work samples, teacher/parent/student reports, Curriculum-based measures, etc.



Note: You may have a strength **and** a weakness within a broad ability domain (e.g., Glr:MA is a weakness and Glr:NA is a strength) – Glr:MA score would contribute to the ICC and Glr:NA score would contribute to the FCC


PSW-A Data Summary
Data Organizer
Selecting PSW-A Scores
Start
Cross-Battery Assessment Software System (X-BASS® v1.0)
PSW-A g-Value Summary
Conceptualization by D.P. Flanagan, S.O. Ortiz, V.C. Alfonso; Programming by S.O. Ortiz and A.M. Dynda
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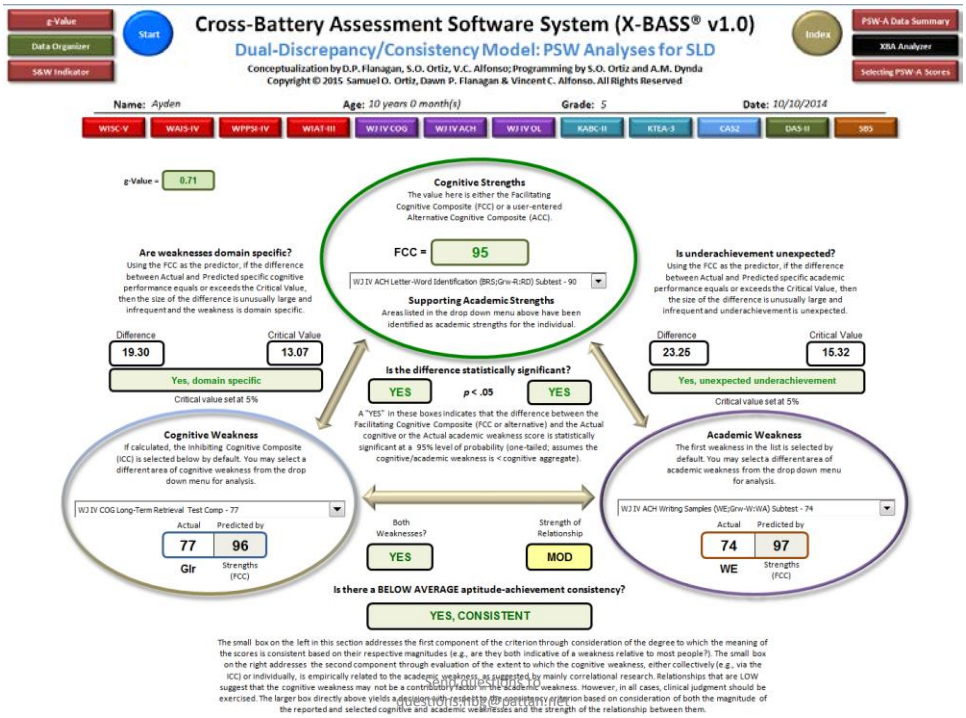
Index
PSW Analyzer
XBA Analyzer
S&W Indicator
Name: Ayden
Grade: 5
Age: 10 years 0 month(s)
Date: 10/10/2014
WISC-V
WAIS-IV
WPPSI-IV
WIAT-III
WJ IV COG
WJ IV ACH
WJ IV OL
KABC-II
KTEA-3
CAS2
DAS-II
SB5
Analysis and Interpretation of g -Value
Based on data entered in prior tabs, a g -Value is computed and displayed here. Users are advised to refer to the PSW-A Notes tab in X-BASS and to the relevant text in Essentials of Cross-Battery Assessment, Third Edition for a detailed discussion regarding the full meaning and proper use and interpretation of the g -Value.
g-Value = 0.71 Average overall ability is very likely
The g-Value reflects overall cognitive ability based on the broad CHC abilities judged by the evaluator to be strengths for the individual using the following scale:
≥ 60 = average overall ability is very likely
51 - 59 = more information needed
≤ 50 = average overall ability is unlikely
The Cognitive Strengths graph indicates the abilities used for the purpose of calculating the g-Value and FCC and which collectively represent general ability within the DD/C model. The g-Value is interpreted according to the likelihood that an individual possesses at least average overall cognitive ability.
The Cognitive Weaknesses graph indicates the abilities used for the purpose of calculating the ICC. The ICC is the default value used to represent the area(s) of cognitive weakness in the DD/C model. It is compared to the FCC and evaluated for consistency with specific areas of academic weakness.
SS
Facilitating Cognitive Composite (FCC)
Gc
Gf
Gsm
Gv
g-Value = 0.71
Inhibiting Cognitive Composite (ICC)
Glr
Ga
Gs
*Indicates a CHC domain that is comprised of both a strength and weakness.
Interpretation of g -Value: 0.71
How likely is it that the individual's pattern of strengths indicates at least average overall cognitive ability?
LIKELY. Despite the presence of weaknesses in one or more cognitive ability domains, this individual displays average or better functioning in cognitive ability domains considered important for acquiring the academic skills typical for this grade level. The individual's overall cognitive ability is very likely to be average or better and, therefore, ought to enable learning and achievement, especially when specific cognitive weaknesses are minimized through compensatory efforts, accommodations, and the like.


g-Value
Data Organizer
S&W Indicator
Start
Cross-Battery Assessment Software System (X-BASS® v1.0)
Dual-Discrepancy/Consistency Model: PSW Analyses for SLD
Conceptualization by D.P. Flanagan, S.O. Ortiz, V.C. Alfonso; Programming by S.O. Ortiz and A.M. Dynda
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PSW-A Data Summary
XBA Analyzer
Selecting PSW-A Scores
Name: Ayden
Age: 10 years 0 month(s)
Grade: 5
Date: 10/10/2014
WISC-V
WAIS-IV
WPPSI-IV
WIAT-III
WJ IV COG
WJ IV ACH
WJ IV OL
KABC-II
KTEA-3
CAS2
DAS-II
SB5
g-Value = 0.71
Cognitive Strengths
The value here is either the Facilitating Cognitive Composite (FCC) or a user-entered Alternative Cognitive Composite (ACC).
FCC = 95
WJ IV ACH Letter-Word Identification (BRS;Grw-R;RD) Subtest - 90
Supporting Academic Strengths
Areas listed in the drop down menu above have been identified as academic strengths for the individual.
Are weaknesses domain specific?
Using the FCC as the predictor, if the difference between Actual and Predicted specific cognitive performance equals or exceeds the Critical Value, then the size of the difference is unusually large and infrequent and the weakness is domain specific.
Difference
19.30
Critical Value
13.07
Yes, domain specific
Critical value set at 5%
Is underachievement unexpected?
Using the FCC as the predictor, if the difference between Actual and Predicted specific academic performance equals or exceeds the Critical Value, then the size of the difference is unusually large and infrequent and underachievement is unexpected.
Difference
23.25
Critical Value
15.32
Yes, unexpected underachievement
Critical value set at 5%
Is the difference statistically significant?
YES
p < .05
YES
A "YES" in these boxes indicates that the difference between the Facilitating Cognitive Composite (FCC or alternative) and the Actual cognitive or the Actual academic weakness score is statistically significant at a 95% level of probability (one-tailed; assumes the cognitive/academic weakness is < cognitive aggregate).
Cognitive Weakness
If calculated, the Inhibiting Cognitive Composite (ICC) is selected below by default. You may select a different area of cognitive weakness from the drop down menu for analysis.
WJ IV COG Long-Term Retrieval Test Comp - 77
Actual
77
Predicted by
96
Glr
Strengths (FCC)
Academic Weakness
The first weakness in the list is selected by default. You may select a different area of academic weakness from the drop down menu for analysis.
WJ IV ACH Writing Samples (WE);Grw-W;WA) Subtest - 74
Actual
74
Predicted by
97
WE
Strengths (FCC)
Both Weaknesses?
YES
Strength of Relationship
MOD
Is there a BELOW AVERAGE aptitude-achievement consistency?
YES, CONSISTENT
The small box on the left in this section addresses the first component of the criterion through consideration of the degree to which the meaning of the scores is consistent based on their respective magnitudes (e.g., are they both indicative of a weakness relative to most people?). The small box on the right addresses the second component through evaluation of the extent to which the cognitive weakness, either collectively (e.g., via the ICC) or individually, is empirically related to the academic weakness, as suggested by mainly correlational research. Relationships that are LOW suggest that the cognitive weakness may not be a contributory factor in the academic weakness. However, in all cases, clinical judgment should be exercised. The larger box directly above yields a decision with regard to the consistency criterion based on consideration of both the magnitude of the reported and selected cognitive and academic weaknesses and the strength of the relationship between them.

Flanagan and Colleagues' PSW Model Provides Information About Important Markers for SLD

- *Overall cognitive ability is at least average* despite specific cognitive processing weaknesses – FCC (top oval)
- Specific cognitive processing weaknesses – ICC or individual weaknesses as reported in bottom left oval
  - Weaknesses relative to most people (< 90)
  - Weaknesses because they are significantly lower than FCC
  - Weaknesses because difference between actual and predicted performance is unusual in the general population
  - SLD is *specific, not general*
- Academic weaknesses – as reported in bottom right oval
  - Weaknesses relative to most people (< 90)
  - Weaknesses because they are significantly lower than FCC
  - Weaknesses because difference between actual and predicted performance is unusual in the general population
  - *Unexpected underachievement*
- *May have academic areas of strength* (reported in top oval as they are expected to be consistent with the FCC)
- *Consistency between* cognitive processing weakness (or weaknesses; e.g., ICC) and academic area of weakness (bottom two ovals)
  - Specific learning disabilities are caused by underlying cognitive processing weaknesses (i.e., cognitive deficits raise the risk of academic difficulties; causal is probabilistic not deterministic)
  - "Disorder in one or more of the basic psychological processes" – IDEIA'

Manifestations of Cognitive Processing and Ability Weaknesses: What is the Severity of Educational Impact?

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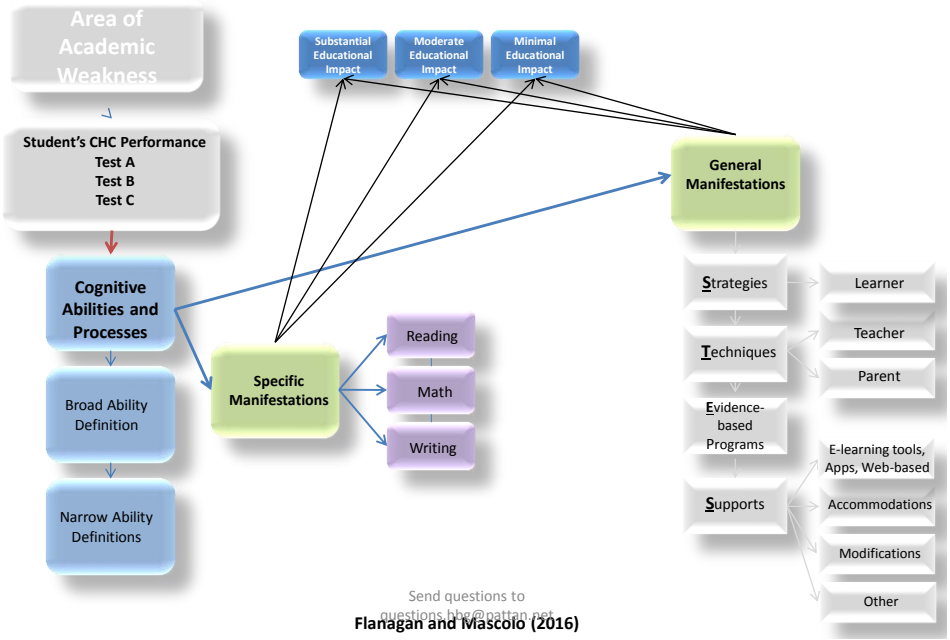
Strategies, Techniques, Evidence-based Programs, and Supports (STEPS)



Flanagan and Mascolo (2016)

Severity of Educational Impact

(consistent with terminology used for Specific Learning Disorder in DSM-5; APA, 2013, p. 68)

- Substantial – deficits in one or more academic areas and the student is not likely to acquire and develop those skills without *individualized and specialized instruction (e.g., Tier III, special education)* throughout schooling. Even with support services, these students may not be able to perform academic skills effectively or at grade level.
- Moderate – marked difficulties in one or more academic areas and the student is not likely to become proficient without some *intervals of specialized instruction (e.g., Tier II small group)* throughout schooling. *Support services may be needed* across settings in order for activities involving the academic skills to be performed effectively.
- Minimal – difficulty in one or two academic areas but the student *is able to function well* when provided with support services (e.g., accommodations).

Flanagan, 2016, NASP W02

The Assessment-Intervention Connection

Assessment

- Academic Skills
- Cognitive Abilities and Processes
- General and Specific Manifestations of Cognitive Weaknesses
- Severity of Educational Impact

Intervention

- Evidence-based Interventions
- Compensatory Strategies for the Learner
- Techniques for Teachers and Parents
- Supports – accommodations, modifications, e-learning tools, apps, web-based

Flanagan, 2016, NASP W02

Evidence-based Interventions

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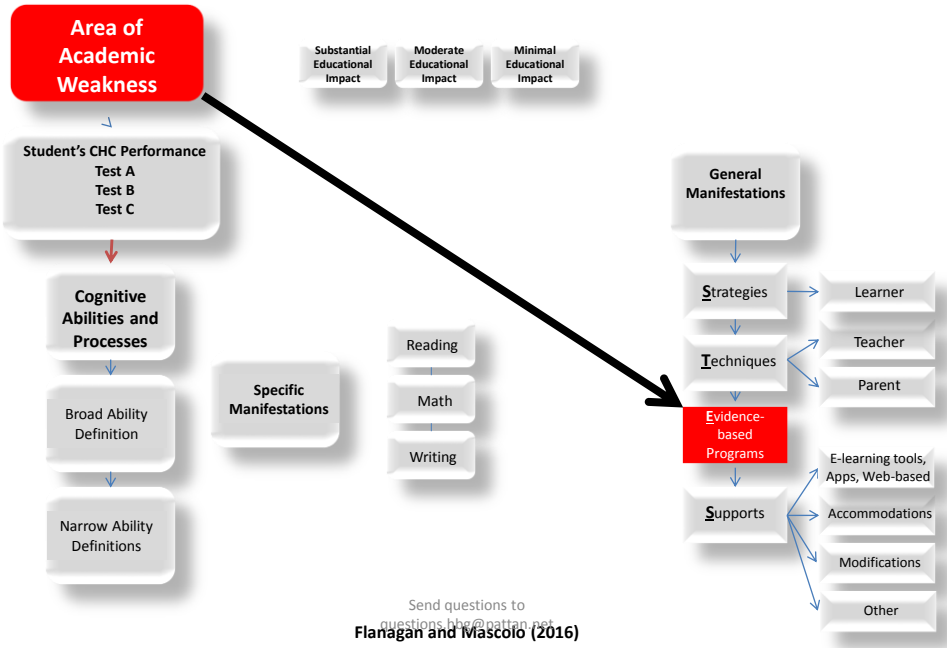
Strategies, Techniques, Evidence-based Programs, and Supports (STEPS)

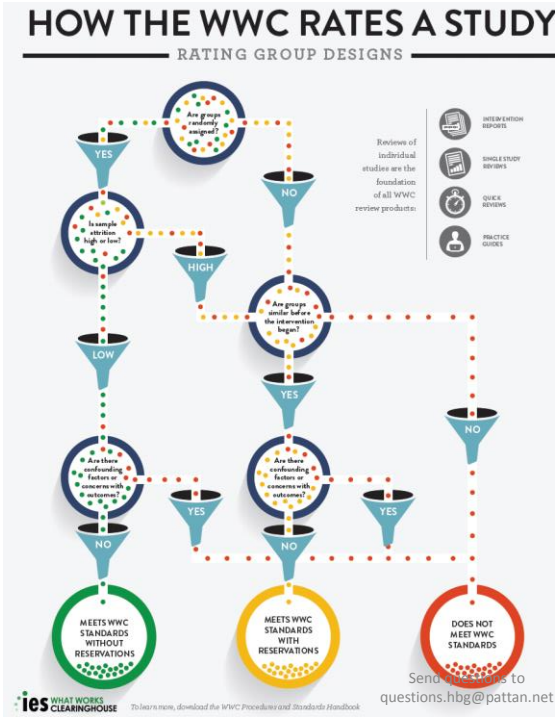


Flanagan and Mascolo (2016)

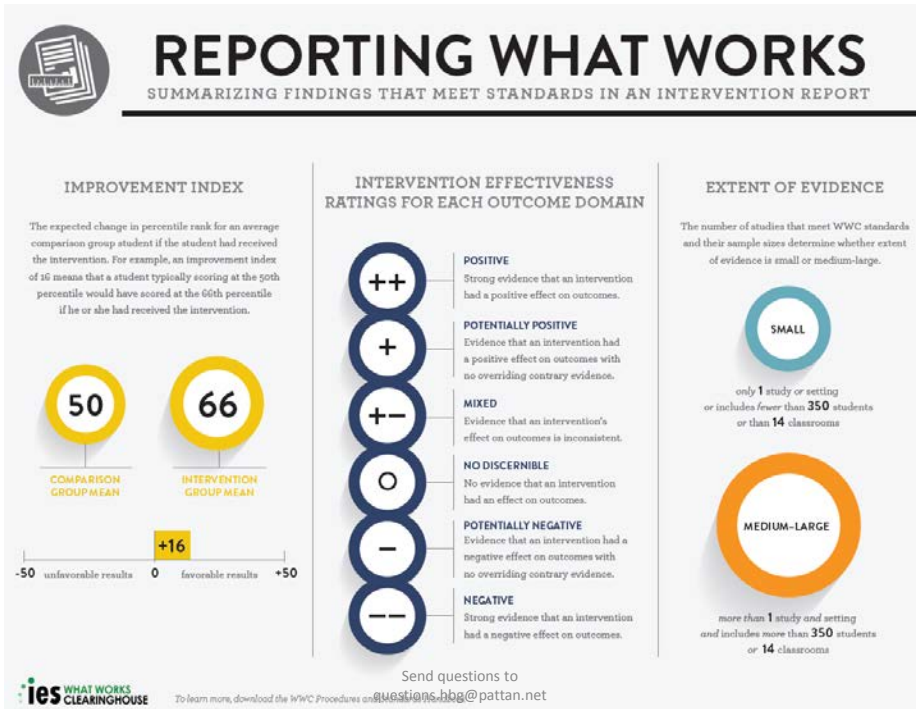
Evidence-based Interventions

- What Works Clearinghouse

http://ies.ed.gov/ncee/wwc/



- Are groups randomly assigned?
- Is sample attrition high or low?
- Are groups similar before the intervention began?
- Are there confounding factors or concerns with outcomes?



Evidence-based ***Academic Interventions*** Are Often Not Sufficient

- A student can learn to read and still struggle with learning in general
- Cognitive weaknesses may continue to interfere with the student's ability to access the curriculum in a manner similar to typically achieving peers

Why Cognitive Testing is Important

As Kaufman (1979, p. 14) famously quipped, "Intelligence test scores should result ultimately in killing the prediction." That is, the proper role of cognitive ability tests is to predict problems that never happen—because skilled professionals, dedicated teachers, and loving parents make plans and labor long hours to prevent them.

Joel Schneider (2016). Overview. In D.P. Flanagan & V.C. Alfonso, *Essentials of WISC-V Assessment*. Hoboken, NJ: Wiley. Publication expected late Summer 2016.

Strategies, Techniques, and Supports

Guided by General and Specific Manifestations

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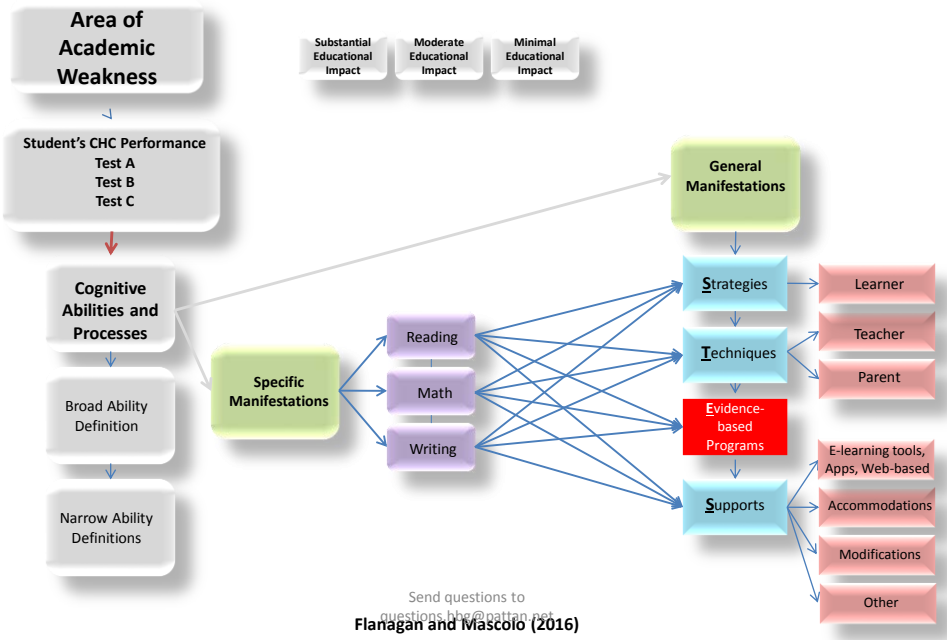
Strategies, Techniques, Evidence-based Programs, and Supports (STEPS)



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Strategies, Techniques, and Supports

Guided by Degree of Educational Impact

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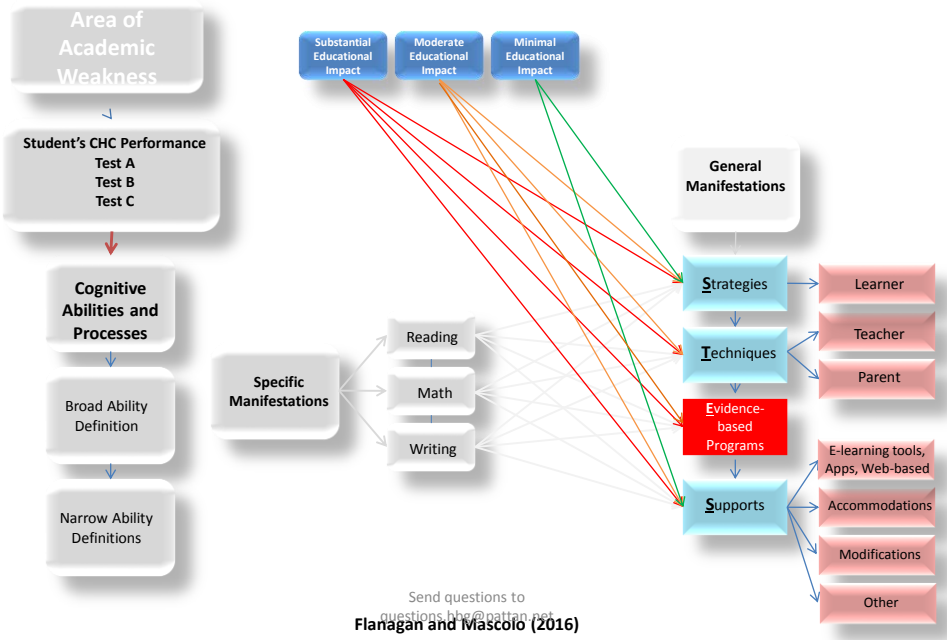
Strategies, Techniques, Evidence-based Programs, and Supports (STEPS)



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Compensatory Strategies for the Learner

- Provide the learner with procedures, techniques, and strategies to assist in bypassing or minimizing the impact of a cognitive or academic deficit.
  - Teaching the use of mnemonic devices
  - Organizational aids or techniques
  - Teaching a student to outline or use graphic organizers

Techniques for Teachers

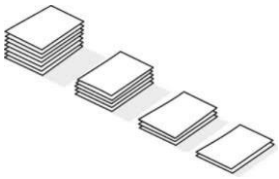
- Techniques for teachers are methods or ways of teaching or interacting with students to assist in bypassing or minimizing the impact of a cognitive or academic deficit.
  - Organizing cooperative learning groups
  - Providing targeted feedback
  - Extending upon student's language in conversation

Techniques for Parents

- Parent techniques are ways of teaching or interacting with children to assist in bypassing or minimizing the impact of a cognitive or academic deficit and/or to support school-based learning.
  - Providing naturalistic learning opportunities (e.g., "Learning through Living")
  - Supporting/Monitoring use of learned strategies
  - Configuring one's environment (physical environment, routines) to support learning

Supports

- ***Modification:*** Changes content of material to be taught or measured. Changes the depth, breadth, and complexity of learning and measurement goals. For example:
  - Reducing the amount of material that a student is required to learn
  - Simplifying test instructions and content or the material to be learned



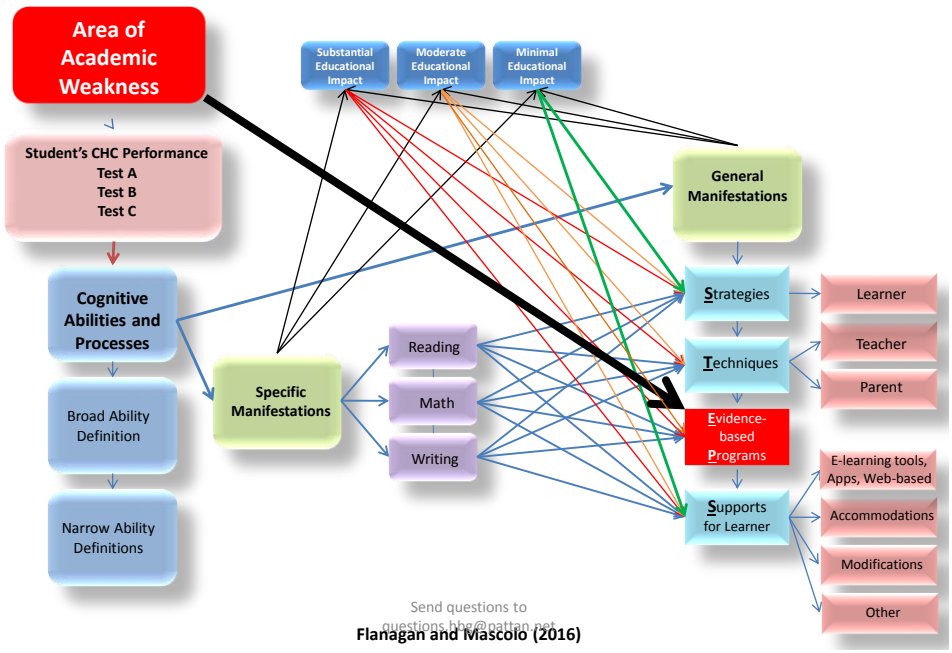
- ***Accommodation:*** changes conditions under which learning occurs or is measured, but does not change or reduce learning or assessment expectations. For example:
  - Extending time on exams
  - Providing separate room to work
  - Aligning math problems vertically, as opposed to horizontally

Supports

- e-learning tools
  - Instructional tools/content delivered via electronic media, typically the internet (e.g., interactive textbooks, digital video-based lessons)
- (Learning) Apps
  - Specialized programs typically downloaded to an electronic mobile device that provide an interactive learning experience on a specific skill or subject (e.g., arithmetic, geography, spelling)
- Web-based programs
  - Instructional content delivered via the web that is typically aimed at remediating a specific skill deficit or providing practice with a skill (e.g., My Virtual Reading Coach ®, Earobics ®, CogMed ®).

Flanagan, 2016, NASP W02

Strategies, Techniques, Evidence-based Programs, and Supports (STEPS)



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Prior to Planning, Selecting, and Tailoring Interventions, it is Necessary to Understand the Confines of the Case

29

Factors to Consider

- Student
  - Age (developmental appropriateness)
  - Interests
  - Motivation
  - Skill Level/Ability (e.g., keyboarding skills)
  - Social Factors (e.g., discrete intervention/support versus open intervention)

Source: Adapted from Mascolo, 2008 S.M.A.R.T. Approach

30

Factors to Consider

- Parent
  - Motivation
  - Availability
  - Skill Level/Ability
  - Financial Resources
  - Physical Resources (e.g., computer, iPad®)

Send questions to

Source: Adapted from Mascolo, 2008 S.M.A.R.T. Approach

31

Factors to Consider

- Teacher
  - Motivation
  - Instructional Style/Preferences
  - Instructional Techniques Used
  - Skill Level/Ability
  - Available Resources
  - Relationship with Student

Send questions to

Source: Adapted from Mascolo, 2008 S.M.A.R.T. Approach

32

Factors to Consider

- "Other" Factors
  - Current Environment
    - Physical layout (e.g., seating arrangements)
    - Resources (e.g., strategy posters, word walls, computers)
    - Composition of class (e.g., number of students, gender, ability level)

Source: Adapted from Mascolo, 2008 S.M.A.R.T. Approach

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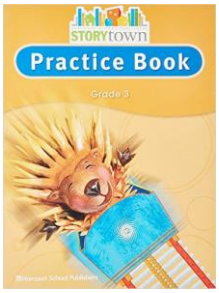
Factors to Consider



- "Other" Factors
  - Curricular Environment
    - Textbooks used
    - Instructional materials (e.g., worksheets)
    - In-school versus at-home materials (e.g., practice books)

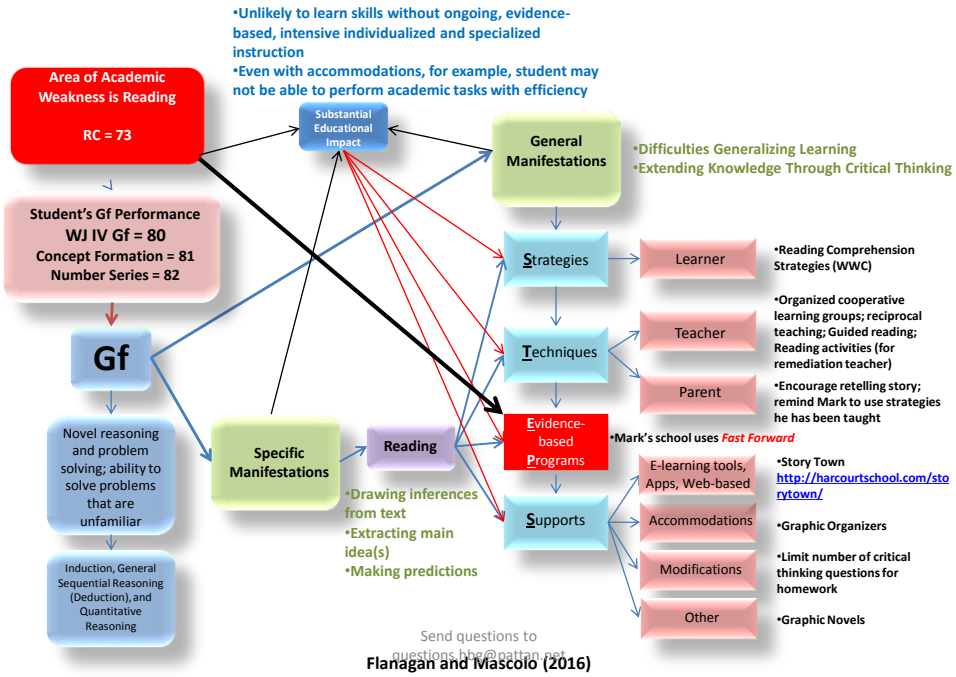
Source: Adapted from Mascolo, 2008 S.M.A.R.T. Approach

Factors to Consider

- "Other" Factors
  - General Education Resources
    - After-school supports (e.g., homework club)
    - Peer support (e.g., reading buddy, peer tutors)
    - Materials (e.g., extra set of books; learning aids)

Source: Adapted from Mascolo, 2008 S.M.A.R.T. Approach

Mark: Grade 3; Referral: Reading Comprehension



Flanagan and Mascolo (2016)

Area of Academic Weakness

- Basic Reading Skills SS = 92
- Reading Fluency SS = 90
- Reading Comprehension SS = 73

Area of Cognitive Weakness

- Mark's Gf Performance
  - WJ IV Gf SS = 80
  - Concept Formation SS = 81
  - Number Series SS = 82

  - WISC-V Similarities = 7 (Vocabulary = 10)
  - D-KEFS Twenty Questions Test = 84

General Manifestations

- Difficulties Generalizing Learning

Parent Report
- *Mark is always saying, "I didn't learn it yet" when he is doing homework*

- Extending Knowledge Through Critical Thinking

Teacher Report
- *Mark has "trouble thinking on his own." He always needs multiple explanations and even with examples, he seems lost*

Specific Manifestations

- Drawing inferences from text
- Extracting main idea(s)
- Making predictions

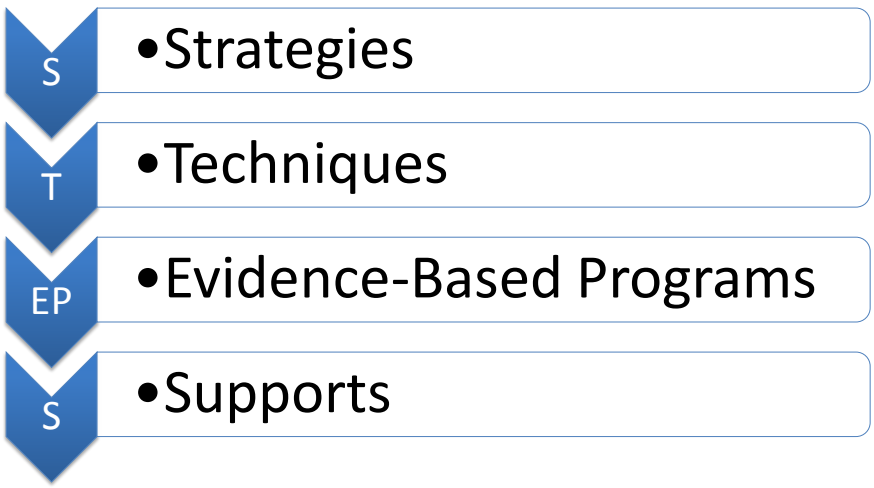
Work Sample Review
3 of 4 end of chapter multiple-choice questions answered incorrectly.
Review revealed a *prediction* error, an *explanatory* error (could not select the correct reason "why" something occurred), and a *thematic* error (could not identify chapter's topic)

Classroom Observation (School Psychologist)
Mark was *unable to make a reasonable prediction* during a class read-aloud (e.g., class was reading a story about a stray dog and when Mark was asked what would likely happen next when the dog catcher's van arrived, he said, "the family will find him.")

Degree of Educational Impact is Considered Substantial

- Academic deficit in Reading Comprehension
- Main area of cognitive deficit: Gf
- General and specific manifestations identified by parent, teacher, school psychologist
  - **Unlikely to learn skills without ongoing, evidence-based, intensive individualized and specialized instruction**
  - **Even with accommodations, for example, Mark may not be able to perform academic tasks with efficiency**
- Maximum breadth of intervention considered necessary

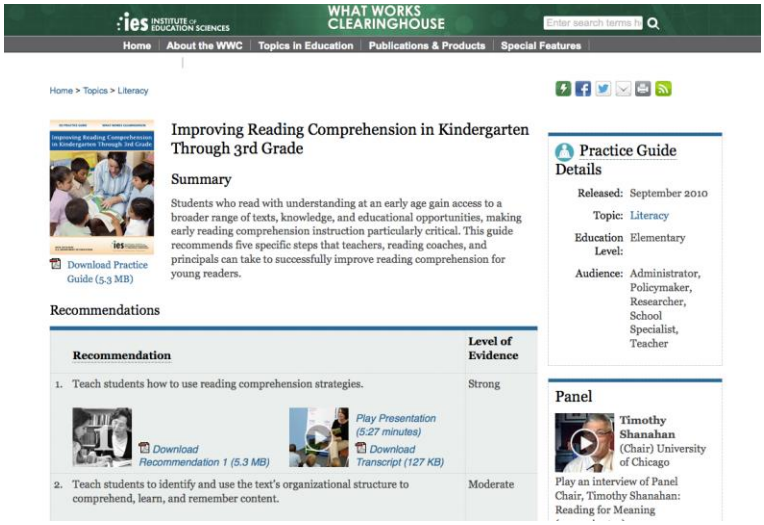
STEPS



We know deficit is manifesting in general and specifically… and the educational impact is substantial…now what can we do

Strategies: Learner

- Reading Comprehension Strategies (WWC)



Send questions to
http://ies.ed.gov/ncee/wwc/PracticeGuide.aspx?sid=14

Table of Contents

Improving Reading Comprehension in Kindergarten Through 3rd Grade

Table of Contents

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Table 2. Recommendations and corresponding levels of evidence

Recommendation	Levels of Evidence		
	Minimal Evidence	Moderate Evidence	Strong Evidence
1. Teach students how to use reading comprehension strategies.			◆
2. Teach students to identify and use the text's organizational structure to comprehend, learn, and remember content.		◆	
3. Guide students through focused, high-quality discussion on the meaning of text.	◆		
4. Select texts purposefully to support comprehension development.	◆		
5. Establish an engaging and motivating context in which to teach reading comprehension.		◆	

Strategies: Learner

- Reading Comprehension Strategies (WWC)
  1. Activating prior knowledge or predicting
  2. Questioning
  3. Visualization
  4. Monitoring, clarifying, or fix-up
  5. Inference
  6. Retelling

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Examples of Effective Reading Comprehension Strategies

Effective Strategy	Description	Activities to Promote Strategy Practice[29]
Activating Prior Knowledge/ Predicting	Students think about what they already know and use that knowledge in conjunction with other clues to construct meaning from what they read or to hypothesize what will happen next in the text. It is assumed that students will continue to read to see if their predictions are correct.	1. Pull out a main idea from the text and ask students a question that *relates the idea to their experience*. Ask them to predict whether a similar experience might occur in the text. 2. Halfway through the story, ask students to *predict what will happen* at the end of the story. Have them explain how they decided on their prediction, which encourages them to make inferences about what they are reading and to look at the deeper meaning of words and passages.
Questioning	Students develop and attempt to answer questions about the important ideas in the text while reading, using words such as *where* or *why* to develop their questions.	1. Put words that are used to formulate questions (e.g., *where, why*) on index cards, and distribute to students. 2. Have students, in small groups, ask questions using these words.

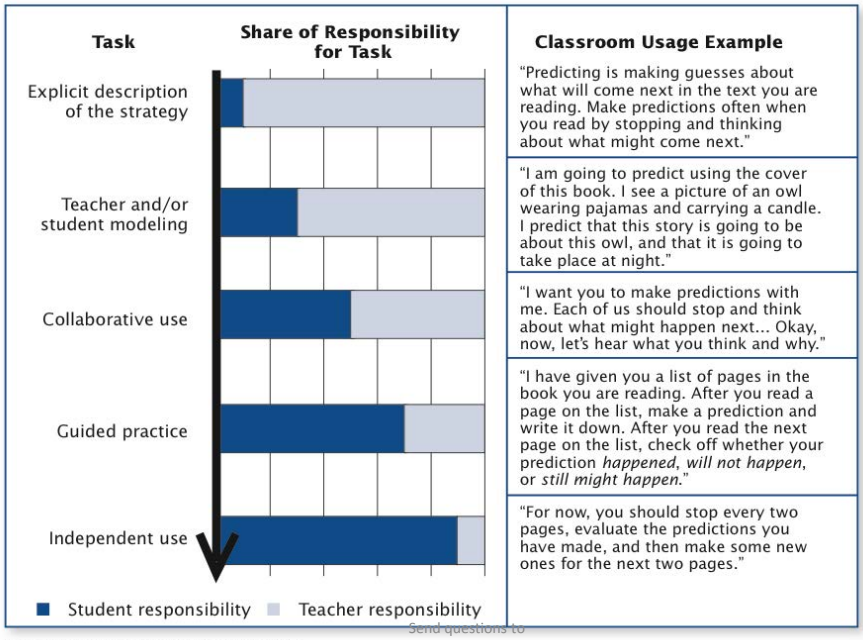
Examples of Effective Reading Comprehension Strategies

Effective Strategy	Description	Activities to Promote Strategy Practice[29]
Visualizing	Students develop a mental image of what is described in the text.	1. Explain to students that visualizing what is described in the text will help them remember what they read. 2. Have students examine objects placed in front of them, and later a picture depicting a scene. Remove the objects and picture, and ask students to *visualize and describe what they saw.* 3. Read a sentence and describe what you see to the students. Choose sections from the text and ask students to practice visualizing and discussing what they see.
Monitoring, Clarifying, and Fix Up	Students pay attention to whether they understand what they are reading, and when they do not, they reread or use strategies that will help them understand what they have read.	1. Relate each strategy to a traffic sign (e.g., stop sign—stop reading and try to restate in your own words what is happening in the text; U-turn—reread parts of the text that do not make sense). 2. Write different reading comprehension strategies on cards with their signs, and have students work in pairs to apply the strategies to *text they do not understand.*

Examples of Effective Reading Comprehension Strategies

Effective Strategy	Description	Activities to Promote Strategy Practice[29]
Drawing Inferences	Students generate information that is important to constructing meaning but that is missing from, or not explicitly stated in, the text.	1. Teach students how to look for key words that help them understand text, and demonstrate how they can draw inferences from such words. For example, a teacher might show that a passage that mentions "clowns" and "acrobats" is probably taking place in a circus. 2. Identify key words in a sample passage of text and explain *what students can learn about the passage from those words.*
Summarizing/ Retelling	Students briefly describe, orally or in writing, the main points of what they read.	1. Ask a student to describe the text in *his or her own words* to a partner or a teacher. 2. If a student has trouble doing this, ask questions such as "What comes next?" or "What else did the passage say about [subject]?"

Figure 1. Illustration of instructional practices to gradually release responsibility to students as task progresses



Source: Adapted from Duke and Pearson (2002).
Note: Teachers should modify these examples to best suit students' age and abilities.

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Techniques: Teacher

- Classroom Teacher
  - Organized cooperative learning groups
  - Reciprocal teaching (e.g., reading)
- Remediation Teacher
  - Guided Reading
  - Additional Reading Practice (e.g., Main idea)

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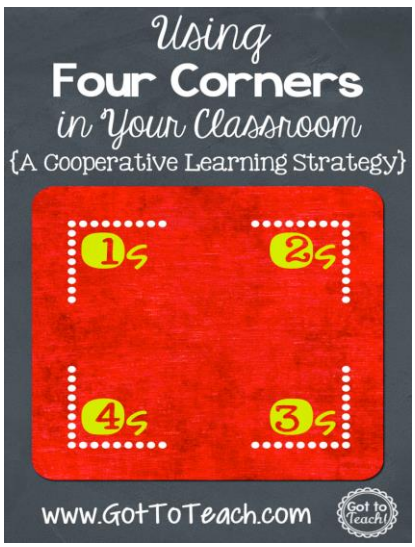
Cooperative Learning Groups



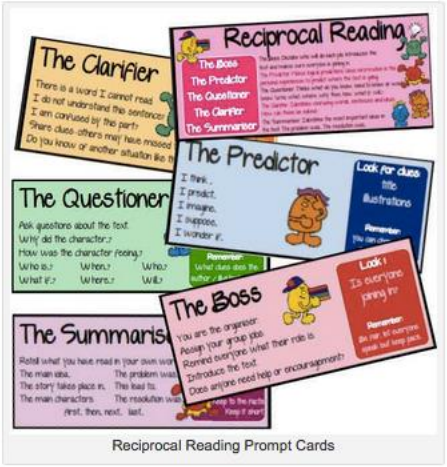
- **How It Works:**
- Choose four aspects of a topic that your class is currently focusing on.
- Assign each of these aspects to a corner (or an area) of your room.
- Present the topic and the four related aspects to the whole group and give the students some "think time."
- Students can then choose a corner to discuss the topic.
- Representatives from each corner can share what their respective groups discussed.

Reciprocal Prompt Cards include:

The Boss
The Predictor
The Questioner
The Clarifier
The Summariser

The Boss. Decides who will do each job, introduces the text and makes sure everyone is joining in.

The Predictor. Makes logical predictions. Uses information in the text & personal experiences to predict where the text is going.



Reciprocal Reading Prompt Cards

The Questioner.
Thinks what do you know, need to know or would like to know. Who, what, where, why, then, how, what if, will…?

The Clarifier. Identifies confusing words, sentences and ideas. How can these be solved?

The Summariser. Identifies the most important ideas in the text: The problem was… The resolution was…

Reciprocal Reading Groups: Assign a Role

Guided Reading (for Remedial Reading Teacher)

- Guided Oral Reading
  - Guided oral reading is an instructional strategy that can help students improve a variety of reading skills, including fluency.
  - Example: the teacher reads with the student and then asks the student guided questions about the passage read.

Source: http://www.readingrockets.org/article/what-guided-oral-reading

The Gf Connection to Reading Comprehension

Work on developing *specific comprehension skills*. This often involves questions and discussing the material as they read along. The depth of comprehension skills increases as the student becomes older and their skills advance. Beginning comprehension is having the student simply pay attention to what they are reading. The higher level comprehension skills have the student thinking about deeper questions such as *'why did this happen'*, and inferring *'what do I think this means'*

Source: http://www.righttrackreading.com/guidedreading.html

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Guided reading questions

Here are a few questions teachers can ask during guided reading sessions to help students uncover the meaning of unknown words.

During the guided reading session, the teacher should have these question stems available when students find a word they don't know the meaning of. The teacher pauses the reading and chooses the appropriate question to ask.

"What do you think the word means considering (a certain action or event) has happened?
"How do you know that the word means (insert definition)?"
"What part of the text helps you make this inference?"
"Where can you find other clues to help you understand?"
"If you substitute what you think is a similar word, would the sentence still make sense?"

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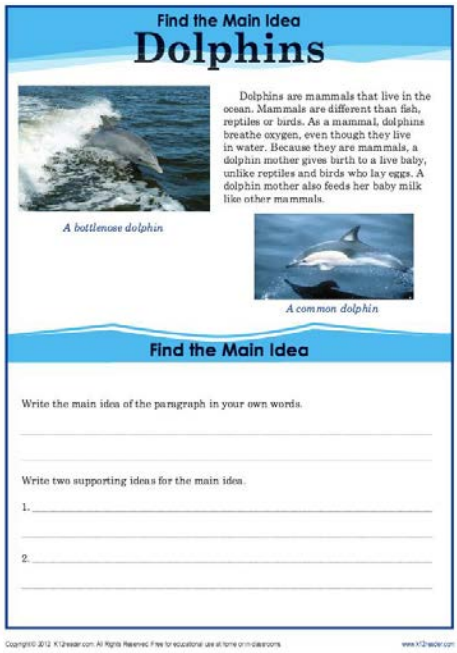
Find the Main Idea

Dolphins

Dolphins are mammals that live in the ocean. Mammals are different than fish, reptiles or birds. As a mammal, dolphins breathe oxygen, even though they live in water. Because they are mammals, a dolphin mother gives birth to a live baby, unlike reptiles and birds who lay eggs. A dolphin mother also feeds her baby milk like other mammals.

A bottlenose dolphin

A common dolphin

Find the Main Idea

Write the main idea of the paragraph in your own words.

Write two supporting ideas for the main idea.

1.

2.

Reading Activities: Main Idea Worksheet

Source: http://www.k12reader.com/worksheet/find-the-main-idea-dolphins/view/

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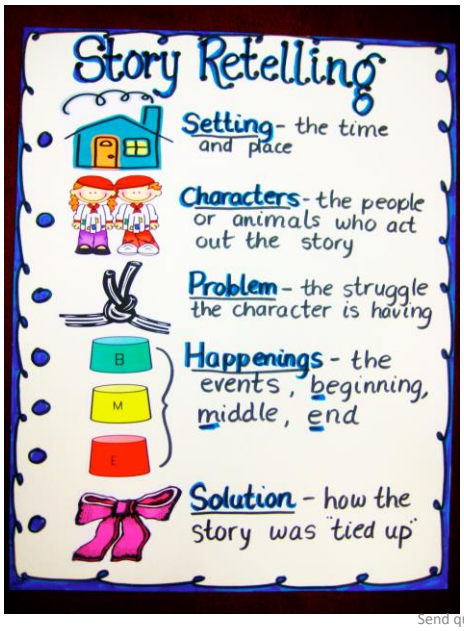
Techniques: Parent

- Encourage story retelling
- Remind Mark to use the strategies he has been taught



Guided Retelling Ideas:

1. Pick a category
2. Ask questions
3. Extend upon information given
4. Provide cues/prompts
5. Model retelling for a category

Parent Tips to Facilitate Comprehension/Thinking

- **Ask a question** about what he has already read (to themselves, or to you).
- **Infer** what is going on or might happen, based on what they already know and what they have read.
- **Make a connection:**
  - **Make a text-to-text connection** where he relates this book to another he has read.
  - **Make a text-to-world connection** where he relates the book to an experience going on in our world (e.g., truffula trees being chopped down and our own struggles with deforestation).
  - **Make a text-to-self connection** where he relates the book to himseld or an experience he has had (e.g., remembering a time he was not listened to, even when he knew better than the other person).

- **Visualize**: Encourage your child to **create a mental image or play the scene like a movie** in her head
- **Evaluate:** Determine the importance of characters, events, or details.
- **Synthesize** information means taking information you learn along the way and combining it with the information you know.
- Other tips:
  - **Make a prediction.**
  - **Take the character's perspective** or relate to the character's feeling.
  - **Read it like a sentence.** If your child reads haltingly, have them re-read the same sentence to get the fluency (and confidence!) aspect of reading. It's hard to comprehend disjointed sentences.

http://www.scholastic.com/parents/resources/article/developing-reading-skills/reading-comprehension-and-decoding-strategies

Increase parent awareness about HOW to do it

Evidence-based Programs

Support all children in meeting challenging state academic standards and improve state test scores with the Fast ForWord LANGUAGE Series. Provide extra academic support and learning opportunities in reading and language for struggling students, including at-risk students, ELL students, and special education students.

Fast ForWord Language v2
Develops listening accuracy, phonological awareness, and language structures and moves elementary students who are reading below grade level toward grade level reading skills.

Fast ForWord Language to Reading v2
Emphasizes the link between spoken and written language to guide young students to become proficient grade level readers.

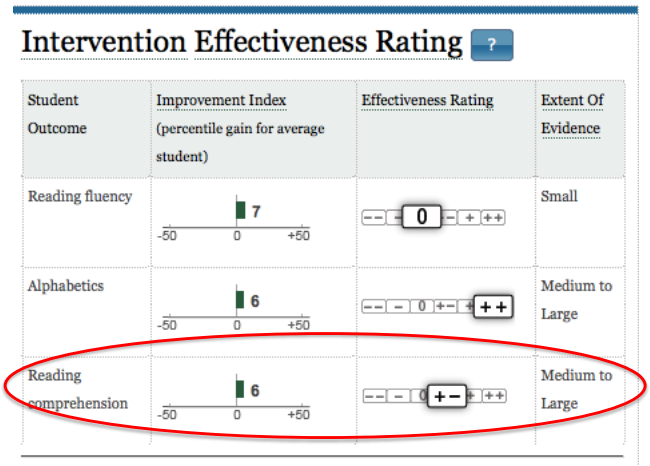
Fast ForWord® by Scientific Learning®

Fast ForWord:
Frequency, Intensity, Duration

Program Description

Fast ForWord® is a computer-based reading program intended to help students develop and strengthen the cognitive skills necessary for successful reading and learning. The program, which is designed to be used 30–100 minutes a day, 5 days a week, for 4–16 weeks, includes three series. The *Fast ForWord*® Language series and the *Fast ForWord*® Literacy series aim to build cognitive skills such as memory, attention, processing, and sequencing. They also strive to build language and reading skills, including listening accuracy, phonological awareness, and knowledge of language structures. The *Fast ForWord*® to Reading series (also known as the *Fast ForWord*® Reading series) aims to increase processing efficiency and further improve reading skills such as sound–letter associations, phonological awareness, word recognition, knowledge of English language conventions, vocabulary, and comprehension. The program is designed to adapt the nature and difficulty of the content based on individual student's responses.

Fast ForWord: *Effectiveness*



Intervention Effectiveness Rating ?

Student Outcome	Improvement Index (percentile gain for average student)	Effectiveness Rating	Extent Of Evidence
Reading fluency	7 (-50 0 +50)	0	Small
Alphabetics	6 (-50 0 +50)	++	Medium to Large
Reading comprehension	6 (-50 0 +50)	+−	Medium to Large

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Extending Intervention through Technology

Fast ForWord has always been at the forefront of technology, helping millions of children and adults improve their language, reading and cognitive skills through computerized learning. Now it can reach even more – through the iPad®, the tablet that makes content accessible to learners of all ages and abilities.

Play Video

New for iPad!

- **More engaging, more accessible**: Touch-screen technology and bright, animated graphics make it easier to captivate Kindergarten and high school learners alike.
- **More portable:** Want to use Fast ForWord in the front of the classroom…At home…In the library? Or all three? iPad portability allows you and your learners to use Fast ForWord wherever you want, whenever you want.
- **More functional**: with a username and password, students can access their

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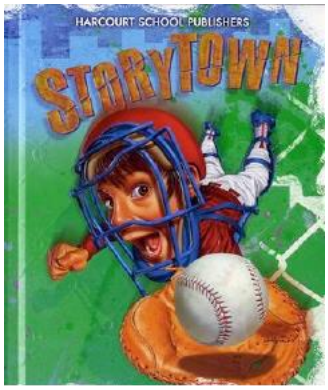
Supports: E-learning tools, Apps, Web-based

- Story Town
  http://harcourtschool.com/storytown



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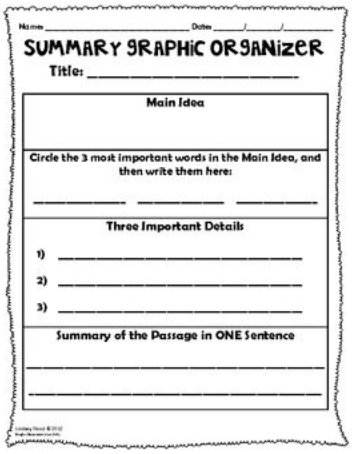
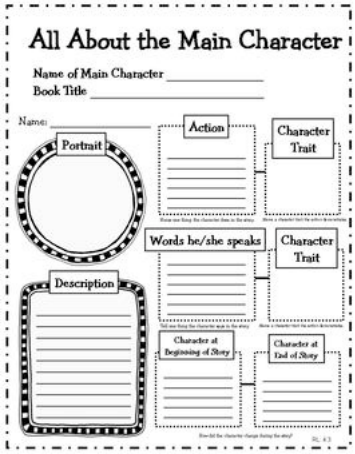
Supports: Accommodation

- Graphic Organizers

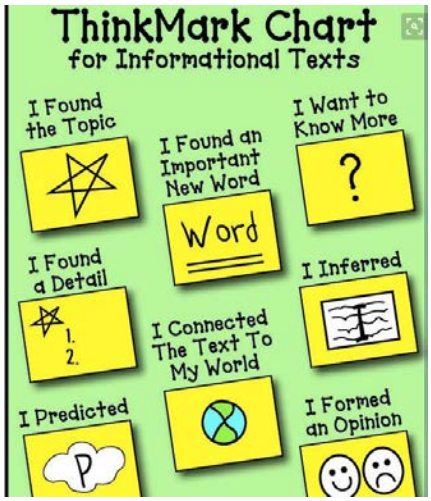




Helping RC by making Mark an active and more thoughtful reader…guiding his thinking

Supports: Modification

- Limit number of critical thinking questions for homework *or create tailored critical thinking activities*
- *Have Mark pick two Critical thinking activities each night*



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Supports: Other

- Graphic Novels
  - Pictures
  - Using a technique similar to comic books, graphic novels use visuals to guide the story, adding text only to fill in the gaps.
  - More complex than picture books
  - Can be read with an adult or independently, and are especially good for struggling or reluctant readers.

Source: http://www.readingrockets.org/booklist/graphic-novels

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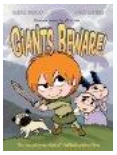
Supports: Other

- Graphic Novels
- *Top 10 Graphic Novels for 3rd Grade 9 Year Old Boy* (http://www.pragmaticmom.com/2013/06/graphic-novels-for-3rd-grade/)



Summary of Services for Mark

- Wrap Around Support
  - Learner (Mark's *reading comprehension strategies*)
  - Parent supports his reading (e.g., *parent check-in* via retell)
  - Engaging classroom teacher by capitalizing on what she already does, but encouraging pairing with strong students, *peer models* for making predictions, etc.
  - Including remedial teacher (e.g., take *existing program* and tell her what aspects of the intervention are important for Mark; extend to iPad)
  - Capitalizing on his *curricular materials* (e.g., Storytown support)
  - Modifying *homework* in a meaningful way
  - Addressed *motivation* for reading via graphic novels
- All Supports selected based on how Gf deficits manifest in general (i.e., overall learning) but also more specifically (i.e., reading comprehension)

Summary and Conclusions

- Specific cognitive ability and processing weaknesses interfere with learning in general and with acquisition and development of academic skills in particular
- Cognitive ability and processing weaknesses manifest in real-world performances, specifically academic performance in the classroom, in predictable ways
- Understanding the manifestations of cognitive weaknesses provides specific targets for intervention
- Evidence-based academic programming/instruction is the primary means of intervening with students who have specific academic skill weaknesses – but, it is often insufficient as the sole means of addressing a student's overall learning needs
- Data from a comprehensive evaluation that includes cognitive assessment informs intervention planning
- The STEPS approach (**S**trategies, **T**echniques, **E**vidence-based **P**rograms and **S**upports) was described as a means of ensuring wrap around services for students who struggle academically, with particular emphasis on services that address the student's areas of cognitive weaknesses and the severity of the educational impact of those weaknesses
- While academic achievement data provide information to assist in selecting appropriate academic interventions, cognitive assessment data assist in understanding how those interventions may need to be tailored for the student
- Cognitive assessment data demonstrate what abilities and processes may obstruct or constrain learning. This knowledge leads to the development or selection of accommodations, instructional/curricular modifications, and compensatory strategies that minimize these effects, thereby allowing the student greater access to the curriculum

Cognitive Tests Are Important

- "If these tests will give us a basis from which we can start to understand a child's difficulties, they will have justified the time spent on them. Anything which helps educators or parents to ***understand*** any phase of development or lack of development is of immeasurable value" (p. 189).
- Source: Stranger, M. A. & Donohue, E. K. (**1937**). *Prediction and prevention of reading difficulties*. New York, NY: Oxford University Press.

Cognitive Tests Are Important

"At the *current state of scientific knowledge*, it is only through a comprehensive evaluation of a student's cognitive and psychological abilities and processes that insights into the underlying proximal and varied root causes of [academic] difficulties can be ascertained and then specific interventions be provided targeted to each student's individual needs, *a process long advocated*"

Reynolds and Shaywitz (2009)

Cognitive Tests Are Important

- **Why do some children fail to respond?**
  - Perhaps because interventions are being applied "blindly" as a one size fits all method without understanding whether or not specific cognitive deficits exist
- A neuropsychological process that is important to reading skills development is working memory – it is a crucial process for early reading recognition and later reading comprehension. ***One must assess it if one is to develop the most appropriate method of intervention*** (Teeter et al., 1997).
- Given the findings from the neuroimaging and neruopsychological fields of deficient performance on measures of ***working memory, processing speed, auditory processing ability, and executive functions***, evaluation of these skills is necessary to determine the most appropriate program to fit the individual child's need.

Semrud-Clikeman (2005)

Cognitive Tests Are Important

- The danger with not paying attention to ***individual differences*** is that we will repeat the current practice of simple assessments in curricular materials to evaluate a complex learning process and to plan for interventions with children and adolescents with ***markedly different needs and learning profiles*** (Semrud-Clikeman, 2005).

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The Value of Assessing Cognitive **Abilities and Processes…**

Even if a student never enters the special education system, the general education teacher, the student's parents, and the student him- or herself would receive valuable information regarding why there was such a struggle in acquiring academic content, to the point of possibly needing special education

Kavale, Holdnack, & Mostert (2005, p. 12)

*Before we protest too much that we are not testers and that we decline such restrictive roles, let us remember our heritage, and our roots in the schools, and let us remember also that the **well trained school psychologists** should be the most skilled of anyone on a school staff in conducting thorough psychological and psychoeducational assessments. Rather than **abandoning the testing role** to others who will gladly assume the burden and perform the role, less thoroughly, less competently, and less expensively, we need to demonstrate to educators and parents the importance and value of **thorough assessment** conducted by **competent** school psychologists (Trachtman, 1979; p. 386).*

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