Language, Literacy and Executive Functions

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# A Clinical Assessment Process

1. **Is there a language disorder?**
   - Total language or Core Language Score

2. **What is the nature of the disorder?**
   - Language Composite or Index Scores
   - Receptive and Expressive
   - Listening and Speaking
   - Reading and Writing
   - Syntax, Morphology,
   - Semantics, Pragmatics
   - Language and Memory
   - • Modality based
   - • Educationally based
   - • Linguistically based
   - • Language & memory interfaces

3. **What are the language weaknesses?**
   - Profiling

4. **What are the language strengths?**
   - Significance of discrepancies
Language Disorder Case Study: Executive Functions

This student …

has problems paying attention
doesn’t focus on what’s going on in class
has difficulty following directions
has problems remembering things in class
has difficulty complying with my requests
loses things
has trouble sequencing things in proper order
writes in a sloppy or disorganized manner
does work in a disorganized way
does not come to class prepared
seems lost or confused in school
makes the same mistakes over and over again
doesn’t ask for help when it’s necessary
distracts the class
exhibits emotional outbursts
is not interested in classroom activities
needs to be in control
is impulsive
needs to be the center of attention

Executive Functions

Attention
Memory
Organization
Monitoring
Behavioral Regulation
A Norm-Referenced/Clinical Perspective

Question 1. *Is there evidence of a language disorder?*
   Total Language, Receptive or Expressive (Modalities)

Question 2. *What is the nature of the disorder?*
   Language Strengths and Weaknesses (Content)
   Syntax, Morphology, Semantics, Language & Memory

Question 3. *How does this student’s performance compare with that of his/her peers?*
   Educational level of performance compared to age/grade peers

Question 4. *Does the student’s clinical performance profile meet criteria for eligibility for speech and language services?*
A Neuropsychological/Brain-Behavior Perspective

Question 1. *What evidence is there of co-morbidities?*
   Developmental and medical history
   Reasons for referral
   Behavioral indicators

Question 2. *What critical neuropsychological behaviors underlie the disorder?*
   Attention/hyperactivity, auditory processing, dysnomia, cognitive, memory deficits, etc.

Question 3. *Which neuropsychological functions are involved?*
   Executive functions, visual spatial, motor, processing speed, verbal automaticity, etc.

Question 4. *Which neuro-psychological functions represent strengths?*
Question 1. *Which aspects of communication in context are compromised?*
  Verbal pragmatics
  Nonverbal communication

Question 2. *Which aspects of academic performance are compromised?*
  Listening, speaking, reading, writing, mathematics

Question 3. *Which curriculum and learning objectives are compromised?*
  English and language arts, social studies, natural/physical sciences, arithmetic, algebra, physical education, arts

Questions 4. *Which areas of performance represent communication strengths?*
A Social Perspective

Question 1. Which aspects of social communication are compromised?
   Verbal pragmatics - perspective taking
   Nonverbal communication

Question 2. Which aspects of peer relations are compromised?
   Play or game activities, friendship, interactive sharing or participating in conversations or discussions

Question 3. Which aspects of student-adult relationships are compromised?
   Respect, following directions for activities, behavioral management, mutual respect, trust etc.

Questions 4. Which areas of social communication represent strengths?
Executive Functions

Behavioral Regulation
Inhibition of prepotent cognitive and emotional responses (medial prefrontal region).
(Barkley, Brown, Denckla, Lezak, Pennington)

Initiation of Action
Readiness to start an intended action (mediated by medial frontal lobe).

Planning and Organization
Sequencing and prioritizing, categorizing and developing options (dorso-lateral prefrontal lobe).

Monitoring
External monitoring to capture errors and evaluate corrections

Responding to Feedback and Shifting
(mediated by orbital prefrontal regions) (Barkley, Brown, Lezak, Lyon & Krasnegor)

Working Memory
Explicit working memory for novel stimuli and conscious processing (orbital prefrontal cortices).
Implicit working memory for familiar and visual stimuli (posterior cortices and left parietal lobe).
Interacts with selective attention (Goldman-Rakich, Shallice, Tulving, Furey, deSimone)
What is processing-speed?

Processing speed is a general term that refers to the rate/speed with which an individual can react and respond to auditory, visual or other input.

Processing speed deficits can affect the auditory and visual domains and are associated with language disorders, reading disabilities/dyslexia, psychiatric disorders and dementia.

Processing speed can be perceptual or cognitive in nature.

*Perceptual speed* measures account for reaction + response time.
When do we need adequate or rapid processing speed in daily life?

An easy answer would be to say “ALWAYS,” but here are some specific examples:

Child Care – consider being all eyes and ears on a playground.

Reading – consider scanning to decode while processing to interpret.

Driving – consider focusing and responding rapidly to changing traffic patterns during rush hour.

Piloting – consider shifting attention to multiple visual panels while making decisions.
Is processing speed related to attention?

There is a relationship with interactive components that form the functional system involved in executive attention.

Sustained attention maintains attention over time and is controlled by the reticular formation, brain stem and frontal regions.

Selective attention maintains the ability to focus on a stimulus in the presence of distracters and is mediated by temporal, parietal, and striatal regions of the brain.

Response inhibition, divided attention, and shifting attention have all been linked to mediation by the frontal regions, as has processing speed.
Are processing speed and working memory related?

Working memory is a neural activation resource with limited capacity and duration.

It holds information in mind, as in a buffer store, while processing, interpreting, or responding to input or information.

It contains distinct subsystems: a phonological loop, a visual-spatial sketchpad and a modality free central executive.

The phonological loop activates verbal information in memory, important for the acquisition of content and structure.
There is evidence of developmental relationships between working memory and inhibitory control, general-purpose functions that guide complex cognition and behavior (Roncadin, Pascual-Leone, Rich & Dennis, 2007).

Dual-task efficiency (cognitive speed) correlates positively with working memory activation in children ages 6 through 11 years.

In contrast, working memory correlates with inhibition efficiency in children ages 12 through 17.
When in the child’s life can we observe increases in processing speed?

In infancy between 5 and 36 mos. of age.

Developmental studies of visual processing speed (attention and habituation) show similar developmental patterns, but higher levels of performance in full-term than in pre-term infants (Rose, Feldman & Jankowski, 2002).

A longitudinal study of habituation in infants at 40 months and at 4 years of age indicates a small significant, indirect effect of early habituation efficiency (visual processing) on full-scale intelligence (Bornstein, Hahn, Bell et al., 2006).
What happens to processing speed during the school years?

Processing speed differentiates pre-school and school-age children with normal language development from those with language disorders.

Both groups show similar, linear patterns of increase in visual-processing and naming speed (decreased naming time) between ages 5-6 and 15-16 years.

Of the children with significant cognitive speed deficits, about half had a severe language disorder with total language scores below 70.

What happens to processing speed as we age?

In normal adolescents and adults, cognitive speed, measured by naming repeated color-form combinations, slows on average by 10 sec. between ages 15 and 95.

The slowing of cognitive speed with age is linear and amounts to 1 sec. per decade up to age 55 and 1 sec. per 7 years until age 95.

Cognitive speed is significantly reduced in MCI, Alzheimer’s disease (AD) and dementia with Lewy bodies (DLB).
Which conditions are associated with reduced processing speed?

• Severe receptive-expressive language disorders.
• SLI and primarily expressive language disorders.
• Dyslexia/reading disabilities.
• Executive function disorders:
  - Tourette spectrum syndrome
  - Attention deficit hyperactivity disorder (ADHD)
• Mood disorders (e.g., depression)
• Traumatic brain injury (TBI) or stroke (CVA)
• Dementia
  - Frontal-lobe dementia
  - Alzheimer’s disease (AD)
  - Dementia with Lewy bodies (DLB)
Why would SLPs assess processing speed?

Deficits in processing speed are predictors of … specific language impairments (SLI) reading disabilities, including dyslexia attention deficit hyperactivity disorders (ADHD) generalized executive function disorders mild cognitive impairment (MCI) dementia (AD)

Executive function disorders may require medication as in the management of ADHD, Tourette, mood disorders and dementia of the Alzheimer’s type
How are processing-speed tests designed?

Processing-speed tests require rapid, sustained responses to a series of single- or dual-dimension visual stimuli.

The total time (sec.) used to complete the task is measured objectively and is the measure of performance.

Processing speed for single-dimension stimuli measures reaction + response time (perceptual speed).

Processing speed for dual-dimension stimuli measures perceptual speed + cognitive overhead from demands on attention, working memory, inhibition or set-shifting (cognitive speed).

The *Stroop Color-Word Test, AQT, RAN-RAS, and Trail-Making Test* are standardized perceptual- and cognitive-processing speed tests. The cognitive overhead varies as a function of the design, task demands and required responses.
• Continuous rapid naming (RAN) of single-dimension stimuli (colors and objects) measures perceptual speed (i.e., reaction + response time) for highly familiar stimuli.

• Rapid naming of alternating stimuli (i.e., repeated color and object sequences) measures cognitive speed (i.e., perceptual speed + cognitive overhead --- visual working memory and set shifting).

• Allow identification of students at risk for reading failure/dyslexia.

• Naming times are converted to criterion-referenced scores by age/grade.

• Presumably involves mediation by activation of the temporal-parietal lobe.
RAN/RAS (Wolf & Denckla, 2005)

- Continuous rapid naming (RAN) of single-dimension stimuli (letters, numbers, colors and objects) measures perceptual speed (i.e., reaction + response time) for highly familiar stimuli.
- Rapid alternating stimuli (RAS) of (a) letters and numbers, and (b) letters, numbers and colors measure cognitive speed (i.e., perceptual speed + cognitive overhead --- visual working memory and set shifting).
- Allow identification of students at risk for reading failure/dyslexia.
- Naming times are converted to percentiles, standard scores and age and grade equivalents.
- Presumably involves mediation by activation of the angular gyrus.
• Continuous rapid naming of dual-dimension visual stimuli (e.g., color-form combinations) requires control of attention, working memory and set shifting.

• Attention is controlled and divided in proportion to:
  (1) The degree of automaticity and available working memory resources
  (2) Resource allocation and requirements for cognitive/set switching
  (3) Structural factors in the input (e.g., single- versus dual-dimension visual stimuli)
  (4) Degree of similarity and possible confusion
Word Association Tests

**CELF-4 Word Associations**
Requires retrieval and naming of members of the semantic categories: Animals, foods, and jobs/occupations. Subtest is supplemental and criterion-referenced

**Emergent Literacy and Language Assessment (ELLA)**
Requires retrieval and naming of members of the semantic categories: Snacks, classroom things, words beginning with “m,” and words beginning with “s”

**Verbal Fluency Test (FAS)**
Requires identification, retrieval and naming of words that begin with the same sounds (F - A - S).

Executive functions evaluated, among them explicit/conscious, verbal working memory, are mediated by orbito-frontal lobe activation.
Number Repetition 1 (Ages 5-16)
Eight digit forward items (2 sequences each); length: 2-9 digits.
Eight digit backward items (2 sequences each); length: 2-8 digits.

Number Repetition 2 (Ages 17-21)
Eight digit forward items (2 sequences each); length: 2-9 digits.
Eight digit backward items (2 sequences each); length: 2-8 digits.

Familiar Sequences 1.
Number sequences (counting forward and backward); days of the week; months of the year (forward and backward); alternating alphanumerical counting (e.g., A1, B2, etc.).

Familiar Sequences 2.
Number sequences (counting forward and backward); days of the week; months of the year (forward and backward; alternating numerical/day of the week (e.g., 0/Sun, 6/Mon, 12/Tues, etc.).
Observational Rating Scales

**CELF–4**

*Content*

- 40 statements describe problems a student may have in listening, speaking, reading, and writing
- Uses negatively stated queries about observable behaviors (e.g., has difficulties)
- Rated on a 4-point frequency of occurrence scale (1=Never, 2=Sometimes, 3=Often, 4=Always)
- Separate ratings by teachers and parents
Standard Scores and Educational Performance Ranges

Above Educational Average
Standard score 115 and above (+1 SD)

Average Educational Range
Standard score 86 to 114 (within +/-1 SD)

Marginal Educational Range
Standard score 79 to 85 (within -1 to -1.5 SD)

Low Educational Range
Standard score 71 to 78 (within -1.5 to -2 SD)

Very Low Educational Range
Standard score 70 and below (-2 SD)
### Case Study 1  Female (6 yrs. 8 mo.)

**Test of Language Development-Primary (TOLD-P-3)**

<table>
<thead>
<tr>
<th>Subtest Performance</th>
<th>Standard Scores</th>
<th>Subtest Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Picture Vocabulary</td>
<td>8</td>
<td>+2</td>
</tr>
<tr>
<td>Relational Vocabulary</td>
<td>7</td>
<td>+1</td>
</tr>
<tr>
<td>Oral Vocabulary</td>
<td>7</td>
<td>+1</td>
</tr>
<tr>
<td>Grammatic Understanding</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Sentence Imitation</td>
<td>3</td>
<td>-3 (-)</td>
</tr>
<tr>
<td>Grammatic Completion</td>
<td>5</td>
<td>-1</td>
</tr>
</tbody>
</table>

Mean of Subtest Standard Scores: $\frac{36}{6} = 6$
**Case Study 1 Female (6 yrs. 8 mo.)**

*TOLD-P-3 Composite Scores (90%) Level of Confidence*

<table>
<thead>
<tr>
<th>Quotient</th>
<th>Score</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listening Quotient</td>
<td>82 ± 7</td>
<td>(75 to 89)</td>
</tr>
<tr>
<td>Spoken Language Quotient</td>
<td>72 ± 5</td>
<td>(67 to 77)</td>
</tr>
<tr>
<td>Semantic Quotient</td>
<td>83 ± 7</td>
<td>(78 to 90)</td>
</tr>
<tr>
<td>Syntactic Quotient</td>
<td>66 ± 6</td>
<td>(60 to 72)</td>
</tr>
<tr>
<td>Listening Quotient</td>
<td>82 ± 7</td>
<td>(75 to 89)</td>
</tr>
<tr>
<td>Organizing Quotient</td>
<td>70 ± 7</td>
<td>(63 to 77)</td>
</tr>
<tr>
<td>Speaking Quotient</td>
<td>76 ± 7</td>
<td>(69 to 83)</td>
</tr>
<tr>
<td>Organizing Quotient</td>
<td>70 ± 7</td>
<td>(63 to 77)</td>
</tr>
</tbody>
</table>
Case Study 1 Female (6 yrs. 8 mo.)

Clinical Evaluation of Language Fundamentals–4 (CELF-4)

<table>
<thead>
<tr>
<th>CELF-4 Subtests</th>
<th>Standard Score</th>
<th>Subtest Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concepts &amp; Directions</td>
<td>10</td>
<td>+4 (+)</td>
</tr>
<tr>
<td>Word Structure</td>
<td>5</td>
<td>-1</td>
</tr>
<tr>
<td>Recalling Sentences</td>
<td>3</td>
<td>-3 (-)</td>
</tr>
<tr>
<td>Formulated Sentences</td>
<td>3</td>
<td>-3 (-)</td>
</tr>
<tr>
<td>Sentence Structure</td>
<td>9</td>
<td>+3 (+)</td>
</tr>
<tr>
<td>Word Classes – Receptive</td>
<td>8</td>
<td>+2</td>
</tr>
<tr>
<td>Word Classes – Total</td>
<td>7</td>
<td>+1</td>
</tr>
<tr>
<td>Expressive Vocabulary</td>
<td>7</td>
<td>+1</td>
</tr>
</tbody>
</table>

Mean of Subtest Standard Scores: $49/8 = 6.12$ or 6
Case Study 1  Female (6 yrs. 8 mo.)

*CELF-4 Composite/Index*  
(90%) Level of Confidence

Core Language Score  67 + 4  
(63-71)

Receptive Language Index  94 + 7  
(87-101)
Expressive Language Index  61 + 5  
(56 -66)

Language Content Index  88 + 5  
(83-93)
Language Structure Index  70 + 5  
(65-75)
Case Study 1  Female (6 yrs. 8 mo.)

<table>
<thead>
<tr>
<th>WISC-IV Index Scores</th>
<th>(90%) Level of Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Comprehension</td>
<td>95 ± 5 (90-100)</td>
</tr>
<tr>
<td>Perceptual Reasoning</td>
<td>94 ± 6 (88-100)</td>
</tr>
<tr>
<td>Working Memory</td>
<td>72 ± 8 (64-80)</td>
</tr>
<tr>
<td>Processing Speed</td>
<td>97 ± 7 (90-104)</td>
</tr>
</tbody>
</table>
Case Study 1 Female (6 yrs. 8 mo.)

CELF-IV Level 3. Criterion/Norm Referenced Scores

- Phonological Awareness: 56 (＞46)
- Word Associations: 22 (＞18)
- Rapid Automatic Naming: 142 sec (<120 sec.)
- Working Memory Index: 72 (+/-7 at 90%) 3rd%

There is evidence of deficits in attention, working memory, processing speed and verbal automaticity.

CELF-IV Level 4. Behavioral Ratings

- Pragmatics Profile: 172 (＞125)

The expressive, linguistic structure, working memory and verbal automaticity deficits do not appear to carry over to communication in context.
CELF-4 Case Study 1 Summary

The Core Language score (67) is in the very low educational range and supports eligibility for services.

The Receptive score (94) is in the average educational range and the Expressive score (61) in the very low educational range, indicating a severe expressive language disorder.

Language Content (84) is in the marginal educational performance range and Language Structure score (70) in the very low educational range.

RAN color-form time was 142 seconds and in the slower-than-normal range, indicating a cognitive speed (attention, visual working memory, set shifting) and verbal automaticity deficit.

The Working Memory Index (72) is in the low to very low educational range.

The Pragmatics score (172) is well above criterion.
## Case Study 2 Male (13 yrs. 8 mo.)

### Clinical Evaluation of Language Fundamentals-4 (CELF-4)

<table>
<thead>
<tr>
<th>CELF-4 Subtests</th>
<th>Standard Score</th>
<th>Subtest Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recalling Sentences</td>
<td>3</td>
<td>-3 (-)</td>
</tr>
<tr>
<td>Formulated Sentences</td>
<td>4</td>
<td>-2</td>
</tr>
<tr>
<td>Word Classes – Total</td>
<td>7</td>
<td>+1</td>
</tr>
<tr>
<td>Word Classes – Receptive</td>
<td>9</td>
<td>+3 (+)</td>
</tr>
<tr>
<td>Word Classes - Expressive</td>
<td>5</td>
<td>-1</td>
</tr>
<tr>
<td>Word Definitions</td>
<td>7</td>
<td>+1</td>
</tr>
<tr>
<td><strong>Supplementary Subtests</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understanding Paragraphs</td>
<td>7</td>
<td>+1</td>
</tr>
<tr>
<td>Semantic Relationships</td>
<td>10</td>
<td>+4 (+)</td>
</tr>
<tr>
<td>Sentence Assembly</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

Mean of Subtest Standard Scores: \( 44/7 = 6.29 \) or 6
### Case Study 2  Male (13 yrs. 8 mo.)

**CELF-4 Composite/Index**  
(90%) Level of Confidence

<table>
<thead>
<tr>
<th>Component</th>
<th>Score</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Language Score</td>
<td>72 ± 5</td>
<td>(67-77)</td>
</tr>
<tr>
<td>Receptive Language Index</td>
<td>92 ± 8</td>
<td>(84-100)</td>
</tr>
<tr>
<td>Expressive Language Index</td>
<td>63 ± 7</td>
<td>(56-70)</td>
</tr>
<tr>
<td>Language Content Index</td>
<td>80 ± 8</td>
<td>(72-88)</td>
</tr>
<tr>
<td>Language &amp; Memory Index</td>
<td>74 ± 7</td>
<td>(67-81)</td>
</tr>
</tbody>
</table>
### Case Study 2  Male (13 yrs. 8 mo.)

*Test of Language Competence - Expanded (TLC-E)*

<table>
<thead>
<tr>
<th>Composite Scores</th>
<th>Standard Score (90%) SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Score</strong></td>
<td>73 ± 8</td>
</tr>
<tr>
<td><strong>Expressing Intents</strong></td>
<td>69 ± 13</td>
</tr>
<tr>
<td><strong>Interpreting Intents</strong></td>
<td>82 ± 12</td>
</tr>
<tr>
<td><strong>Screening Composite</strong></td>
<td>65 ± 15</td>
</tr>
</tbody>
</table>
Case Study 2 Male (13 yrs. 8 mo.)

*TLC-E* Subtest Scores (90%) Level of Confidence

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Score</th>
<th>Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambiguous Sentences</td>
<td>7</td>
<td>+1</td>
</tr>
<tr>
<td>Making Inferences</td>
<td>10</td>
<td>+4 (+)</td>
</tr>
<tr>
<td>Recreating Sentences</td>
<td>3</td>
<td>-3 (-)</td>
</tr>
<tr>
<td>Figurative Language</td>
<td>4</td>
<td>-2</td>
</tr>
</tbody>
</table>

Mean of the Subtests 24/4 = 6
Case Study 2 Male (13 yrs. 8 mo.)

CELF-4 Level 3. Criterion/Norm Referenced Scores

<table>
<thead>
<tr>
<th>Category</th>
<th>Score (Percentile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phonological Awareness</td>
<td>51 (&gt;24)</td>
</tr>
<tr>
<td>Word Associations</td>
<td>24 (&gt;13)</td>
</tr>
<tr>
<td>Rapid Automatic Naming</td>
<td>204 (&lt;135)</td>
</tr>
<tr>
<td></td>
<td>(8 err.) (&lt;10)</td>
</tr>
<tr>
<td>Working Memory Index</td>
<td>75 (+/-9) percentile 5</td>
</tr>
</tbody>
</table>

There is evidence of attention, working memory and verbal automaticity deficits.

CELF-4 Level 4. Behavioral Ratings

<table>
<thead>
<tr>
<th>Category</th>
<th>Score (Percentile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pragmatics Profile</td>
<td>108 (&gt;125)</td>
</tr>
</tbody>
</table>

The linguistic and neuropsychological deficits carry over to communication in context.
Case Study 2  Male (13 yrs. 8 mo.)

WISC-IV Index Scores (90%) Level of Confidence

Verbal Comprehension  93  ± 6  (87-99)

Perceptual Reasoning  108  ± 6  (102-114)

Working Memory  90  ± 6  (84-96)

Processing Speed  101  ± 8  (93-109)

Peabody Picture Vocabulary Test - III (PPVT-III)

Total score  98
# Case 2. Academic Referencing

7th Grader (CA 13.8 yrs.) receiving services in a public school.

**Woodcock-Johnson III**

<table>
<thead>
<tr>
<th>Test</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter-Word Identification</td>
<td>4.1</td>
</tr>
<tr>
<td>Word Attack</td>
<td>6.1</td>
</tr>
<tr>
<td>Reading Vocabulary</td>
<td>7.6</td>
</tr>
<tr>
<td>Passage Comprehension</td>
<td>3.8</td>
</tr>
<tr>
<td>Reading Fluency</td>
<td>3.6</td>
</tr>
<tr>
<td>Spelling</td>
<td>5.2</td>
</tr>
</tbody>
</table>
The Core Language score (72) is in the low to very low educational range and supports eligibility for continuing language intervention. The Modality Index scores differ significantly. The Receptive score (92) is in the average educational range and the Expressive score (63) in the very low educational range, indicating a severe expressive language disorder. The Language Content score (80) is in the marginal educational range and the Language and Memory score (74) is in the low educational range. The RAN time (204 sec) is in the atypical range, indicating a naming-speed deficit with reduced cognitive speed (attention, working memory for visual input and set shifting). The Working Memory Index (75) falls in the low educational range. The Pragmatics profile score (108) indicates inadequacies in communication in context, especially pronounced for informing.
# Authentic-Contextual Assessment

**THE CLASSROOM PERFORMANCE ASSESSMENT (CPA)**

## LEVEL A

<table>
<thead>
<tr>
<th>Listening</th>
<th>Speaking</th>
<th>Reading</th>
<th>Writing</th>
<th>Social Communication</th>
<th>Critical Thinking</th>
<th>Executive Functions</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

## LEVEL B

1. **Listening Skills**  
   - Oral Presentation  
   - Emergent Skills  
   - Emergent Skills  
   - Communication Skills  
   - Intention Skills  
   - Reasoning Skills  
   - Awareness Skills  
   - Self-Control Skills

2. **Language Comprehension**  
   - Content & Structure  
   - Reading Comprehension  
   - Content Structure  
   - Conversational Knowledge  
   - Organization Skills  
   - Memory Skills

3. **Following Instructions**  
   - Organization Formulation  
   - Reading Strategies  
   - Organization Mechanics  
   - Non-Verbal Communication  
   - Social Skills  
   - Problem Solving  
   - Organization Skills  
   - Study Skills

4. **Other**  
   - Other  
   - Other  
   - Other  
   - Other  
   - Other  
   - Other  
   - Other

---

**Authored by:**

- Elisabeth Wiig  
- Wayne Secord  
- Jo-Anne Prendeville  
- Carney Sotto  
- Ann Glaser

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## CPA CASE ANALYSIS – Case No. ___

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<th>WRITING</th>
<th>COMMUNICATION</th>
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</table>

CASE NUMBER ____  (Summary of Patterns) © 2006 by Red Rock Educational Publications, Inc. and Schema Press, Inc. All Rights Reserved – Used by Permission
## Authentic-Contextual Assessment

### CPA

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<td>Speaking Applications &amp; Presentations</td>
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<td>Synthesis</td>
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<td><strong>Classroom Discourse</strong></td>
<td>Reading Comprehension and Analysis</td>
<td>Writing Process and Organization</td>
<td>Non-Verbal Communication</td>
<td>Evaluation</td>
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<td>Reading Applications</td>
<td>Writing Conventions</td>
<td>Application</td>
<td>Using Memory</td>
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<td></td>
</tr>
</tbody>
</table>

Elisabeth Wiig             Wayne Secord             Jo-Anne Prendeville             Carney Sotto             Ann Glaser

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### Observational Rating Scale for Executive Functions

**The Student ...**

<table>
<thead>
<tr>
<th>Task Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focuses and maintains attention on speakers and materials used in teaching</td>
</tr>
<tr>
<td>Answers questions and responds to requests for information within a reasonable time period</td>
</tr>
<tr>
<td>Returns to task within an appropriate amount of time if interrupted during an activity</td>
</tr>
<tr>
<td>Reflects on and thinks about answers to complex questions and <strong>does not</strong> act impulsively</td>
</tr>
<tr>
<td>Plans ahead before starting an activity (e.g., shopping, cleaning room)</td>
</tr>
<tr>
<td>Organizes activities by breaking them down into steps, grouping or categorizing, and deciding on an order of action</td>
</tr>
<tr>
<td>Monitors what she/he is doing and takes steps to correct errors</td>
</tr>
<tr>
<td>Handles two or more simple activities or tasks in parallel (e.g., making a sandwich and answering the phone)</td>
</tr>
<tr>
<td>Prioritizes two or more simple, often repeated activities or tasks (e.g., dressing, eating, packing back pack)</td>
</tr>
<tr>
<td>Prioritizes two or more complex activities or tasks and alternate between them (e.g., projects - - language arts/science)</td>
</tr>
</tbody>
</table>
Executive Functions and Written Expression

Language Domain

• Difficulty initiating ideas
• Difficulty limiting topic
• Disorganization and lack of planning
• Poor self-monitoring -- many careless errors
• Inability to edit written production
• Unable to change sets to maintain topic
Executive Function Disorders and Written Expression

Memory Domain

- Difficulty handling complex memory demands
- Poor recall and maintenance of ideas
- Difficulty remembering appearance of letters/words
- Difficulty making writing legible
Executive Function Disorders and Grapho-Motor and Handwriting Domains

Poor Fine Motor Skills
- Handwriting Not an Integrated Skill
- Impulsivity - Rapid, Unplanned Writing
- Excessively Slow Writing
- Impersistence When Writing Several Paragraphs
- Tic Interference
- Perseverating on Letters
- Perfectionism (Erasing Constantly)
Implications for Daily Living

*Academic Barriers*

Students with expressive language disorders, word retrieval and automaticity-of-naming deficits cannot perform within established time limits in the regular classroom.

They need extended time for responding to questions and completing oral-verbal and written assignments and untimed tests.

Teachers may need training to provide models, scaffolding, guided questioning, and individualized cues for retrieval that benefit performance.
Implications for Daily Living

Academic Accommodations

(1) Untimed test taking and untimed written language assignments

(2) Use of computers for written language assignments

(3) “Word banks” for fill-in-the-blank tests due to word retrieval deficits
Generic Language Intervention Principles

Provide structure to support planning, organizing, problem solving and implementing oral or written communication (e.g., webbing, conceptual mapping, Inspiration software)

Use mediated learning procedures with guided questioning, cognitive mediation, coaching and scaffolding

Develop mental models (scripts and schema) for interpreting and writing text

Develop critical thinking strategies for analysis, categorization, comparison and contrast, synthesis, evaluation and application of concepts, expressions and text to develop in-depth understanding
Generic Language Intervention Principles

Provide bridges for the transitions from concrete (e.g., hand) to abstract (e.g., handouts) and figurative uses (e.g., empty handed) of words and expressions

Develop automaticity for serial language, academic sequences, structural rules, and social pragmatic repertories

Develop self-monitoring processes by scaffolding, editing spoken and written language, and using strategies for elaborating

Develop self-awareness of barriers to performance and inefficient compensatory strategies, and develop effective compensatory strategies for life

Develop strategies for appropriate self-advocacy
Intervention Strategies for Expressive Language Disorders

Semantic Development

Developing word associations and broadening knowledge of meaning features.

Defining words and comparing-contrastining words and concepts.

Relating words from multiple perspectives

Building semantic categories and hierarchies and comparing-contrastining.

*Map It Out! Wiig & Wilson, 2000*
Intervention Strategies for Expressive Language Disorders

Semantic-Syntactic Interfaces

Automaticity in forming and using basic sentence structures.

Developing structural/transformational rules for forming complex sentences with conjunctions and relative clauses, among others.

Using transition words and phrases to form logical ties and mark relationships (coherence and cohesion).
Strategies for Word Retrieval

Using word associations, word opposites, visual or symbolic imagery.

Substituting synonyms for hard-to-find words.

Expanding the stored vocabulary.

Using appropriate place-holding for processing and answering questions and when writing.
Automaticity for Serial Language

Alphabet recital with melodic cues (e.g., the alphabet song).

Sequential and patterned counting (e.g., 2, 4, 6…) and basic multiplication tables.

Time sequences such as days of the week, months of the year, and seasons.
Pragmatic Flexibility

Automaticity for commonly used verbal rituals and social exchanges.

Using different words and structures to express the same intent (i.e., one intent-many expressions).

Using discourse strategies (e.g., repeating or using the previous speaker’s words or phrases). Role-playing in skits designed to reflect daily-life interactions.
Executive Functions

Develop self-monitoring processes by scaffolding, editing spoken and written language, and using strategies for elaborating.

Develop strategies for planning and organizing spoken and written narrative (conceptual mapping).

Develop mental models for narrative structure and basic types (story telling, descriptive, expositive, argumentative)

(Map It Out! Wiig & Wilson, 2000)
Literacy Begins at Home!!
Literacy Defined

National Assessment of Adult Literacy (NAAL) 2003

“Literacy is defined as an individual’s ability to read, write, speak in English, compute and solve problems at levels of proficiency necessary to function on the job, in the family and in society.”


“Literacy is not simply knowing how to read and write a particular script but applying the knowledge for specific purposes in specific contexts of use.”


Specific uses of literacy serve to enhance or amplify ways of thinking, including how we classify, reason and remember.


Literate thought is abstract, analytical, logical, reflective, decontextualized and complex.

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# Literacy Levels Defined

## NAALS Literacy Levels (Baldwin et al., 1995)

<table>
<thead>
<tr>
<th>Level</th>
<th>Prose Literacy</th>
<th>Document Literacy</th>
<th>Quantitative Literacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>Read short text and identify single piece of information.</td>
<td>Locate information based on literal match; enter personal information.</td>
<td>Perform single, specified arithmetic operations using provided numbers.</td>
</tr>
<tr>
<td>Level 2</td>
<td>Locate single piece of information; make low-level inferences; compare and contrast.</td>
<td>Match information; make low-level inferences; cycle through and integrate data from document parts.</td>
<td>Perform single operation with given numbers; determine operation by the format.</td>
</tr>
<tr>
<td>Level 3</td>
<td>Match literal information; make low-level inferences; integrate information; respond to or answer questions.</td>
<td>Integrate multiple pieces of information; cycle through complex data or graphs for information.</td>
<td>Locate two or more numbers in material; determine operation from terms used.</td>
</tr>
<tr>
<td>Level 4</td>
<td>Perform multiple feature matches; integrate/synthesize complex, lengthy information; make complex inferences.</td>
<td>Perform multiple feature matches; integrate information; make higher level inferences.</td>
<td>Perform two or more sequential operations; infer operations from information or knowledge.</td>
</tr>
<tr>
<td>Level 5</td>
<td>Search for information in dense text; make high-level inferences; use knowledge; contrast complex information.</td>
<td>Search through complex displays with multiple distracters; make high-level, text-based inferences; use specialized knowledge.</td>
<td>Perform multiple operations sequentially; identify problem features from text; use knowledge to determine quantities or operations needed.</td>
</tr>
</tbody>
</table>
AN EMERGING LITERACY MODEL

Four Pillars of Emerging Literacy

Foundation for Literacy

I. Phonological Awareness and Flexibility
II. Memory, Retrieval and Automaticity
III. Sign and Symbol Recognition and Interpretation
IV. Oral Language
A MULTIPLE LITERACIES MODEL

Cultural Literacy

Education
Legal/Regulatory
Philosophy
Religion

Stories
Prose
Poetry
Plays

Listening
Speaking

Reading
Writing

Oral Literacy

Theoretical "Systems Perspective"

Pragmatic "Phenomenological Perspective"

World Knowledge Literacy

Geography
Natural Sciences
Physical Sciences
Computer Sciences
Psychology
Economics

School
Community
Regional
National
Global

Listening
Speaking

Reading
Writing

Symbolic Literacy

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LITERACY and Work Types

US Knowledge Workers

Tacit Interaction Workers 41%
Transaction Workers 44%
Transformational Workers 15%

Tacit Interaction Workers in 2004

UK 45% Germany 37% Russia 29% US 41% China 25% India 26%
Tacit Interaction
Requires oral and symbolic literacy, primarily of a theoretical nature, and encompassing high-level cultural and world knowledge literacy (NAALS levels 4 and 5)

Transaction
Requires oral and symbolic literacy, pragmatic and somewhat theoretical in nature, and cultural and world knowledge literacy (NAALS levels 3 and 4)

Transformation
Requires oral and symbolic literacy, primarily pragmatic in nature, and world knowledge (NAALS levels 1 and 2)
Economic Impact of Literacy

World Literacy Rates
26 percent of the world’s population are illiterate (UNESCO).
98 percent of non-literate live in developing countries.
52 percent of all non-literate live in India and China (1/3 of world population).
Less than 60 percent are literate in Africa.
Women make up two thirds of all non-literate.

Literacy and Income Averages
Per capita income in countries with literacy rates less than 55 percent average about $600
Per capita income in countries with a literacy rate between 55-84 percent is $2,400
Per capita income in countries with a literacy rate between 85-95 percent is $3,700
Per capita income in countries with a literacy rate above 96 percent is $12,600

Source: International Literacy Day – September 2001, Washington, DC
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Requirements for Developing Literacy

Self-Regulation and Executive Functions

*Attention* -- Select, focus, and sustain attention.

*Inhibition* -- Disregard extraneous stimuli or thoughts.

*Initiation* -- Overcome resistance to begin task.

*Reflection* -- Control impulsive acting or responding.

*Persistence* -- Use different attacks, if one does not work.

*Using Senses* -- Use multimodal approaches/learning styles.

*Memory Strategies* -- Chunking, visual imagery, associations.

*Cognitive Flexibility* -- Set shifting and taking multiple views.

*Self-Monitoring* -- Focus, evaluate, repair, monitor outcome.

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Requirements for Developing Literacy

Critical Thinking Strategies

Analysis
Identification of significant features, components, relations or sequences.

Synthesis
Perception/creation of patterns in stimuli, contexts, relations or processes.

Hypothesis Formation
Formulating and testing hypotheses about the significance of patterns.

Evaluation
Checking the adequacy and completeness of every step above.

Decision Making
Selecting a response or plan of action with high probability of success.

Execution
Self-monitoring, evaluation, revision and repair to improve efficiency or effectiveness.
## Requirements for Developing Literacy

**Domains: Skills/Knowledge**  
**Methodology**  
**World Understanding**

<table>
<thead>
<tr>
<th>SCHEMA</th>
<th>Text Structure</th>
<th>Critical Thinking</th>
<th>Environment/Conceptual Blending</th>
<th>Society (Macro-World)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCRIPTS</td>
<td>Narrative/Dialogue</td>
<td>Critical Thinking</td>
<td>Community</td>
<td>Community (Micro-World)</td>
</tr>
<tr>
<td>PROCESSING</td>
<td>Creating Meaning and Structure</td>
<td>Cause-Effect/Time Relationships</td>
<td>Relating to Self and Others</td>
<td></td>
</tr>
<tr>
<td>ROUTINES</td>
<td>Decoding</td>
<td>Repeated Events</td>
<td>Own Experiences/Mirroring Others</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Encoding</td>
<td>Rote Actions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Literacy Require Metaknowledge!
Stories Are Mental Reference Models!

Stories provide the basic structure and are often the origin of mental reference models!

This is because …

• It is difficult to grasp the whole coherently

• Stories are unsurpassed for effective communication

• We rely on stories to tackle new problems

• Stories help us learn, remember and recall

• We use stories to perform mental simulations

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The Power of Stories and Conceptual Blending

• Stories provide context, structure, meaning, metaphors and overall understanding of complex topic areas and their relations to other parts of the system in which they exist

• Stories portray actors, tell of conflicts and relationships, illuminates objectives and drives, and identifies threats and opportunities and all other aspects of interesting situations
The Power of Stories and Conceptual Blending

- Stories cover many abstraction levels (How to, know that and why, patterns and metaphors) and complement theories and practices

- By engaging in conceptual blending, stories tie together concepts, judgments and other objects into mental spaces (schema) that provide meaningful structure, organization and relationships
Higher Order Reasoning for Knowledge Acquisition and Implementation

Mental reference libraries support effective academic and social functioning by providing capabilities to...

- Consider higher order consequences
- Balance multiple factors and objectives
- Reason with metaphors and conjectures
- Create, innovate and deal with complex challenges
- Perceive situations from different perspectives
- Anticipate behaviors of complex dynamic systems
- Understand complex academic, personal, cultural and societal relationships
Language and Literacy
Assessment and Intervention

Elisabeth H. Wiig and Carolyn C. Wilson

A. Assessment Component

Design and Assessment Objectives
Administration, Scoring, and Interpretation

B. Intervention Component

Curriculum Objectives
Ladder Steps for Intervention
Adding Conceptual Mapping

@Thinking Publications
The Learning Ladder -- Assessment

Design Features and Purposes

Provides a standard method of evaluating text comprehension

Uses a story format, presented in spoken and printed forms

Features two stories for each grade level (K-7); one for early and one for late in the school year

Uses ten questions for each story; five focus on given information and five on going beyond the given

Allows for comparison of comprehension and recall of the given information and going beyond the given (inference, application)

Gives criterion-referenced as well as qualitative measures

Provides a direct link to intervention
The Learning Ladder -- Assessment

Bloom’s Taxonomy of Educational Questions

A. Lower Order Questions

Knowledge -- Recall of given information (Who? What?)

Analysis -- Similarities and differences (How … alike?)

B. Higher Order Questions

Comprehension -- Meanings and abstract patterns (How? Why?)

Application -- Generalize to a related context by analogy (What if?)

Synthesis -- Connect, create, problem solve (How else? Improve!)

Evaluation -- Judge by academic, social or other criteria (How do you feel about?)

The Learning Ladder -- Assessment

Assessment Stories

Small-print version to be read aloud by examiner.

Large-print version to be read silently by students.

Assessment Questions

Questions for the examiner to read aloud with scoring guidelines.

Question sheets with areas for student to write responses.

Scoring Responses to Items

Complete one- or two-part correct response -- Score 2

Partial or incomplete correct response -- Score 1

Incorrect response or no response -- Score 0
The Learning Ladder -- Intervention
Curriculum Objectives for Critical Thinking

1. Analyzing Meanings and Topics
2. Grouping and Categorizing Information
3. Comparing and Contrasting for Similarities and Differences
4. Making Predictions and Drawing Inferences
5. Generalizing to New Contexts and Applications
6. Summarizing and Supporting Ideas
7. Evaluating Outcomes and Products
8. Showing Awareness and Use of Metaknowledge
The Learning Ladder

Given Information

Ladder Step 1. Interpreting the Title

What does the title tell me?

Objectives

Teacher - Identify missing concept knowledge

Student - Understand key words, concepts, and expressions in the title

Outcomes

Teacher - Identify individual variations and needs

Student - Awareness of relationships among words and concepts in a title and the content of the text
The Learning Ladder

Given Information

Ladder Step 2. Prior Knowledge of Theme

What do I already know?

Objectives

Teacher - Establish prior knowledge as a baseline for teaching

Student - Answer Who, What, Where, When, How, and Why questions

Outcomes

Teacher - Awareness of existing knowledge and of what must be taught

Student - Awareness of strategies for recalling existing knowledge
The Learning Ladder
Given Information

Ladder Step 3. Key Words and Concepts

What are the key words and ideas?

Objectives
Teacher - Identify key words and concepts for teaching
Student - Scan and identify difficult words and concepts

Outcomes
Teacher - Lists of words and concepts to be emphasized in teaching
Student - Mark or write difficult words and concepts
The Learning Ladder
Given Information

Ladder Step 4. Prior Word and Concept Knowledge

What words and ideas do I already know?

Objectives

Teacher - Identify existing and missing word- and concept-knowledge

Student - Define key words and concepts

Outcomes

Teacher - Awareness of individual variations in knowledge

Student - Broadened meanings for critical words and concepts in the text
The Learning Ladder
Given Information

Ladder Step 5. Strategies for Recalling Information

What can I remember?

Objectives
Teacher - Identify existing and missing memory strategies
Student - Establish level of recall and identify strategies used

Outcomes
Teacher - Awareness of individual variations in strategy use
Student - Use of additional strategies for recalling information
The Learning Ladder
Beyond the Given Information

Ladder Step 6. Likenesses and Differences

*How are words and ideas alike or different?*

**Objectives**

Teacher - Identify existing or missing meaning contrasts

Student - Develop similarities and differences

**Outcomes**

Teacher - Awareness of individual variations and needs

Student - Knowledge of semantic relations for establishing semantic networks
The Learning Ladder
Beyond the Given Information

Step 7. Cause-Effect, Time, Location, and Human-Relationship Changes

What changes do I see?

Objectives

Teacher - Identify existing and missing perceptions of change

Student - Identify relations and changes in ideas and information

Outcomes

Teacher - Awareness of individual variations and needs

Student - Knowledge of cause-effects, times, locations, and emotions and their changes
Developing Causal Networks

Observational and Instrumental Cause-Effect Models

A. One-Cause---One-Outcome Model:

  Cause --------- Effect

B. Common Cause Model:

  Effect (1)

  Cause

  Effect (2)

C. Causal-Chain Model:

  Effect (1)

  Cause  Effect (2)
The Learning Ladder
Beyond the Given Information

Ladder Step 8. Application to Self and Others

How does it apply to my life?

Objectives

Teacher - Identify existing or missing abilities

Student - Utilize and extend information to situations related to self and others

Outcomes

Teacher - Awareness of individual variations and needs

Student - Ability to utilize and extend acquired information to related contexts
The Learning Ladder
Beyond the Given Information

Ladder Step 9. Identifying and Organizing Main Ideas

What are the main ideas?

Objectives
Teacher - Identify existing and missing strategies
Student - Develop mental models for organizing text

Outcomes
Teacher - Awareness of individual variations and needs
Student - Internalized mental models (schema) for text structure
The Learning Ladder
Beyond the Given Information

Ladder Step 10. Predicting, Creating, Imagining

What can I predict or imagine?

Objectives

Teacher - Identify existing or missing strategies

Student - Use information in new and complex situations to predict, create, or imagine

Outcomes

Teacher - Awareness of individual variations and needs

Student - Ability to utilize information to predict, create, and imagine beyond the given
MAP IT OUT!

Elisabeth H. Wiig and Carolyn C. Wilson

Presentation Overview

A. Introducing the Resource
   Design and Intervention Objectives
   Generic Conceptual Map Designs

B. Presenting the Intervention Materials
   Focused Master Maps
   Cognitive Mediation
   Intervention Illustration

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MAP IT OUT!
Visual Tools for Planning, Organizing and Communicating

Educational Objectives

1. Develop critical thinking and assist in constructing individual and group knowledge

2. Facilitate storage of the constructed knowledge in memory as mental models such as for routines, scripts, or schema

3. Augment and structure existing knowledge

4. Integrate old and new knowledge for immediate and long term learning and application
MAP IT OUT!
Visual Tools for Planning, Organizing and Communicating

Conceptual Mapping with Cognitive Mediation

1. Provide explicit, organizing templates for critical thinking.

2. Use a mediated process for developing metaknowledge.

3. Serve as guides for a conscious reasoning and problem-solving process (critical thinking).

The mode and process of critical thinking generalize, become automatic with time and can therefore be used to attack new content, contexts, and problems expertly.
MAP IT OUT!
Visual Tools for Planning, Organizing and Communicating

**Appreciative Inquiry**

**Appreciating**
Valuing the best in a context

**Envisioning**
Imagining what effect changes would have

**Dialoguing**
Engaging in intra- and inter-personal dialogue

**Innovating**
Creating an ‘ideal’

**Problem Solving**

**Problem identification**
Responding to a challenge for solution

**Analysis of causes and factors**
Identifying significant aspects of the problem

**Analysis of solutions**
Identifying possible solutions for the problem

**Action planning**
Selecting and implementing an effective plan

Adapted from Cooperrider & Srivastva, 1997.
MAP IT OUT!
Visual Tools for Planning, Organizing and Communicating

**Associative Maps**
Provide visual tools for eliciting word and topic associations

**Concept Maps**
Provide visual tools for knowledge of meaning features

**Comparison-Contrast Maps**
Provide visual tools for knowledge of shared and non-shared features and meanings

**Theme Maps**
Provide visual tools for multiple interpretations of text

**Underlying Structure Maps**
Provide visual tools for knowledge of underlying organization and structure

**Process Maps**
Provide visual tools for knowledge of procedural steps in implementation
MEANINGS OF ABSTRACT WORDS

Treaty

Driving Forces
(Reasons/causes)
Needs: opposite views or actions, disagreement, hostility
Processes: negotiation, consensus
Products: written, legal document

Document

Actions
(How to get there?)
Discuss
Negotiate
Compromise
Agree
Document

Persons - Entities
(Who is involved?)
Two parties: persons, representatives, governments, countries, tribes, religions

Functions/Outcomes
Guides relations
Deters or limits aggressive action
Sets conditions
Contractual Guarantees

Examples
Nuclear weapons ban; peace or cease Fire Treaty

Definition
A written document that sets conditions and guides relations between two parties, arrived at through negotiation

- Process
  -- Students encountered the word in a history lesson. They were guided in identifying aspects for each major dimension, identify a category name, and give examples. Teacher recorded responses in telegraphic form. Each student wrote a definition based on the entries in the map.
MAP IT OUT!

COMPARING AND CONTRASTING WORDS AND CONCEPTS

WORD OR CONCEPT PAIR

Dimensions and Aspects

QUALITIES-QUANTITIES

SEMANTIC CATEGORY - CLASS

ACTIONS - BEHAVIORS

WORD A

Word B

PROCESS -- This map complements the primary Master Map. It identifies dimensions and aspects that may be alike (shared) or different in the meanings of two words that are being compared.

PHYSICAL TRAITS
- Gender
- Size
- Coloration
- Unique physical features

QUALITIES
- Personality
- Experience
- Knowledge
- Process
- Methods

SEMANTIC SUBCATEGORY
- Fish (Animals)
- Flute (Instrument)
- Happy (Emotion)
- Juice (Beverage)
- Other

PHYSICAL TRAITS

ABSTRACT CONCEPTS
- Social Studies
- Physical Science
- Natural Science
- Math, Algebra, Other

ABSTRACT CONCEPTS

Differences

BEHAVIORS
- Positive-Negative
- Transitive-Intransitive
- Attitudes (assertive, docile, etc.)
Selected Resources

Selected References


Selected References


