

Making SLD Identification Work: A Modern Approach for Practitioners

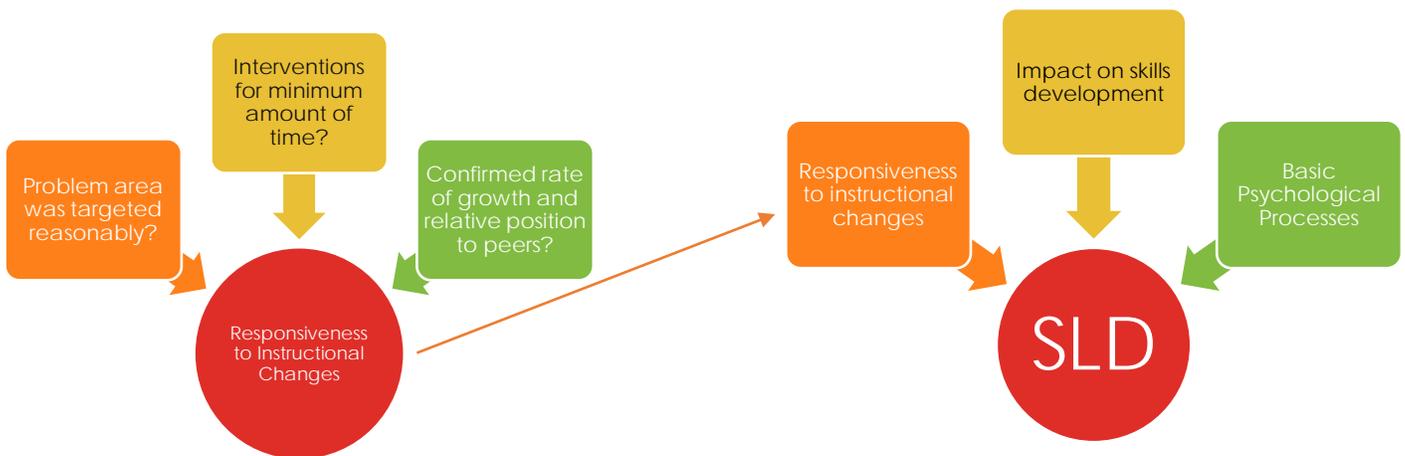
The debate over how to best evaluate and identify students with Specific Learning Disabilities is ongoing. An extensive research and literature review was conducted on two methods noted in IDEA 2004 regarding identification of Specific Learning Disability (SLD): Response to Intervention (RTI) and an “alternative research-based procedure” sometimes referred to as Pattern of Strengths and Weaknesses (PSW). While all models have limitations, current research indicates that elements of both RTI and PSW can be implemented to arrive at the most accurate and useful eligibility decisions for practitioners. To that end, an Integrated Model of evaluation was created.

The Integrated Model:

This Integrated Model seeks to reduce inappropriate identification of Specific Learning Disability by integrating tiered instructional intervention, progress monitoring and pre-referral information into a comprehensive evaluation that highlights student academic and psychological processing strengths, as well as weaknesses. The model also seeks to improve instructional outcomes by accurately identifying the potential underlying reasons for achievement problems.

The Instructional Intervention/Progress Monitoring System (IIPM)

The IIPM Process incorporates a framework derived from behaviorist learning theory and a Multi-Tiered System of Supports (MTSS). The IIPM process is a formal, structured approach to the provision of high-quality instruction and intervention matched to a student’s academic and learning needs. The IIPM Process is a three-tiered model of increasingly specific instructional interventions, coupled with instruction-linked progress monitoring, which provides both intervention for struggling learners and important pre-referral information guiding a Comprehensive Evaluation. It is critical to the success of any system because it reduces the probability of failures due largely to instructional variables alone. However, it differs from standalone RTI systems because of the challenges faced by the lack of a single cohesive “gold standard” adoption. Across the country, RTI-only systems either fail to meet the rigorous standards set by the research base and even state law, or may struggle because, “its successful implementation requires ambitious intent, a comprehensive structure, and coordinated service delivery” (Fuchs, 2012).



The Integrated Model uses multiple measures on a principle of convergent validity to establish a “pattern”.

The Pattern of Strengths and Weaknesses Methodology (PSW)

Eligibility and diagnostic determinations are high-stakes decisions that can have lasting impacts on students. The goal is to minimize false positives while maintaining diagnostic specificity true to the core definition of a learning disability as a disorder in one or more basic psychological processes involved in learning. This model is not a “test” but is a way of organizing and integrating data from intervention processes and individualized, hypothesis-driven assessments so that teams may make fully informed eligibility decisions.

Developing a Working Hypothesis during Evaluation Planning

The question of whether a student *has* a Specific Learning Disability is never proven. When testing a hypothesis, we are seeking to reject the NULL hypothesis — that the evidence has no pattern consistent with a learning disability. Developing a working hypothesis, that there is a pattern, based on the nature of the referral concerns is part of adequate evaluation planning. The working hypothesis may be accepted, rejected or found inconclusive based on the probability and confidence that we can reject the NULL.

SPED Comprehensive Evaluation: Basic Psychological Processes

Following instructional interventions and systematic progress monitoring, the comprehensive evaluation itself is guided by the idea that “basic psychological processes” must be considered. The concept of basic psychological processes is referenced in the definition of specific learning disability. It is also implicitly referenced in the eligibility regulations as, “determined to be relevant to the identification of a specific learning disability.” As the definition of specific learning disability includes a, “disorder in one or more” of these basic psychological processes, the team should ensure that data associated with these processes is gathered and analyzed.

The team may gather information for specific constructs in up to 9 basic processes: memory, processing, attention, visual, auditory, sensori-motor, mental control, analysis/reasoning, and language use. In addition to processes related to the area of academic deficit, the evaluation should also target areas of potential strength for the student. This is a critical element because identifying strengths are necessary for finding potential skills and resiliencies in students, rather than focusing solely on their deficits.

The basic psychological processes are related to academic achievement domains through the underlying cognitive constructs associated in the research base. Criterion measures based on a variety of tools allow examiners to evaluate and infer whether the student has a normative weakness or significant weaknesses relative to their areas of strength.

Example: Basic Reading Skills		
Psychological Process	Construct(s):	Measure(s):
Memory	Verbal Working Memory	WJ-IV Short-Term Working Memory WJ-IV Auditory Memory Span WISC-V Auditory Working Memory CELF-4 Working Memory CTOPP-2 Phonological Memory KABC-II Sequential
Auditory	Phonological Awareness	WJ-IV Auditory Processing KTEA-3 Phonological Processing CTOPP-2 Phonological Awareness
Processing	Speeded Visual Discrimination Rapid Automatic Naming	WJ-IV Perceptual Speed WISC-V Processing Speed WISC-V Naming Speed CTOPP-2 Rapid Naming

A common criticism of various PSW models is a reliance on the use of cognitive or IQ measures. However, it is not a requirement under this model to consider measures of constructs only from cognitive tests. Just because a measure appears in an achievement test, doesn't mean it is not a measure of a cognitive construct. And just because a measure appears in a cognitive test does not mean it is not a measure of achievement. Although most reliably measured processes will be found in a cognitive test, checklist and observation measures can also provide invaluable data for assessment.

In most cases, obtaining a full-scale IQ score is unnecessary and only minimally relevant to eligibility decision-making.

The Basic Psychological Processes

The **Memory Process** is a complex and multifaceted domain related to many areas of learning. Specific kinds of memory are utilized depending on task demands. The memory process involves the ability to store and retrieve information in a useful manner. Measures of this process include short-term memory, working memory, associative memory and long-term retrieval.

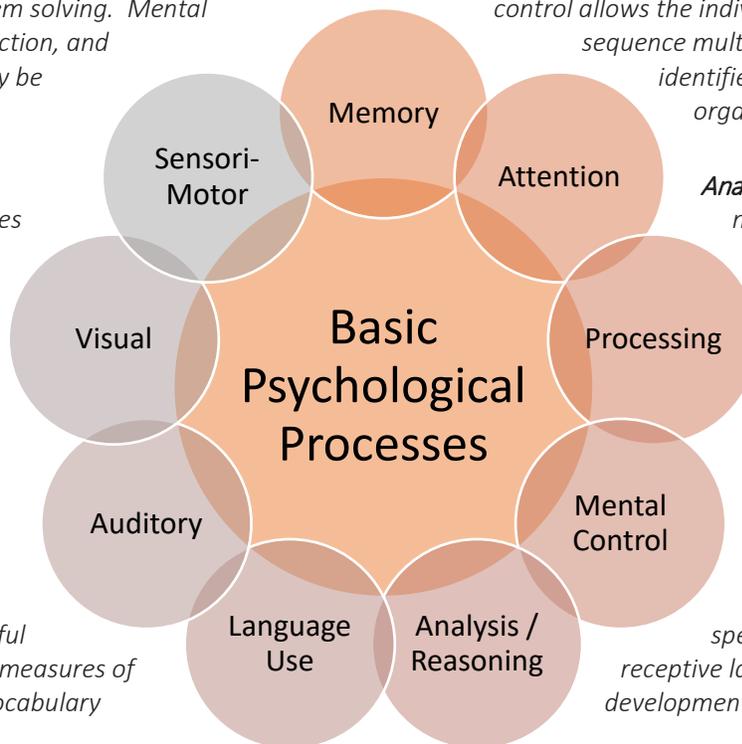
The **Attention Process** involves the individual's ability to attend to, or to selectively attenuate, perceptual stimuli in a systematic and effective manner. This process includes measures of selective attention, sustained attention, response inhibition, attention shifting, and focus.

Processing can be globally defined as the ability to make efficient and rapid decisions or quickly perceive distinctions in stimuli. Processing involves input and output mechanisms, and frequently demonstrated under timed conditions. Measures of processing include processing speed, automaticity, and rapid decision-making. Processing may also include aspects of Rapid Automatic Naming facility, though this is an overlapping domain with memory.

The **Mental Control Process** may be thought of as an individual's ability to manage and prioritize perceptions to facilitate decision-making and problem solving. Mental control allows the individual to recognize the nature of a problem, plan a course of action, and sequence multiple actions to solve a problem. Mental Control abilities may be identified through measures of executive functioning, planning, organization, and self-regulation.

Like memory, the **Analysis/Reasoning Process** is a complex activity that involves multiple sub-processes. This individual's skill at analysis and synthesis of multiple elements to resolve problems. The capability to engage in interpersonal interaction involved. Measures of Analysis and Reasoning include social awareness, reasoning skills, decision-making, fluid reasoning and emotional control.

The **Language Use Process** involves the individual's skill at using verbal information to define concepts and solve problems. Language Use includes both the understanding and production of meaningful speech and communication. Language Use may include measures of receptive language, expressive language, development, and general knowledge. Language Use may include measures of listening comprehension, vocabulary



The **Auditory Process** is not intended to be a measure of acuity of the sensory mechanism. Rather, it is intended to be the underlying cognitive mechanism involved in using auditory information for the purpose of learning. Measures of the auditory process may include phonemic awareness (including rhyming, segmentation, sound-symbol association, etc.), auditory perception, sound discrimination, and auditory mental manipulation.

The **Visual Process** is defined by cognitive mechanisms that are involved in the retention, processing, and organization of visual information so as to demonstrate accurate perception. For PSW, these should not be confused as a measure of the sensory mechanism of sight, but rather as indicators of the more complex underlying cognitive activities. Measures of the visual process may include factors such as spatial awareness, visual perceptual skills, perceptual organization, visual mental manipulation, and perceptual discrimination.

The **Sensory-Motor Process** involves integration of perceptual and cognitive skills to organize physical output. The Sensory-Motor Process can include all types of motor output including speech, gross motor, and fine motor skills. For the use as a basic psychological process involved in learning, Sensory-Motor primarily involves fine motor output. The Sensory-Motor Process may include measures of visual-motor integration, motor speed, and overall fine/gross motor skills.

Working Hypothesis Guiding Statements

Each academic skill development area has a unique design and research base for reference. It is important to have a working definition of each of the 10 academic domains of eligibility for Specific Learning Disability. Only 8 of the 10 are noted below since oral expression and listening comprehension often overlaps with speech/language disorders. Each guiding statement is informed by its respective research base.

Basic Reading Skills (BRS)

Basic reading skills deficits, also known as word-level reading disability or dyslexia, theoretically should represent approximately 80% of the students with Specific Learning Disabilities. This is defined by a weakness in decoding skills at the single word and phoneme level. Due to the cognitive demands created by poor decoding skills, multiple academic domains may be affected. It may occur in conjunction with difficulty in reading fluency and comprehension tasks, as well as spelling and written expression. Core basic psychological processes hypothesized to have a strong relationship with basic reading skills include phonemic awareness, automaticity or rapid naming facility, and working memory.

Reading Fluency (RF)

Reading fluency is the most recent addition to the classification model in the federal language around Specific Learning Disabilities. Although the measurement of reading fluency is relatively straightforward, it involves a number of processes that are highly correlated. Poor reading fluency may also be primarily caused by word-level reading and phonological deficits, although evidence for a fluency-only subtype of learning disability does exist (O'Brien, 2012). Basic psychological processes primarily involved in reading fluency include Processing Speed, including rapid naming, Mental Control, Attention, and Memory (specifically retrieval fluency).

Reading Comprehension (RC)

For the majority of students, reading comprehension problems are related fundamentally to decoding problems at the individual word level. However, there may be evidence for a percentage of students who demonstrate poor comprehension despite adequate decoding ability (Catts, 2003). Students with poor reading comprehension may not only exhibit poor decoding, but also comprehension in oral listening tasks. Fluency with reading tasks can also impact overall comprehension. Therefore, it is unlikely that any single underlying source may be solely attributed to poor reading comprehension (Cain, 2006). Core basic psychological processes contributing to reading comprehension may include Language (including listening comprehension and vocabulary development), Memory (such as long-term retrieval and working memory for language-based information), and Mental Control (specifically metacognitive skills such as self-monitoring, strategic planning, and formulating mental models or inferencing).

Written Expression (WE)

Written expression is a complex activity involving many processes and skills. There is generally a lack of adequate research defining or distinguishing all the relevant components of the written language domain (Fletcher, 2007). However, two main subtypes may exist: 1) Poor quality of narrative composition with generally adequate mechanical elements (syntax, semantics, spelling); and, 2) Adequate content/meaning with low spelling, grammar, syntax and mechanical skills. The latter group may frequently demonstrate comorbid reading failures (Wakely, 2006). Core basic psychological processes focus on executive functions, including initiating responses and ability to shift response set. Language processes of value are oral expression, general knowledge, and vocabulary. Analysis/reasoning processes related to writing include fluid reasoning and planning abilities.

Math Calculations (MC)

Math calculation skills have generally been conceptualized and evaluated as paper-and-pencil math computations. However, researchers have struggled to consistently define the parameters of these skills, including developmental elements such as number sense, counting, estimations, and algorithmic computations. Complicating matters, nearly a decade of math instruction emphasizing cognitively advanced conceptual problem-solving may have resulted in a reduced emphasis on basic number skills (Geary, 2004). Regardless, evidence exists of students with specific deficits in fact retrieval and basic calculation fluency that occur in the absence of reading problems (Seethaler & Fuchs, 2006). Cognitive correlates of calculation skills have been centered on Processing Speed (including retrieval fluency), Working Memory (memory span), and attention. Students with reading failures may exhibit concurrent difficulty with phonological awareness and language use.

Math Problem-Solving (MPS)

Math problem-solving is a multi-domain academic activity that encapsulates features of mathematical computation competencies and adds the complexity of language interpretation and reasoning skills. Thus, many core cognitive processes may be involved (Fuchs et al., 2006b). Problem-solving skill deficits that occur distinctively from basic calculations have sometimes been characterized as a "semantic" subtype of dyscalculia, or math disorder (Feifer, 2006). Despite difficulty in defining the characteristics unique to math problem-solving, research has identified several cognitive processes that contribute to problem-solving capacity. Consistent with math calculations, the area of Working Memory, and specifically visual-spatial memory span, is thought to play a significant role in arithmetic skill (Bull, 1999). Working Memory is believed to primarily influence the acquisition of basic mathematical competencies as applied to solving problems (Wilson, 2001). Additional cognitive correlates include Language and Mental Control, with Attention and inhibitory controls influencing the ability to form conceptual representations and eliminate distracting information (Geary, 2004).

Basic Psychological Processes Grid

Dark shaded boxes identify the most likely basic psychological processes involved in each area of academic skill development as aligned with the SLD definition (weaknesses). Unshaded boxes are areas that may have only moderate to weak relationships to that area of skill development, and may be an area of potential strength for the student.

As with all basic psychological processes, there is overlap between processes and across academic skill domains. The purpose of the grid is to provide the evaluation planning team with a starting point when considering academic skill weaknesses with related basic psychological processes

	Visual	Auditory	Attention	Memory	Processing	Mental Control	Analysis / Reasoning	Language Use	Sensori-Motor
Basic Reading Skills	1	W		W	W			W	
Reading Fluency		2	W	W	W	W			
Reading Comprehension		3		W		W	W	W	
Math Calculation		4	W	W	W			5	
Math Problem-Solving	W	6	W	W	7	W	8	W	
Written Expression			9			W	W	W	W
Oral Expression								W	
Listening Comprehension								W	

1. Although low level sensory (visual/perceptual) abilities may be correlated to word reading problems, there is little evidence of a causal relationship unless there is an acuity issue (Fletcher, 2007).
2. When accuracy may be impacting fluency, consider effects of poor phonological awareness on decoding first (see Basic Reading Skills).
3. Phonological processing and word level decoding may significantly impact reading comprehension (see Basic Reading Skills).
4. Not currently known to be related to other types of auditory processing such as CAPD, but phonemic awareness skills may be a cognitive correlate for fluency with number systems.
5. Consider assessment of language development when suspecting procedural (semantic) memory types of math deficits.
6. Consider assessment of phonological processing deficits when comorbid reading failures are prevalent.
7. Processing speed for basic numeracy may free up cognitive resources for applied problem-solving tasks.
8. Research in this area varies based on the specific construct of analysis/reasoning being measured, many of which are better characterized by other processes.
9. Students identified with AD/HD or ASD may demonstrate concurrent deficits in written expression.

Choosing the right tools

The choice of tools is guided by the primary area of academic or behavioral concerns along with areas identified as potential strengths for the child. This is driven by the relationship between the areas of achievement and related constructs. Each assessment may measure a basic psychological process with a slightly different construct. In all cases, attempt to choose constructs that are validated by the research to be associated with the learning area.

The tests below are a representative, not exhaustive, set of multi-subtest index or composite measures (unless noted with "s" for individual subtests). Ideally, when choosing a battery, preference should be given to a single full test and supplement with composites from additional batteries. For example, give the entire KABC-II, and supplement with the CTOPP-2 Rapid Naming Index because the KABC-II does not have a measure of RAN.

	Visual	Auditory	Attention	Memory
	WISC-V Visual-Spatial		WISC-V Cognitive Proficiency	WISC-V/WAIS-IV Working Memory
	WJ-IV Visual Processing	WJ-IV Auditory Processing WJ-IV Phonemic Awareness	WJ-IV Cognitive Efficiency	WISC-V Symbol Translation WJ-IV Short-Term WM WJ-IV Auditory Memory Span WJ-IV Long-Term Retrieval
	KABC-II Simultaneous			KABC-II Sequential KABC-II Learning
	CAS-2 NonVerbal Content	CAS-2 Visual/Auditory comparison (s)	CAS-2 Attention	CAS-2 Working Memory
	DAS-II Spatial	DAS-II Auditory Processing (s)		DAS-II Memory DAS-II Retrieval
		CTOPP-2 Phon. Awareness		CTOPP-2 Phonological Memory
	UNIT Non-Symbolic	CELF-4 Phon. Awareness (s)	CMS Attention/Concentration	UNIT Memory Quotient
		KTEA-3 Phonological Processing (s)		

	Processing	Mental Control	Analysis / Reasoning	Language Use
	WISC-V/WAIS-IV Proc. Speed	WISC-V Quantitative Reasoning	WISC-V Fluid Reasoning	WISC-V/WAIS-IV Verbal Comp
	WISC-V Naming Speed			
	WJ-IV Cognitive Processing Speed		WJ-IV Fluid Reasoning	WJ-IV Comprehension/Knowl.
	WJ-IV Perceptual Speed			
	WJ-IV Speed of Lexical Access (OL)	KABC-II Planning CAS-2 Planning CAS-2 EF w/o Working Memory	KABC-II Simultaneous CAS-2 Simultaneous	KABC-II Knowledge CAS-2 Verbal Content
	DAS-II Processing Speed		DAS-II Nonverbal Reasoning	DAS-II Verbal Ability
	CTOPP-2 Rapid Naming		UNIT Reasoning Quotient	KTEA-3 Oral Language CELF-4 Expressive Language
	KTEA-3 Oral Fluency			

	Sensori-Motor
	BOT-2 Fine Manual Control Beery VMI NPCC-3 Sensorimotor

Don't forget to seek out strengths rather than focus on relationships to weaknesses only.

Basic Reading Skills

Indicator descriptions for basic reading skill deficits
Difficulty in single-word decoding
Problems with letter sound correspondence
Problem naming all the letters of the alphabet
Problems blending two or more sounds
Difficulty identifying that two words rhyme
Frequent mispronunciation of age-appropriate words
Failure to identify the starting letters of own name
Failure to identify the initial phoneme of own name
Frequent long pauses between words
Makes wild guesses at unfamiliar words without sounding
Avoidance or behavior problems when asked to read
Spelling that demonstrates pre-phonetic relationships or no phonetic relationship
Higher skill development in areas that are not dependent on reading

Processes with moderate to strong research-based link to basic reading skills
<ul style="list-style-type: none"> - Memory - Auditory (phonological awareness) - Processing (primarily rapid naming) - Language Use
Processes with moderate to weak link to basic reading skills
<ul style="list-style-type: none"> - Visual - Analysis/Reasoning - Sensori-Motor - Mental Control

Basic Reading Skills (BRS)

Basic reading skills deficits, also known as word-level reading disability or dyslexia, theoretically should represent approximately 80% of the students with Specific Learning Disabilities. This is defined by a weakness in decoding skills at the single word and phoneme level. Due to the cognitive demands created by poor decoding skills, multiple academic domains may be affected. It may occur in conjunction with difficulty in reading fluency and comprehension tasks, as well as spelling and written expression. Core basic psychological processes hypothesized to have a strong relationship with basic reading skills include phonemic awareness, automaticity or rapid naming facility, and working memory.

Empirically-derived Criterion Assessments
Phoneme segmentation (DIBELS, AIMSWEB, easyCBM)
Letter/Word identification (DIBELS, AIMSWEB, easyCBM)
Word reading fluency (DIBELS, AIMSWEB, easyCBM) - Accuracy
Passage reading fluency (DIBELS, AIMSWEB, easyCBM) - Accuracy
Norm Referenced Assessments
YCAT Reading
GORT-5 Accuracy
WJ-IV Basic Reading Skills
WJ-IV Phoneme/Grapheme Knowledge
KTEA-3 Decoding
WIAT-III Word Reading/Pseudoword Decoding
Curriculum/Grade Levelled Assessments
State-level benchmarking
Teacher-scored reading from curriculum
Graded reading activities

	Memory	Auditory	Processing	Language Use
Rating Scales	BRIEF Working Memory CEFI Working Memory NPCC-3 Learning & Memory Process	PPC-R Auditory Processing NPCC-3 Auditory Process	BASC-2 Learning Problems BRIEF Plan/Organize CEFI Organization NPCC-3 Cognitive Processing	BASC-2 Functional Comm CBRS Academic – Language NPCC-3: Language Abilities

	Memory	Auditory	Processing	Language Use
Observations	Inconsistently follows verbal instructions Problems with initial mastery Tendency to lose track when working on sequential activities Deficits in paired associations (word & meaning, picture & word)	Difficulty composting words from sounds Problems with associating sounds with symbols Problems breaking words down into component sounds Frequent confusion of auditory information (confusing words)	Understands initial point but misses subsequent information Mental fatigue when keeping up with routine tasks Works hard to “just keep up” Easily overwhelmed by volume of tasks	Difficulty handling large amounts of verbal information at one sitting Difficulty perceiving relationships between verbal elements Problems with abstract terms or figurative language Limited vocabulary development or word finding problems

Reading Fluency

Hypothesized Indicator descriptions	Accuracy	Fluency
Problems accurately identifying individual letters		
Problems quickly associating a letter with a sound		
Increased effort when naming letters		
Substitution of words		
Difficulty using context to correctly identify words		
Frequent pauses in between words in connected text		
Frequently guesses at words		
Makes careless errors that omit words or change words with close visual construction		
Difficulty reading simple connecting or function words such as <i>that, an, in, the, etc.</i>		
Oral reading that is choppy or dysfluent		
Missing phonemes in the middle or end of words		
Problems with reading words in isolation		
Inability to finish reading tasks or tests in a reasonable amount of time		

Processes with moderate to strong research-based link to reading fluency
<ul style="list-style-type: none"> - Processing - Attention - Mental Control - Memory
Processes with moderate to weak link to reading fluency
<ul style="list-style-type: none"> - Analysis/Reasoning - Auditory - Language Use - Visual

Reading Fluency (RF)

Reading fluency is the most recent addition to the classification model in the federal language around Specific Learning Disabilities. Although the measurement of reading fluency is relatively straightforward, it involves a number of processes that are highly correlated. Poor reading fluency may also be primarily caused by word-level reading and phonological deficits, although evidence for a fluency-only subtype of learning disability does exist (O'Brien, 2012). Basic psychological processes primarily involved in reading fluency

Empirically-derived Criterion Assessments
Letter naming fluency (DIBELS, AIMSWEB, easyCBM) Word reading fluency (DIBELS, AIMSWEB, easyCBM) Passage reading fluency (DIBELS, AIMSWEB, easyCBM)
Norm Referenced Assessments
GORT-5 Rate KTEA-3 Reading Fluency WJ-IV Reading Fluency / Reading Rate WIAT-3 Oral Reading Fluency TOWRE Sight Word Efficiency
Curriculum/Grade Levelled Assessments
Reading Logs Curriculum or diagnostic measures

	Memory	Attention	Processing	Mental Control
Rating Scales	BRIEF Working Memory CEFI Working Memory NPCC-3 Learning & Memory Process	CAS-2 Rating: Attention Conners 3: Attention BASC-2: Attention CEFI Attention NPCC-3: Attentional Facilitators	BASC-2 Learning Problems BRIEF Plan/Organize CEFI Organization NPCC-3: Cognitive Processing	BRIEF Initiate BRIEF Shift Connors 3-T Executive Funct. CEFI Planning CAS-2 Rating: Planning NPCC-3: Executive Functions

	Memory	Attention	Processing	Mental Control
Observations	Inconsistently follows verbal instructions Problems with initial mastery Tendency to lose track when working on sequential activities Deficits in paired associations (word & meaning, picture & word)	Unusual or erratic patterns of error Easily distracted from relatively mundane tasks Inattentiveness to error Problems when focusing on more than one thing at a time	Concentrates on minor or irrelevant details Works well only in short intervals Trouble with word-finding or frequent pauses when talking Passive learning, requires frequent repetition of instruction	Difficulty getting energy level up to start tasks Unpredictable effort levels Problems transitioning from one task requirement to another Poor flexibility in problem-solving and recognition of obvious patterns

Reading Comprehension

Hypothesized Indicator descriptions
Difficulty understanding oral directions at an age/grade appropriate level
Uses imprecise vocabulary
Trouble remembering what was read
Difficulty retelling a story
Problems defining vocabulary
Trouble recalling relevant detail from a passage
Difficulty retelling a sequence of consecutive actions
Problems drawing an accurate picture from an age appropriate orally presented story
Problems with cloze or maze reading tasks
Difficulty providing possible outcomes in a given unfinished story
Problems identifying inconsistencies in a contrived story
Problems sorting and sequencing randomized sentences from the same story (story anagram)
Difficulty with inference tasks (providing missing elements, elaboration on detail, etc.)

Reading Comprehension (RC)

For the majority of students, reading comprehension problems are related fundamentally to decoding problems at the individual word level. However, there may be evidence for a percentage of students who demonstrate poor comprehension despite adequate decoding ability (Catts, 2003). Students with poor reading comprehension may not only exhibit poor decoding, but also comprehension in oral listening tasks. Fluency with reading tasks can also impact overall comprehension. Therefore, it is unlikely that any single underlying source may be solely attributed to poor reading comprehension (Cain, 2006). Core basic psychological processes contributing to reading comprehension may include Language (including listening comprehension and vocabulary development), Memory (such as long-term retrieval and working memory for language-based information), and Mental Control (specifically metacognitive skills such as self-monitoring, strategic planning, and formulating mental models or inferencing).

Processes with moderate to strong research-based link to reading comp
<ul style="list-style-type: none"> - Language Use - Memory - Mental Control - Analysis/Reasoning
Processes with moderate to weak link to reading comp
<ul style="list-style-type: none"> - Auditory - Visual - Sensori-Motor

Empirically-derived Criterion Assessments
CBM Multiple Choice Reading Comprehension CBM Reading Maze
Norm Referenced Assessments
YCAT Reading GORT-V Comprehension WJ-IV Reading Comprehension WIAT-III Reading Comprehension (subtest) KTEA-3 Reading Understanding
Curriculum/Grade Leveled Assessments
State level reading benchmarks Teacher-scored reading/vocab from curriculum

	Memory	Language Use	Analysis/Reasoning	Mental Control
Reading Scales	BRIEF Working Memory CEFI Working Memory NPCC-3 Learning & Memory Process	BASC-2 Functional Comm CBRS Academic – Language NPCC-3: Language Abilities	BRIEF Organize BRIEF Monitor CEFI Flexibility CAS-2 Rating: Simultaneous	BRIEF Initiate BRIEF Shift Connors 3-T Executive Funct. CEFI Planning CAS-2 Rating: Planning NPCC-3: Executive Functions

	Memory	Language Use	Analysis/Reasoning	Mental Control
Observations	Inconsistently follows verbal instructions Problems with initial mastery Tendency to lose track when working on sequential activities Deficits in paired associations (word & meaning, picture & word)	Difficulty handling large amounts of verbal information at one sitting Difficulty perceiving relationships between verbal elements Problems with abstract terms or figurative language Limited vocabulary development or word finding problems	May do things without understanding why Difficulty with mastery of abstract concepts Difficulty perceiving relationship between items Poor categorization ability	Difficulty getting energy level up to start tasks Unpredictable effort levels Problems transitioning from one task requirement to another Difficulty using assistive tools adequately such as dictionary or internet search

Written Expression

Type 1 – composition & expression
 Type 2 – spelling & mechanical

Hypothesized Indicator descriptions	Type 1	Type 2
Poor narrative (consistent style, point of view, etc.)		
Poor spelling (phonological, additional syllables, etc.)		
Limited use of punctuation, incorrect punctuation		
Demonstrates poor grammatical structure (verb tense, subject verb agreement, etc.)		
Uses poor semantics (words with wrong meaning)		
Poor letter formation		
Poor descriptive quality		
Poor organization		
Poor visual format (spacing, paragraphs, indentation, margins, etc.)		
Incorrect or missing capitalizations		
Does not correct mistakes (revising for content, mechanics, etc.)		
Problems with vocabulary (age appropriate words, descriptive, imaginative)		
Poor decoding/reading skills		

Processes with moderate to strong research-based link to writing
<ul style="list-style-type: none"> - Language Use - Mental Control - Analysis/Reasoning - Sensori-motor
Processes with moderate to weak link to writing
<ul style="list-style-type: none"> - Auditory - Attention - Visual - Processing

Written Expression (WE)

Written expression is a complex activity involving many processes and skills. There is generally a lack of adequate research defining or distinguishing all the relevant components of the written language domain (Fletcher, 2007). However, two main subtypes may exist: 1) Poor quality of narrative composition with generally adequate mechanical elements (syntax, semantics, spelling); and, 2) Adequate content/meaning with low spelling, grammar, syntax and mechanical skills. The latter group may frequently demonstrate comorbid reading failures (Wakely, 2006). Core basic psychological processes focus on executive functions, including initiating responses and ability to shift response set. Language processes of value are oral expression, general knowledge, and vocabulary. Analysis/reasoning processes related to writing include fluid reasoning and planning abilities.

Empirically-derived Criterion Assessments
3 minute WE-CBM Probes 10 minute WE-CBM Probes
Norm Referenced Assessments
TOWL Composite OWLS Written Expression Scale WJ-IV Written Expression cluster WIAT-III Written Expression KTEA-3 Written Expression
Curriculum/Grade Levelled Assessments
State level reading benchmarks Teacher-graded writing samples from curriculum Writing samples scores on state standards

	Language Use	Analysis/Reasoning	Mental Control	Sensori-Motor
Reading Scales	BASC-2 Functional Comm CBRS Academic - Language	BRIEF Organize BRIEF Monitor CEFI Flexibility CAS-2 Rating: Simultaneous	BRIEF Initiate BRIEF Shift Connors 3-T Executive Funct. CEFI Planning CAS-2 Rating: Planning NPCC-3: Executive Functions	BRIEF Organization Connors CBRS Writing PPC-R Visual Motor Processing NPCC-3 Sensorimotor

	Language Use	Analysis/Reasoning	Mental Control	Sensori-Motor
Observations	Difficulty handling large amounts of verbal information at one sitting Difficulty perceiving relationships between verbal elements Problems with abstract terms or figurative language Limited vocabulary development or word finding problems	Fails to look ahead and consider consequences Seems to have trouble organizing or estimating needs for a task Excessive reliance on trial and error Frequent or careless errors	Evidence of fatigue Erratic pattern of arousal state Misses beginning of instruction Works well only for short intervals	Trouble with areas of self-help skills such as tying shoes or buttoning Approaches motor tasks in a haphazard or inefficient way Clumsiness when handling materials Poor handwriting

Math Calculation

Hypothesized Symptom descriptions	Conceptual	Procedural
Problems accurately identifying individual numbers		
Problems with rapid number identification		
Early delays in counting objects or object sets		
Errors in regrouping process		
Require excessive repetition of math facts for learning		
Difficulty retaining instructions for solving math problems		
Delayed associations between amounts shown and corresponding number		
Uses inefficient or ineffective strategies when solving simple problems		
Makes 'careless' errors on computations		
Lack of understanding of concepts underlying use of certain procedures		
Difficulty with comparisons of quantity, volume, or other measures		
Uses less mature procedures for computations (finger counting, hash marks, etc.)		
Problems with sequence or order in computations		
Delayed response times on simple counting or computations		
Delayed reading development or poor phonemic awareness		

Conceptual – related to facility with number sense and basic facts.
 Procedural – steps and strategies or algorithmic skill.

Math Calculations (MC)

Processes with moderate to strong research-based link to math calculation
<ul style="list-style-type: none"> - Memory - Language - Attention - Processing
Processes with moderate to weak link to math calculation
<ul style="list-style-type: none"> - Visual - Auditory - Sensori-Motor

Math calculation skills have generally been conceptualized and evaluated as paper-and-pencil math computations. However, researchers have struggled to consistently define the parameters of these skills, including developmental elements such as number sense, counting, estimations, and algorithmic computations. Complicating matters, nearly a decade of math instruction emphasizing cognitively advanced conceptual problem-solving may have resulted in a reduced emphasis on basic number skills (Geary, 2004). Regardless, evidence exists of students with specific deficits in fact retrieval and basic calculation fluency that occur in the absence of reading problems (Seethaler & Fuchs, 2006). Cognitive correlates of calculation skills have been centered on Processing Speed (including retrieval fluency), Working Memory (memory span), and attention. Students with reading failures may exhibit concurrent difficulty with phonological awareness and language use.

Empirically-derived Criterion Assessments
Math digits-correct probes Math computation probes (AIMSWEB, DIBELS, easyCBM)
Norm Referenced Assessments
KEYMATH 3 Operations WJ-IV Math Calculation Skills WIAT-III Numerical Operations and/or Math Fluency KTEA-3 Math Computation
Curriculum/Grade Leveled Assessments
State level math benchmarks Teacher-scored math computation worksheets

	Memory	Language Use	Attention	Processing
Reading Scales	BRIEF Working Memory CEFI Working Memory NPCC-3 Learning & Memory Process	BASC-2 Functional Comm CBRS Academic – Language NPCC-3: Language Abilities	PPC-R Attention CAS-2 Rating: Attention Conners 3: Attention BASC-2: Attention CEFI Attention NPCC-3: Attentional Facilitators	BASC-2 Learning Problems BRIEF Plan/Organize CEFI Organization NPCC-3 Cognitive Processing

	Memory	Language Use	Attention	Processing
Observations	Inconsistently follows verbal instructions Problems with initial mastery Tendency to lose track when working on sequential activities Deficits in paired associations (word & meaning, picture & word)	Difficulty handling large amounts of verbal information at one sitting Difficulty perceiving relationships between verbal elements Problems with abstract terms or figurative language Limited vocabulary development or word finding problems	Unusual or erratic patterns of error Easily distracted from relatively mundane tasks Inattentiveness to errors Problems when focusing on more than one thing at a time	Concentrates on minor or irrelevant details Works well only in short intervals Trouble with word-finding or frequent pauses when talking Passive learning, requires frequent repetition of instruction

Math Problem-Solving

Hypothesized Symptom descriptions	Conceptual/ Semantic	Procedural
Difficulty understanding the task expectations in math problems		
Problems developing estimation skills		
Fails to identify wildly inaccurate results		
Confuses operations identified by quantitative words (sum, difference, etc.)		
Trouble retaining process for common algorithms		
Difficulty explaining verbally how an answer was derived		
Errors in the order of computations applied to a problem-solving task		
Problems disregarding irrelevant items/numbers in word problems		
Problems with basic computations even when using a calculator		
More anxious when approaching math in context of story problems		
Difficulties with regrouping		
Takes excessive time to solve problems		
Uses immature strategies such as finger counting or hash marks		

Processes with moderate to strong research-based link to math problem-solving
<ul style="list-style-type: none"> - Memory - Mental Control - Language Use - Attention - Visual
Processes with moderate to weak link to math problem-solving
<ul style="list-style-type: none"> - Auditory - Sensori-Motor - Analysis/Reasoning - Processing

Math Problem-Solving (MPS)

Math problem-solving is a multi-domain academic activity that encapsulates features of mathematical computation competencies and adds the complexity of language interpretation and reasoning skills. Thus, many core cognitive processes may be involved (Fuchs et al., 2006b). Problem-solving skill deficits that occur distinctively from basic calculations have sometimes been characterized as a “semantic” subtype of dyscalculia, or math disorder (Feifer, 2006). Despite difficulty in defining the characteristics unique to math problem-solving, research has identified several cognitive processes that contribute to problem-solving capacity. Consistent with math calculations, the area of Working Memory, and specifically visual-spatial memory span, is thought to play a significant role in arithmetic skill (Bull, 1999). Working Memory is believed to primarily influence the acquisition of basic mathematical competencies as applied to solving problems (Wilson, 2001). Additional cognitive correlates include Language and Mental Control, with Attention and inhibitory controls influencing the ability to form conceptual representations and eliminate distracting information (Geary, 2004).

Empirically-derived Criterion Assessments
CBM Concepts/Applications probes (DIBELS, AIMSWEB, easyCBM)
Norm Referenced Assessments
KeyMath 3 Operation and/or Applications WJ-IV Math Problem Solving WIAT-III Math Problem-Solving KTEA-3 Math Concepts and Applications (subtest) YCAT Math
Curriculum/Grade Levelled Assessments
State level math benchmarks Curriculum or diagnostic measures

	Memory	Mental Control	Language Use	Attention	Visual
Rating Scales	BRIEF Working Memory CEFI Working Memory NPCC-3 Learning & Memory Process	BRIEF Initiate BRIEF Shift Conners 3-T Executive Funct. CEFI Planning CAS-2 Rating: Planning NPCC-3: Executive Functions	BASC-2 Functional Comm CBRS Academic – Language NPCC-3: Language Abilities	PPC-R Attention CAS-2 Rating: Attention Conners 3: Attention BASC-2: Attention CEFI Attention NPCC-3: Attentional Facilitators	NPCC-3 Visuospatial

	Memory	Mental Control	Language Use	Attention	Visual
Observations	Inconsistently follows verbal instructions Problems with initial mastery Tendency to lose track when working on sequential activities Deficits in paired associations (word & meaning, picture & word)	Difficulty getting energy level up to start tasks Unpredictable effort levels Problems transitioning from one task requirement to another Poor flexibility in problem-solving and recognition of obvious patterns	Difficulty handling large amounts of verbal information at one sitting Difficulty perceiving relationships between verbal elements Problems with abstract terms or figurative language Limited vocabulary development or word finding problems	Unusual or erratic patterns of error Easily distracted from relatively mundane tasks Inattentiveness to error Problems when focusing on more than one thing at a time	Difficulty forming mental pictures Problems retaining visually-presented information Problems with visual copy or visual transfer Difficulty understanding non-verbal tasks or patterns

Charting Strengths and Weaknesses

S = Strength

I = Inconclusive

W = Weakness

	Empirically-derived criterion-referenced assessments			Norm-referenced academic assessments			Curriculum-based or grade-level assessments			Anecdotal information or observations		
	S	I	W	S	I	W	S	I	W	S	I	W
Basic Reading	S	I	W	S	I	W	S	I	W	S	I	W
Reading Fluency	S	I	W	S	I	W	S	I	W	S	I	W
Reading Comp	S	I	W	S	I	W	S	I	W	S	I	W
Math Calculation	S	I	W	S	I	W	S	I	W	S	I	W
Math Problem Solving	S	I	W	S	I	W	S	I	W	S	I	W
Written Expression	S	I	W	S	I	W	S	I	W	S	I	W
Oral Expression	S	I	W	S	I	W	S	I	W	S	I	W
Listening Comp	S	I	W	S	I	W	S	I	W	S	I	W

Consideration of basic psychological processes:
Memory
Attention
Processing
Analysis / Reasoning
Visual
Auditory
Sensori-motor
Language use
Mental control

Strengths	Weaknesses
Standardized Assessments:	Standardized Assessments:
Rating Scales:	Rating Scales:
Observations:	Observations:

Exclusionary Factors	Unlikely	Inconclusive	Likely
Appropriate Instruction			
English Language Proficiency			
Cultural or Family Factors			
Environmental Disadvantage			
Economic Disadvantage			

Measures Guidance

Criterion-referenced Assessments

Investigating students' academic achievement with respect to grade-level expectations

Examples: easyCBM (Reading)
easyCBM (Math)
DIBELS

Strength \geq 30th percentile
Weakness \leq 20th percentile

Norm-referenced Standardized Academic Assessments

Investigating student's academic achievement with respect to age-level expectations

Examples: Wechsler Individual Achievement Test
Woodcock-Johnson IV Tests of Achievement
Kaufman Tests of Educational Achievement
Oral and Written Language Scales

Strength \geq 25th percentile
Weakness \leq 10th percentile

using age-norms to score

Curriculum-based or Grade-level Assessments

Investigating student's classroom performance with respect to grade-level expectations

Examples: Statewide Assessment Tests

Strength = meets/exceeds
Weakness = does not meet

Chapter assessments
from adopted curricula
Informal Reading Inventories
Writing Prompts

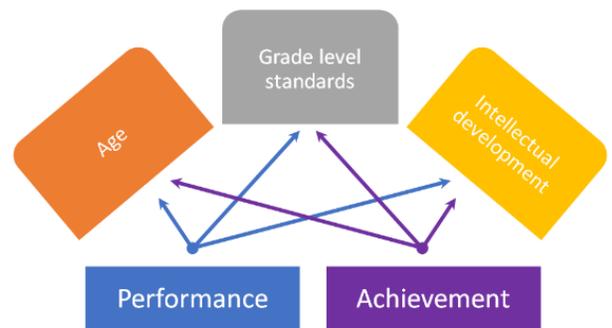
Strength = average or above
Weakness = below average

Anecdotal Information

Investigating student's classroom performance with respect to age-level expectations

Examples: Experienced team members' anecdotes/observations about how a student is performing compared to age-peers

Strength = professional judgment
Weakness = professional judgment



Consideration of Basic Psychological Processes

Investigating student's academic achievement and classroom performance with respect to his/her intellectual development

Examples:

Norm-referenced assessments
(i.e. WISCV/WAISIV, WJ-IV, CAS-2, KABC-II, KTEA-3, DAS-2)

Strength \geq 25th percentile
Weakness \leq 10th percentile

And/or Rating Scales
(i.e. BRIEF, CEFI, Connors-3, BASC-2, PPC-R)

Strength = non-clinical range
Weakness = clinical or at-risk ranges

And/or Structured observational data

Strength = professional judgment
Weakness = professional judgment

Basic Psychological Processes include: Memory, Attention, Processing, Analysis/Reasoning, Visual, Auditory, Sensory-motor, Language Use and/or Mental Control (Exec functioning)