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Reading Domains

CBAS-R: Reading Domain Literature Review to Guide Item Development

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Abstract

General findings on reading assessments are presented in the context of the Computer Based Assessment System-Reading (CBAS-R) to help guide future development of this Computer Adaptive Test based in a three-parameter Item Response Theory. Four domains of reading are also examined using the most recent and relevant literature. This literature review is the basis for new item type development for each domain. There still remains to be limited research that specifically addresses what makes an appropriate and effective assessment.

Keywords: reading, IRT, assessment
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CBAS-R: Reading Domain Literature Review to Guide Item Development

A recent meta-analytical study identified the most common domains found on early reading assessments. Literature showed that word knowledge was found on 50% of tests, sound-symbol correspondence on 65% of tests, language concepts on 90% of tests and only 24% of tests assessed comprehension (Paris and Hoffman, 2004; Paris, 2005). Based on these results, comprehension is largely forgotten across many commercial assessments. Newer assessments are addressing narrative comprehension for younger students to alleviate the discrepancy (Paris and Hoffman, 2004). Other research on reading assessments examines the existence of constrained skills versus skills that are not constrained (Paris, 2005). Paris (2005) describes constrained skills as those that can be mastered by readers because there is a small set of skills to be acquired in that particular domain. Letter knowledge, phonics and concepts of print are constrained skills. Phonemic awareness and oral reading fluency are less constrained while vocabulary and comprehension are generally not constrained because skills continually develop (Paris, 2005).

Constrained skills impact the trajectory of reading development and therefore the assessment of reading (Paris, 2005). Constrained skills are interesting to consider in the context of CBAS and CAT. For instance, concepts of print pertains primarily to acquiring the ability to identify 26 letters. This may explain why concepts of print items exist within a small range of the b-parameter, below -2. This also has implications for why vocabulary and comprehension items should be much harder than what we have been able to create. There is continued need for improvement in this area.

Concepts of Print

Although the National Reading Panel (2001) does not put forth Concepts of Print as its own domain, it is a relevant assessment piece for CBAS. Concepts of Print includes skills such
as identifying letters and identifying correct directionality in book handling. CBAS assesses students as young as kindergarten where students may or may not have mastered these skills. In order to assess the widest range of students’ reading skills, it is necessary to include this component. By identifying a student who does not understand book directionality via a low estimate of reading ability, CBAS can help inform appropriate instruction for that student; it is not appropriate or effective to instruct higher level reading skills if a student has not mastered the most basic skill set in the reading domain. Therefore, Concepts of Print items were determined to be relevant and informative for use on the assessment.

**Phonological Awareness**

Phonological awareness is when an individual has awareness of sounds in oral language (Stahl and Murray, 1994). Phonological awareness is correlated with reading success in general and aids in acquiring alphabetic orthography and spelling (Stahl and Murray, 1994). Some suggest that the development of phonological awareness and reading are dependent on one another (Bentin and Leshem, 1993). Learning the alphabetic orthography facilitates knowledge that there are individual sounds in a word. On the other hand, understanding that sounds make up a word is required to understand alphabetic orthography. In this way, reading and phonological awareness enter an interdependent relationship rather than a causal relationship (Bentin and Leshem, 1993). This domain has been conceptualized into five levels of difficulty beginning with “an ear for sounds” and culminating with the ability to manipulate phonemes, such as through tasks like deletion and substitution.

To understand phonological awareness, three parts of a word need to be defined. The onset is the beginning consonant(s); the rime is the vowel and the final consonants (Stahl and Murray, 1994). The rime can be further broken into the individual vowel and the coda, which are
the final consonants. Rhyming is a skill that should be acquired by early readers and assesses whether a student can identify the rime. It is the recognition that two words such as sit and hit also have the same rime, or the same vowel and ending consonant (Kirtley, Bryant, MacLean, and Bradley, 1989). In segmentation, it is most difficult to divide initial consonants and final consonants, such as those in a blend. For example, it is easier for children to break down the word cramp into /cr/ and /amp/ rather than /c/ and /ramp/ (Stahl and Murray, 1994). This indicates that early readers treat some consonant blends as one unit. Interestingly, nasal blends (such as /nk/, /nd/, and /mp/) and liquid blends (such as /ld/) are easier to divide than other blend types (Stahl and Murray, 1994). As phonological awareness develops fully, a reader should be able to break down consonant blends without trouble. These are examples of the task of phoneme isolation. This is the easiest of tasks used to assess readers however it also makes the best distinction between students who can read and those who might not be able to reach criterion measures on a preprimer list (Stahl and Murray, 1994).

**Item Type Brainstorming: Phonological Awareness.**

1. Easy onset segmentation (using nasals and liquids)

2. Easy: Identify beginning or final consonant when same vowel is in the middle (Kirtley et al., 1989)

3. Identifying beginning consonant is easier than final consonant sounds when one word is different in the set (Example: top, tan, men, toss)

4. Identifying beginning consonant-vowel or vowel-consonant combinations; most difficult when words begin with same consonant (Kirtley et al., 1989)
Phonics

Phonics acquisition begins with cue reading and eventually develops into cipher reading. Readers who are in the early stages of reading use cues; these readers memorize a particular characteristic of the word and use that as a means of recognition. Ehri and Wilce (1987) provide the example, “the humps in the middle of camel,” as the cue for a reader to recognize the word as camel. However, cue reading quickly becomes relatively useless as more and more words are added to the child’s reading vocabulary because there are only a few distinctive features across words. Reading words in this fashion becomes unreliable and difficult. Next, Ehri and Wallace (1987) argue that phonetic-cue reading occurs. Readers at this stage are able to decode a few words using sound-symbol recognition. However, they do not know many sounds, limiting the number of words that can be decoded. Finally, cipher reading develops once a child learns the alphabet and can segment phonemes (Ehri and Wallace, 1987). This occurs once a child has a complete understanding of sound-symbol correspondences and can use those relationships to decode words.

Phonics also encompasses sight word reading, which is the ability to read a single unit of letters automatically and without pause between words. This probably indicates that the reader recognizes the word through memory (Ehri, 2005). Thus, a sight word is not solely defined as being a high frequency word. As a result, sight word reading does not require extra cognitive resources to be utilized, allowing for attention to be given to higher level reading skills. Full development of phonics skills aids in acquiring new vocabulary words because the reader has full knowledge of the alphabetic system (Ehri, 2005).

**Item Type Brainstorming: Phonics.**

1. Sight words (Ehri, 2005)
2. Distracters may have same boundary letters

3. Sight words with similarly spelled sight words as distracters

**Vocabulary**

The definition of vocabulary has gone through a number of iterations, especially as different sources are considered. It is considered its own domain although many of the definitions allude to its relationship with comprehension. Research has documented a strong correlation between vocabulary knowledge and comprehension, ranging between .6 and .8 (Pearson, Hiebert & Kamil, 2007). The strength of the relationship is enhanced based on evidence that level of vocabulary is predictive of level of comprehension (Jenkins, Matlock & Slocum, 1989). Pearson et al. (2007) rely on the National Reading Panel ([NRP], 2001) definitions of vocabulary: (a) receptive vocabulary is being able to understand a larger pool of words than what is used in speech; and (b) productive vocabulary are those words an individual uses in speech. Receptive vocabulary, rather than productive vocabulary, is primarily measured on assessments of this domain (Pearson et al., 2007). Assessments in the past have focused on defining common words as the main measure of vocabulary. In contrast, some contemporary assessments of vocabulary place more emphasis on defining a word within a given context (Pearson et al., 2007).

Although there is an overlap between vocabulary and comprehension, vocabulary is still measured independently because there are great individual differences. For instance, a typically developing child acquires about 6,000 words by the end of grade two, but children in the lowest quartile may only acquire 4,000 words; children in the highest quartile may acquire 8,000 words (Biemiller & Boote, 2006). Children with the strongest vocabulary also demonstrate their knowledge of the interconnectivity between words, which aids in comprehension (Nagy &
Hiebert, 2007). It is likely that this gap would continue and even increase as students enter upper elementary grades, contributing to later difficulties with text comprehension (Biemiller & Boote, 2006).

Selecting words for instruction and assessment purposes can and should be based on specific criteria (Scott, Hoover, Flinspach, & Vevea, 2008), however there is not one agreed upon set of criteria. Selection of vocabulary for an assessment also depends on the purpose of the instruction or assessment. Nagy and Hiebert (2007) propose that the chosen words depend on whether the knowledge will be used to understand a specific text, learn a specific concept or academic domain, or improve comprehension or writing. Beck, McKeown and Kucan (2002) identified basic, high frequency, and mature word categories. Basic words are those that usually do not require instruction in the classroom; high frequency words are those that can be found across a variety of texts and are in a student’s receptive and productive vocabulary (Beck, McKeown & Kucan, 2005; Nagy & Hiebert, 2007). Mature words are those within a specific domain or academic subject area. Biemiller has also constructed criteria for word selection in instruction. Vocabulary that should be known by 40 to 80% of students by the end of grade two should be instructed during the primary grades (Pearson et al., 2007). This criterion was based on The Living Word Vocabulary (Dale & O’Rourke, 1981); words for instruction and selection for assessment could be gathered from the leveled corpuses provided in that text (Pearson et al., 2007). The National Assessment of Educational Progress ([NAEP], 2005) has also defined vocabulary and provided criteria for selecting words. NAEP defines vocabulary as providing information on a student’s text level comprehension and independent word knowledge (NAEP, 2005). These are just a few examples of hypothesized criteria for word selection put forth in the research; perhaps a combination could be considered when developing items for CBAS.
**Item Type Brainstorming: Vocabulary.**

1. PPVT: Picture at the top of screen with four word choices. Unlike PPVT in that it requires reading rather than just oral language. It would be interesting to consider how difficult distracters would be created.

2. Analogies

3. In which sentence does the word ‘safe’ mean the same thing as in the sentence above? (Pearson et al., 2007)

4. Synonyms, antonyms

5. Fill in the Blank items are made up of three to five sentences, with one word removed. A blank replaces the word and the student must choose the word that best fits into the sentence and context. Answer choices are all of the same part of speech and tense so that an option could not be eliminated based on these characteristics alone. This item type is differentiated from vocabulary because the stem is longer than in vocabulary items.

6. Category Coordinates (Nagy & Hiebert, 2007)

7. Superordinate/subordinate (Nagy & Hiebert, 2007)

8. Part/whole (giraffe/neck) (Nagy & Hiebert, 2007)


10. Weak semantic relationships (city/grass → should be hard because students with higher vocabulary can figure this out and not students with lesser vocabulary skills) (Nagy & Hiebert, 2007)

11. Indirect relationships (zebras, stripes) (Nagy & Hiebert, 2007)

12. Use context: contrast, synonym, inference & proximity (Carnine, Kameenui & Coyle, 1984; Sternberg & Powell, 1983):
Comprehension

Comprehension is defined as an integration of skills, including vocabulary knowledge, and its development is marked by purposeful and interactive strategies (NRP, 2003). It is the process of information gathering that is dependent upon a given text and the reader’s personal background knowledge (NRP, 2003). In order to comprehend, the reader must first decode the text, then build a textbase to form the main idea, and then integrate prior knowledge with that found in the text (Kintsch & Kintsch, 2005). The latest research states that comprehension is a multidimensional construct (Pearson & Hamm, 2005; Campbell, 2005). Therefore, an assessment that measures comprehension in only one way is inadequate (Fletcher, 2006).

The most recent framework for comprehension assessments was constructed by the NAEP (2005; as cited in Fletcher, 2006). This framework taps into a student’s ability to gain a basic understanding of a given text, form an interpretation of the text, reflect and respond to the reading based on personal experiences, and be able to think critically about the content. Passage type may also play a role in developing appropriate comprehension assessments (Fletcher, 2006). Students generally demonstrate higher scores on narrative passages than on expository texts (NAEP, 2005); expository texts are primarily used for assessment of older students (Deane, Sheehan, Sabatini, Futagi & Kostin, 2006). To satisfy this issue, an assessment that includes a variety of text types would be suitable for students with higher comprehension achievement, distinguishing them from students who struggle (Pearson and Hamm, 2005). A focus for an early reading assessment that includes comprehension should focus on “meaning-making” by children, often done through pictorial representations (van Kraayenoord and Paris, 1996). “Meaning-making” is the basic goal of comprehension and children should be able to create stories based on illustrations before they have learned the alphabetic orthography (van Kraayenoord and Paris,
1996).

**Item Type Brainstorming: Comprehension.**

1. Select picture that goes with story (Gates-MacGinitie)
2. Character motives in stories (Shannon, Kameenui, Baumann, 1988)
3. Easy: picture of crying girl (How do you think the girl feels)
4. Readability formulas only consider vocabulary in the text and sentence length, not other factors like syntax or sentence structure (Davison and Kantor, 1982; Oakland and Lane, 2004)

**Fluency: A missing domain**

Reading fluency is not assessed under CBAS-2, as it was in the first iteration of the project. Careful research and consideration helped to determine that the software used in CBAS-2 is not able to assess reading fluency properly. Fluency is defined as the quick and accurate production of text and it is measured through three necessary components: rate, accuracy, and expression (NRP, 2001). There is limited research to support methodology for measuring silent reading fluency, although it is very relevant to the classroom. Without an oral component to CBAS-2 software, we are unable to measure accuracy or rate. As these are both necessary components that must be assessed to determine a child’s level of reading fluency, an accurate assessment cannot be conducted as the software is currently written. As a result, it is not appropriate to include measurement of this important domain of reading in CBAS-2 and the decision was made to eliminate it in the second phase of the project.
References


