Journal of Literacy Research
43(2) 130–158

DOI: 10.1177/1086296X11403267
http://jlr.sagepub.com
SAGE

Moving Past "Right" or "Wrong" Toward a Continuum of Young Children's Semantic Knowledge

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Abstract

Vocabulary development is a critical goal for early childhood education. However, it is difficult for researchers and teachers to determine whether this goal is being met, given the limitations of current assessment tools. These tools tend to view word knowledge dichotomously—as right or wrong. A clear sense of children's depth of semantic knowledge is necessary in order to plan and evaluate the effectiveness of instruction. This article proposes a continuum of young children's semantic knowledge that stems from a conceptual analysis of literature across the fields of education, linguistics, and educational psychology. Nineteen categories of children's word knowledge were identified and grouped into five hierarchically related levels: no understanding, schematically related understanding, contextual understanding, decontextual understanding, and paired understanding. This semantic continuum can be used to develop an assessment instrument to measure the incremental changes in young children's semantic knowledge. Also, it can be used to guide assessment-based vocabulary instruction in early childhood.

Keywords

vocabulary, assessment, early childhood

Researchers and teachers tend to score assessment of a child's vocabulary knowledge as right or wrong. This dichotomous view is misleading. Word meanings are complex

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and nuanced. It is crucial to consider shades of word meaning when determining whether a child *knows* a word. For example, consider what 5-year-old Jose knows about the meaning of the word *appear* in the following transcript.

Jose: *Appear* means that like there would be a wizard, and it would be here because magic potion would go onto it.
Teacher: So what happens when something *appears*?
Jose: It means something would have to get there even though you didn't already see it.
Teacher: Have you ever *appeared*?
Jose: No. I don't have a scientist in my house. A scientist is the only one that can make magic potions.

Does Jose know what *appear* means? He knows that *appear* can be used when things become visually apparent because of magic. Although Jose understands something about the meaning of *appear*, he does not have a complex and nuanced grasp of the multiple meanings of *appear.* In short, his understanding falls somewhere along a continuum of semantic understanding. It is not helpful or accurate to score his understanding of the word *appear* as simply right or wrong.

The purpose of this article is to develop a semantic continuum of young children's vocabulary knowledge based on a conceptual analysis of the literature related to the "kinds of knowledge" (Wesche & Paribakht, 1996, p. 13) that individuals express about word meanings. The semantic continuum will help researchers and teachers understand and assess the nuanced word meanings that children express. It will also inform the development and use of more effective assessment and pedagogical practices.

This conceptual analysis focuses specifically on the *depth* of young children's vocabulary knowledge. *Depth* describes the "increments" (Nagy & Scott, 2000) or "precision" (Read, 2004) of vocabulary knowledge. Pearson, Hiebert, and Kamil (2007) stress the importance of assessing depth of word knowledge: "If a new word meaning is acquired incrementally rather than in an all-or-nothing fashion, it seems useful to gauge students' developing depth of understanding of important words" (p. 290). Researchers and teachers need a more precise way of understanding young children's vocabulary knowledge. This article describes a continuum that meets that need.

The Need for a Continuum to Assess Young Children's Vocabulary Knowledge

Three conclusions can be drawn from the research literature regarding young children's vocabulary development. First, purposeful support for early vocabulary learning is needed (Biemiller, 2003). Second, assessing the kinds of knowledge children have about word meanings is needed to support early vocabulary learning

(e.g., National Association for the Education of Young Children [NAEYC], 2009; Pearson et al., 2007; Verhallen & Schoonen, 1998). Third, current continua are inadequate for assessing young children's early vocabulary knowledge (Christ, Kibby, & Chiu, 2011).

Purposeful Support for Early Vocabulary Learning Is Necessary

Supporting meaning vocabulary acquisition during early childhood is necessary. Not all children come to school with similar levels of vocabulary knowledge. In fact, there is a significant disparity between the vocabularies of children from families of lower-socioeconomic status (SES) and their upper-SES counterparts. For example, Hart and Risley (1995) found a 600-word gap between these two groups by age 3. There is also a gap in terms of depth of word knowledge. Curtis (1987) found students with limited receptive vocabulary knowledge had less depth of knowledge of familiar words. The gap widens when left unaddressed during the early childhood years (Biemiller & Slonim, 2001; Juel, Biancaros, Coker, & Deffes, 2003). By fifth grade, students from low-SES families know 4,000 fewer words than their high-SES peers (Biemiller & Slonim, 2001).

Vocabulary knowledge is crucial for academic success. In particular, a strong vocabulary facilitates reading comprehension (Anderson & Freebody, 1981; Biemiller, 2003; Gordon-Pershey, 2003; Hart & Risley, 1995). Children with low vocabulary knowledge often experience reading comprehension difficulties as they begin to "read to learn." Chall, Jacobs, and Baldwin (1990) refer to this as a fourth-grade slump. This comprehension slump may result in general school difficulties (Biemiller, 2001; Chall et al., 1990; Hart & Risley, 1995).

Since vocabulary knowledge is related to academic success, and low-SES children tend to have less vocabulary knowledge, increasing low-SES children's vocabulary knowledge is crucial to educational equity. Therefore, there is an urgent need to develop and implement improved vocabulary practices in early childhood classrooms (Beck, McKeown, & Kucan, 2002; Biemiller, 2004; Stahl & Nagy, 2006; Stahl & Stahl, 2004), especially for young children with less developed vocabularies (Coyne, Simmons, & Kame'enui, 2004; Weizman & Snow, 2001). Biemiller (2003) suggested, "If we could avoid the growing vocabulary gap during kindergarten to grade two, and possibly fill in some words already missing at the beginning of kindergarten, reading comprehension, perhaps, could be improved" (pp. 328-329).

Assessing the Kinds of Knowledge Children Have About Word Meanings Is Crucial

In recent years, there has been an increased interest in closing the early childhood vocabulary gap through the development of vocabulary teaching methods and interventions (Christ & Wang, 2010; Christ & Wang, in press). Although research

is growing in this area, the field still lacks adequate tools to assess incremental gains in children's vocabulary knowledge. Researchers need appropriate assessment tools to develop research-based practices that support children's development of deep vocabulary knowledge. Only with appropriate assessment tools can researchers evaluate the impact of early childhood vocabulary teaching methods and interventions.

Researchers have long asserted that word-meaning knowledge develops incrementally through multiple exposures across varying contexts (Anderson & Nagy, 1991; Carey, 1978; Clark, 1993; Dale, 1965; Miller, 1999; Nagy & Herman, 1987; Vygotsky, 1962) and through lexical network building (Aitchison, 1994; Haastrup & Henriksen, 2000). Hence, it follows that assessment techniques should consider how children's word meanings evolve on the basis of instructional interventions (Vygotsky, 1962). Unfortunately, this has not been the case:

> The depth of word knowledge is a much-neglected area of vocabulary teaching and research. A methodological problem has been the lack of sensitive assessment procedures to measure these qualitative aspects of word knowledge, i.e., deep word knowledge (Wesche & Paribakht, 1996). This may explain the fact that research has mainly focused on vocabulary size or breadth. However, sufficient depth of word knowledge must be considered equally important—also in the context of school success. A superficial knowledge of words is very unlikely to be of much help to children in their schooling, during which each year more abstract and in-depth knowledge of word meanings is required and presupposed. (Verhallen & Schoonen, 1998, p. 453)

Multiple-choice picture tests are the primary means of measuring children's understandings of word meanings (e.g., Elley, 1989; Robbins & Ehri, 1994; Stahl, Richek, & Vandevier, 1991). Multiple-choice tests do not assess the kinds of knowledge a child has about a word's meaning since they are scored dichotomously—as right or wrong. Consequently, one has no way of understanding how children's word meanings evolve. Without adequate means of assessing the kinds of knowledge children have about word meanings, the impact of particular teaching methods remains unclear.

Assessing the kinds of knowledge children have about word meanings is also critical for informing teachers' instructional decisions:

> Learning and development are most likely to occur when new experiences build on what a child already knows and is able to do and when those learning experiences also entail the child stretching a reasonable amount in acquiring new skills, abilities, or knowledge. (NAEYC, 2009, p. 10)

To build on children's knowledge of specific word meanings, teachers need a valid, reliable, and efficient continuum for assessing the kinds of knowledge children

possess (Verhallen & Schoonen, 1998). Without such a continuum, teachers may focus solely on whether words are known or not known rather than consider what depth of knowledge children have acquired. Verhallen and Schoonen (1998) warn that when teachers do not attend to children's depth of word knowledge, "the arrears of linguistically less proficient children may go unnoticed, and thus pose undesirable educational risks" (p. 467). In short, "teachers are not well served when they are stranded without the resources, tools, and supports necessary to make sound instructional decisions" (NAEYC, 2009, p. 5). Therefore, a reliable and valid continuum for assessing the depth of children's vocabulary knowledge is crucial to inform instructional practices.

Current Continua Are Inadequate for Assessing Young Children's Semantic Knowledge

Researchers have developed continua to assess older children's and adults' depth of knowledge for specific words (cf. Beck, McKeown, & Omanson, 1987; Dale, 1965; Drum, 1983; Jenkins & Dixon, 1983; Konopak, 1988; Leung & Pikulski, 1990; Nagy, Herman, & Anderson, 1985; Wechsler Abbreviated Scale of Intelligence [WASI], 1999; Wesche & Paribakht, 1996). Each continuum describes different kinds of word knowledge, arranged in levels ranging from *no knowledge* to *complete knowledge* (see Table 1). These continua provide a foundation for developing a continuum of young children's semantic knowledge. However, they are limited in three ways.

First, these continua were created for older children and adults. The vocabulary knowledge possessed by young children differs from that of older children and adults. For example, overextending the meanings of words is especially germane to early childhood (Miller & Gildea, 1987). Therefore, it is important to explore the potentially different kinds of knowledge that young children might possess.

Second, although the continua for older children and adults are based on researchers' expertise in vocabulary development, other than Drum (1983), they lack empirical validation. Testing the "goodness of fit" between existing continua of word knowledge and young children's expressions of words' meanings would strengthen confidence in the validity of the existing continua. It would also help to identify kinds of knowledge specifically germane to young children.

Third, there is little agreement on the definitions used to establish distinct categories of vocabulary depth. For example, some researchers have defined *no knowledge* as simply not knowing the word (Beck et al., 1987; Dale, 1965; Nagy et al., 1985). Others define *no knowledge* as incorrect knowledge (Konopak, 1988; Leung & Pikulski, 1990). Still others define *no knowledge* as vague or trivial knowledge (WASI, 1999). Similarly, definitions of *complete knowledge* range from "correct" (Nagy et al., 1985) to "rich decontextualized knowledge" (Beck et al., 1987). Categories between these two extremes also differ (see Table 1). Establishing more precise operational

Table 1. Dimensions of Depth of Word Knowledge

Nagy and Scott's (2000) dimensions	Read's (2004) dimensions	Description
Incrementality	Precision of word knowledge	Children learn words in increments over time, from no knowledge to well-developed knowledge
Multidimensionality	Comprehensive word knowledge	Word knowledge extends beyond the semantic dimension to include aspects of word knowledge, such as collocation, syntax, grammar, register, etc.
Interrelatedness	Network knowledge	Based on the theory of lexical organization through semantic connectionist networks; knowing a word has to do with being able to relate the word to other words closest in this network system
Polysemy		Knowledge of words' multiple meanings or shades of meaning
Heterogeneity		Knowledge of a word depends on the word type itself

definitions of categories will assist researchers in the measurement of vocabulary depth. It will also assist teachers in assessing young children's vocabulary knowledge to inform instruction.

A Conceptual Analysis of the Literature Related to Incremental Semantic Knowledge

An incremental semantic continuum for assessing young children's vocabulary knowledge has practical and theoretical value. This review examined the research literature across the fields of education, developmental psychology, and linguistics. Relevant research literature included semantic word-knowledge continua, linguistics and developmental psychology studies related to young children's language development, and concept development research. There were six stages of conceptual analysis: (a) cataloging previously suggested semantic continua categories, (b) synthesizing and disaggregating previous semantic continua categories, (c) adding categories germane to early childhood, (d) honing the categories and establishing validity and reliability, (e) organizing categories into major category groups, and (f) organizing major category groups into a hierarchy. It is important to note that these stages of conceptual analysis were iterative rather than linear. However, for the sake of clarity, they will be presented in linear format.

A Catalog of Previously Suggested Semantic Continua Categories

All semantic continua categories suggested by previous first-language researchers that could be obtained for study were gathered (see Table 1). These categories were listed in approximate order from those that represented no knowledge to those that represented the most semantic knowledge. Categories that occurred more than once in Table 1 were listed only one time. For example, Drum (1983) and Konopak (1988) each used the category *no response*, but this category was listed just once. A list of 22 categories resulted:

1. No response (Drum, 1983; Konopak, 1988);
2. Incorrect meaning (Drum, 1983; Konopak, 1988; Leung & Pikulski, 1990; WASI, 1999);
3. No correct knowledge (Nagy et al., 1985);
4. Predominately incorrect (WASI, 1999);
5. Incomplete answer with substantial correct information (Nagy et al., 1985);
6. Word is not used in an appropriate context (Beck et al., 1987);
7. Vague synonym, nondefinitive attribute, or definition of related word form (WASI, 1999);
8. Contextual placing of the word (Dale, 1965);
9. General semantic information (Drum, 1983; Konopak, 1988);
10. General sense or connotation (Beck et al., 1987);
11. Minimal or partial knowledge (Nagy et al., 1985);
12. Incomplete knowledge (Leung & Pikulski, 1990);
13. Partial definition (Drum, 1983; Konopak, 1988);
14. Partial concept knowledge (Jenkins & Dixon, 1983);
15. Syntactic placement with little information (Drum, 1983; Konopak, 1988);
16. Brief example (WASI, 1999);
17. Narrow, context-bound knowledge (Beck et al., 1987);
18. Word used in an appropriate and meaningful context (Leung & Pikulski, 1990);
19. Reasonably complete definition or synonym (Leung & Pikulski, 1990; WASI, 1999);
20. Definition (Drum, 1983; Konopak, 1988);
21. Synonym (WASI, 1999); and
22. Primary features, general classification, figurative use, or many less definitive features (WASI, 1999).

Synthesis and Disaggregation of Previous Semantic Continua Categories

In the interest of developing categories that were not redundant or vague but that could operationally define the qualitative nature of children's word knowledge, the 22 categories were analyzed, synthesized, and disaggregated. Categories that overlapped in content were collapsed into a single new category (see Table 2). Overly

Table 2. Continua Descriptions of Word Knowledge

Researchers	Complete knowledge					No knowledge
Beck, McKeown, & Omanson (1987)	Rich decontextualized knowledge of a word's meaning, its relationship to other words, and its metaphorical uses	Knowledge of word but not being able to recall it readily enough to use in appropriate situations	Narrow, context-bound knowledge		General sense; connotation	No knowledge
Dale (1965)		Stage 4: Would recognize and remember	Stage 3: Contextual placing of the word		Stage 2: Heard of it but does not know what it means; able to repeat in a sentence, unable to define	Stage 1: Never saw word before
Jenkins & Dixon (1983)	Full concept knowledge: Recognizes examples, discriminates between examples of other concepts	Partial concept knowledge: Any various combination of critical and variable features	Verbal association knowledge: Pairing of labels and their meanings			
Konopak (1988), adapted from Drum (1983)	5 points: Reasonably complete definition of topic	4 points: Partial definition of topic	3 points: General information of semantic nature	2 points: Partial definition not related to topic	1 point: Syntactic placement with little information	0 points: Incorrect or no response

(continued)

Table 2. (continued)

Researchers	Complete knowledge				No knowledge
Leung & Pikulski (1990)	3 points: Synonym or definition	2 points: Target word used in appropriate meaningful context		1 point: Partial or incomplete knowledge	0 points: No knowledge or incorrect response
Nagy, Herman, & Anderson (1985)	3 points: Totally correct answer		2 points: Incomplete answer which displays substantial correct information	1 point: Minimal or partial knowledge	0 points: Answer with no correct knowledge
Wechsler Abbreviated Scale of Intelligence (1999)	2 points: Synonym, primary features, general classification, figurative use, many less definitive features		1 point: Vague synonym, nondefinitive attribute, brief example, related word form is defined		0 points: Incorrect or predominately incorrect

Table 3. Previous Categories Collapsed Into a Single New Category

Categories suggested by previous researchers	New category	Explanation
Incorrect meaning (Drum, 1983; Konopak, 1988; Leung & Pikulski, 1990; Wechsler Abbreviated Scale of Intelligence [WASI], 1999)	Incorrect meaning	There was an overlap in content between previous categories.
No correct knowledge (Nagy, Herman, & Anderson, 1985)		
Contextual placing of the word (Dale, 1965)	Contextual understanding	There was an overlap in content between previous categories.
Word used in an appropriate and meaningful context (Leung & Pikulski, 1990)		
Syntactic placement with little information (Drum, 1983; Konopak, 1988)	Syntactic placement with dummy subordinate	There was an overlap in content between previous categories. The new category name reflects the terminology in linguistic research (Watson, 1985) and suggests a more specific, operational definition for the category into which the three previously suggested categories all fit.
An example that uses the word but is not elaborated (WASI, 1999)		
Narrow, context-bound knowledge (Beck, McKeown, & Omanson, 1987)		

broad categories were broken down into two or more precise new categories (see Table 3). Eight categories resulted:

1. Incorrect meaning,
2. Syntactic placement with dummy subordinate,
3. Description of word meaning using only nondefinitive attributes,
4. Articulating the meaning of a morphologically related word form,
5. Contextual understanding,
6. Description of word meaning using superordinate,
7. Description that depicts the essential meaning of the word, and
8. Synonym that depicts the essential meaning of the word.

Addition of Categories Germane to Early Childhood

Additional categories that are germane to early childhood were added to the continuum. These categories were identified through an analysis of data collected in a previous study that included 56 kindergarteners' expressions of word-meaning understanding for 28 words that they knew to varying degrees (Christ et al., 2011). Children's expressions of word knowledge from this data were coded using the eight categories listed in the previous section. Responses that could not be coded using any of the eight categories were set aside. Then these responses were grouped with similar responses.Groups of similar responses were given initial labels. These labeled categories were compared with one another to ensure that they were sufficiently different. The comparison process resulted in the merger or expansion of group labels so that they more accurately reflected the children's responses. The categories that were added aligned with research on vocabulary acquisition in linguistics and developmental psychology (numbering is continued from the list of eight categories in the previous section):

9. Meaning of a phonologically similar word (e.g., Clark, 1993),
10. Word defined by its opposite (e.g., Carey, 1978),
11. Overextension (e.g., Clark, 1993; Kuczaj, 1982; Miller & Gildea, 1987) or underextension of a word's meaning (e.g., Clark, 1993),
12. Word described by its definitive attributes (Miller, 1991; Newcomer & Hammill, 2008), and
13. Paired knowledge (e.g., Miller, 1991; Vygotsky, 1962).

Honing the Categories and Establishing Validity and Reliability

Using the 13 categories described in the two preceding sections, the researcher and a full-time graduate assistant coded and recoded the 56 kindergarteners' 1,568 word-meaning responses collected in an earlier study (Christ et al., 2011). Both coders had background knowledge to facilitate this coding. The author has a PhD in literacy education, and the graduate assistant was working on her doctoral degree in literacy education. Both the author and graduate assistant had previously taught and assessed children's literacy as K-6 teachers.

The author trained the graduate assistant to code the children's responses using the 13 categories. The graduate assistant was provided with operational definitions and examples of each category. The author then explained the coding process using think-aloud demonstrations. The researcher and graduate assistant discussed their coding difficulties and revised the operational definitions of categories for clarity. An iterative process of coding, discussing category definitions, and refining categories and definitions ensued until a consistently good fit between the categories, their definitions, and the data existed. This process ensured that the final categories adequately represented young children's expressions of word meanings and that their operational definitions were sufficient.

Through this process, several changes to the categories were made. First, the category *contextual understanding* was broken into three categories to represent the qualitative differences that existed among this kind of response. The three new categories were based on the number of examples a child used in explaining a word's meaning: *emerging contextual understanding* (one example), *developing contextual understanding* (two examples), and *advanced contextual understanding* (three or more examples).

Second, four categories that represented decontextual knowledge were used to define the elements of decontextual understanding: (a) description of word meaning using superordinate, (b) description that depicts the essential meaning of the word, (c) description of a word meaning that includes definitive attributes, and (d) description of a word meaning that uses a synonym that depicts theessential meaning of the word. This was done so that gradations of decontextual response could be more meaningfully described across three categories: *emerging decontextual understanding* (includes one of the four elements, [a] through [d], from above), *developing decontextual understanding* (includes two elements), and *advanced contextual understanding* (includes three or more elements).

Third, the category *paired understanding* was broken into four categories to represent the qualitative differences that existed among this kind of response. The four new categories were based on the kind of example and number of decontextual elements a child used in explaining a word's meaning: *pre-emerging paired knowledge* (includes a schematically related example and one decontextual element), *emerging paired understanding* (includes a contextual example and one decontextual element), *developing contextual understanding* (includes a contextual example and two decontextual elements), and *advanced contextual understanding* (includes a contextual example and three or more decontextual elements).

Nineteen final categories resulted (see Table 4, column 2):

1. No response,
2. Incorrect meaning,
3. Meaning of a phonologically similar word,
4. Overextension or underextension,
5. Articulating the meaning of a morphologically related word form,
6. Connotation,
7. Word meaning described by only nondefinitive attributes,
8. Syntactic placement with dummy subordinates,
9. Identifying a word by its opposite,
10. Emerging contextual understanding,
11. Developing contextual understanding,
12. Advanced contextual understanding,
13. Emerging decontextual understanding,
14. Developing decontextual understanding,
15. Advanced decontextual understanding,
16. Pre-emerging paired understanding,
17. Emerging paired understanding,
18. Developing paired understanding, and
19. Advanced paired understanding.

Table 4. Previous Categories Broken Down Into More Precise Categories

Broad category suggested by previous researchers	New categories	Explanation
Primary features, general classification, figurative use, or many less definitive features (Wechsler Abbreviated Scale of Intelligence [WASI], 1999)	Described using subordinate or superordinate	Provides more specific language for operational definition; reflects the linguistics literature (e.g., Clark, 1993; Miller, 1991)
Vague synonym, nondefinitive attribute, or definition of a related word form (WASI, 1999)	Described with only non-definitive attributes	Provides more specific language for operational definition
	Meaning of a related word form	Provides more specific language for operational definition
Reasonably complete definition or synonym (Leung & Pikulski, 1990)	Description that depicts the essential meaning of the word	Coincides with Drum's (1983) and Konopak's (1988) category—definition—but provides more specific language for operational definition
	Synonym that depicts the essential meaning of the word	Coincides with WASI's (1999) category—synonym—but provides more specific language for operational definition

The validity of these categories is supported by their integral relation to previously proposed semantic continua and to relevant research literature from the fields of linguistics and developmental psychology (see Table 4, columns 5 and 6). All categories are supported by literature in one of these bodies of research. Several categories are supported by literature across these bodies of research.

To determine the reliability of using these categories to code young children's expressions of word knowledge, the researcher and graduate assistant used the final 19 categories to code the same subset of the kindergarten data again. There was high reliability in their scoring (using Krippendorff's alpha, $r = .96$, $p < .01$).

Organization of Categories Into Major Category Groups

Axial coding was used to draw interconnections (Strauss & Corbin, 1990) across the 19 categories. The goal was to identify major categories that represented similar kinds of depth of word knowledge. Five major categories resulted:

- No knowledge (includes the following categories: no response, incorrect meaning, and meaning of a phonologically similar word),
- Schematically related knowledge (includes the following categories: overextension and underextension, articulating the meaning of a morphologically

related word form, connotation, described with only nondefinitive attributes, syntactic placement with dummy subordinates, and identifying a word by its opposite),
- Contextual knowledge (includes the following categories: emerging contextual understanding, developing contextual understanding, and advanced contextual understanding),
- Decontextual knowledge (includes the following categories: emerging decontextual understanding, developing decontextual understanding, and advanced decontextual understanding), and
- Paired knowledge (includes the following categories: pre-emerging paired understanding, emerging paired understanding, developing paired understanding, and advanced paired understanding).

Researchers in previous studies have assigned different meanings to the terms *contextual* and *decontextual*, so it is important to define what is meant by these terms. For the purpose of this study, *contextual knowledge* is represented by an example, and *decontextual knowledge* is defined as a generalization of meaning or definition-like expression of understanding (see Fukkink, 2005; Van Daalen-Kapteijns, Elshout-Mohr, & de Glopper, 2001).

Organization of Major Category Groups Into a Hierarchy

Major category groups were organized hierarchically on the basis of principles derived from cognitive psychology. Ausubel (1963, 1968) suggested that concept formation has a hierarchical structure. Therefore, some researchers have organized how well related particular ideas (called propositions) are to a concept's meaning (Novak & Gowin, 1984). Two aspects of concept knowledge are typically considered—*accuracy* and *number of ideas* (White & Gunstone, 1992).Other researchers refer to these same two aspects of concept knowledge as *strength* and *number of word associations* (Meara & Wolter, 2004; Read, 1993; Schoonen & Verhallen, 2008). This approach to assessing concept knowledge is supported by recent research on connectionism, which argues that concept knowledge is organized by a series of weighted semantic connections in the mind (Rogers & McClelland, 2004).

Based on how word knowledge is hierarchically organized in cognitive psychology, the semantic continuum proposed in this articleis organized to reflect both accuracy and number of ideas. The continuum accounts for accuracy by conceptually organizing the categories of semantic understanding in order of increasing word knowledge by level: no knowledge, schematically related knowledge, contextual knowledge, decontextual knowledge, and paired knowledge. The continuum accounts for number of ideas by distinguishing sublevels of word knowledge based on the number of contextual examples or definitional elements expressed. Such is the case for emerging, developing, and advanced understanding within the contextual and decontextual levels, and pre-emerging, emerging, developing, and advanced understanding within the paired

level. The following sections explain the rationales behind the hierarchical organization of the continuum. Examples, definitions, and research connections for each category are presented in Table 4.

Level 0: No knowledge. Logically, one end of the semantic continuum represents situations when an individual possesses no knowledge or understanding of a target word. There is no variation in depth of knowledge for this category, as no knowledge is expressed.

Level 1: Schematically related knowledge. Responses that show *schematically related understanding* miss the essential meaning of the word. When a word's meaning is explained, it is critical to capture its *essential nature* (McNeil, 1987) or provide its *definitive attributes* (Miller, 1991) or its *canonical traits* (i.e., "the semantic traits whose absence is regarded as a defect"; Cruse, 1986, p. 19). Schematically related responses demonstrate that a child has partial understanding but does not clearly articulate an essential meaning contextually (Level 2) or decontextually (Level 3). If a word is known, the ability to differentiate it from other words and meanings will be clear. However, if meaning is in the process of developing, distinctions between the meanings of schematically related words organized in close proximity in the mental lexicon might be unclear. There is no variation in depth of knowledge within this category. All subcategories represent the same level of word knowledge.

Levels 2 and 3: Contextual and decontextual knowledge. Different understandings are represented when a child provides a synonym or description of a word's meaning (i.e., decontextual knowledge) versus when he or she uses the word in an example (i.e., contextual knowledge). Although these two understandings are interrelated (Stahl, 1999) and often co-occur (e.g., paired understanding, Level 4), decontextual responses will always demonstrate greater word-meaning understanding than the most developed contextual responses. This is because decontextual responses require the child to generalize knowledge. This is a higher-order thinking process (Beck et al., 2002; Van Daalen-Kapteijns et al., 2001). Anglin (1985) describes this distinction: "Many studies have supported the notion that there is qualitative change in development described as a transition from definitions in terms of use based on personal experience to abstract definitions in terms of genus and differentia" (p. 83). Snow, Cancino, DeTemple, and Schley (1991) considered definitional expressions of word knowledge to be a complex task that demonstrated deep lexical knowledge. Miller (1999) argued that semantic understanding becomes more decontextualized and abstract over time. To signify the incremental differences within contextual and decontextual categories, there are three subcategories included on the continuum for each of these levels—emerging, developing, and advanced. These subcategories represent increasing elements of contextual or decontextual information (see Table 4 for definitions and examples of each sublevel).

Level 4: Paired knowledge. This is the highest level of knowledge on the continuum. It combines contextual and decontextual information. This category has four sublevels of meaning depth—pre-emerging, emerging, developing, and advanced. The four subcategories represent increasing understanding of vocabulary knowledge. Vygotsky

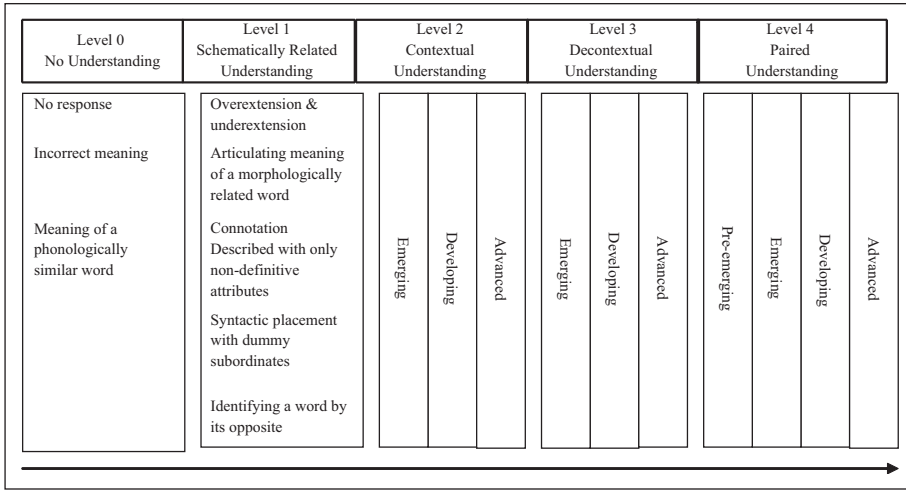

Figure 1. Continuum of young children's semantic word knowledge

(1962) described complex concepts as including contextual and decontextual information (see Table 4 for definitions and examples of each sublevel).

Description of the Continuum of Young Children's Semantic Knowledge

The categories of the semantic continuum proposed in this article are presented from least to most word knowledge in the following sections. The relevant research literature for each category is discussed, and an operational definition is provided. Example responses are presented in Table 4. A visual of the model is presented in Figure 1.

No Knowledge (Level 0)

No knowledge was expressed in three ways: meaning of a phonologically similar word, incorrect meaning, or no response. Each is an equivalent level of word knowledge. These subcategories are not organized hierarchically.

Meaning of a phonologically similar word. Linguists suggest that the lexicon is organized phonologically and semantically. Retrieval may occur through either path (Clark, 1993; de Saussure, 1916/1959; Fay & Cutler, 1977; Miller, 1999). If a word is retrieved phonologically, it may be confused with phonologically similar words organized in close proximity. Therefore, when a word is unfamiliar, a child may give the meaning of a phonologically similar word in place of the requested word.

Incorrect meaning. If a response seems completely unrelated to the target word's meaning, the response was scored as an incorrect meaning. Linguists suggest that children rarely provide completely incorrect word meanings (e.g., Bloom, 2002).

Therefore, these may actually be what Clark (1993) refers to as *mismatches*: "They try to pronounce some word having assigned some meaning to it, but the adults around neither recognize the word being attempted, nor the meaning assigned to it" (p. 36). Another perspective for regarding these responses is Cruse's (1986) concept of an *expressive paradox*—an abnormal use of the word, in which the word's use defies an expected trait of the word's meaning.

No response. Bloom (2002) found that children typically recognize when a word is unfamiliar. Therefore, they rarely offer incorrect word meanings. In alignment with Bloom's observation, when the kindergarten children referenced in this study lacked word knowledge, they often stated that they did not know the meaning of the word.

Schematically Related Knowledge (Level 1)

Miller (1991) discussed how word meanings are connected in the mind through schema. In the case of *schematically related* responses, the child's schema for the target word's meaning is likely to occur early in the process of development. Kant (as cited in Johnson-Laird, 1987) discussed the importance of mental organization of schematic concepts:

> In truth, it is not the images of objects, but schemata, which lie at the foundation of our pure sensuous conceptions. No image could ever be adequate to our conception of triangles in general. For the generalness of the conception it could never attain to, as this includes under itself all triangles, whether right-angled, acute angled, etc. whilst the image would always be limited to a single part of this sphere. (p. 204)

As in Gestalt theory, the sum of information one acquires about a concept over time is greater than any one example of a concept's use. During a child's initial exposures to a concept, some information about the concept is gleaned, and some aspects of conceptual understanding are not yet apparent to the child. Deep word-meaning understanding typically develops over multiple exposures to the word across varied meaningful contexts. The combination of all the information collected across these exposures—these bits of schematically related knowledge—result in greater depth of word knowledge. Before this occurs, however, oversimplified or partial understandings of word meanings frequently occur. This is due to reliance on only one or two contexts for determining word meaning. Although these responses are schematically related to the word's meaning, these ideas are in the early stages of word-meaning development and either include misinformation or exclude essential information.

Typically, when a word's meaning is explained, it is critical to capture its essential nature (McNeil, 1987) and provide its definitive attributes (Miller, 1991) or canonical traits (i.e., "the semantic traits whose absence is regarded as a defect"; Cruse, 1986, p. 19). Fundamentally, responses that show schematically related understanding miss these connections with the target word's essential meaning. For example, Jose described

the meaning of the word *gather* as "you're looking for them." The essential nature of the word *gather* is to bring things together. This is not captured in Jose's response. Jose did, however, point out a schematically related attribute: looking for something. Looking for something is likely part of one's schema concerning *gathering*.

There are six kinds of schematically related responses: (a) overextending or underextending the word's meaning, (b) articulating the meaning of a morphologically related word form, (c) describing the word's connotation, (d) using only nondefinitive attributes to define the word, (e) syntactically placing the word with a dummy subordinate, (f) identifying a word by its opposite. Each schematically related response represents an equivalent level of word knowledge. Therefore, these subcategories are not organized hierarchically.

Overextensions and underextensions. "Overextension can occur when a child's conception is incomplete" (Miller & Gildea, 1987, p. 95)—that is, the boundary of the word's meaning is not yet well formed. Two common overextensions are *overinclusions* (i.e., the word is used to include other things in the same domain to which the word belongs, e.g., *dog* for several small furry animals) and *analogical extensions* (i.e., the word is used to represent objects in different domains, which have some similar characteristic, e.g., *lamp* for anything emitting light, such as a TV, car, or toy; Clark, 1993). Researchers have found that overextensions typically occur in language production. However, in most cases, children are able to demonstrate accurate receptive comprehension of the concepts they overextend (e.g., Clark, 1993; Kuczaj, 1982). Therefore, overextensions do not demonstrate misinformation about words' meanings. Rather, they demonstrate children's semantically meaningful approximations when explaining the meanings of words they know something about. Likewise, underextensions, which explain "situation-bound uses," are often the result of exposure to words in restricted contexts (Clark, 1993).

Articulating the meaning of a morphologically related word form. Morphemes are the smallest meaning-carrying parts of words. They include word's roots or stems (e.g., *play*) and affixes (e.g., *re-* or *-ful*, as in *replay* or *playful*). When a derivational affix is added to the stem, it creates a new lexical unit that changes the meaning of the original word (Cruse, 1986). Such words are *morphologically related word forms*. Although inflectional derivations (e.g., play, plays, played, playing; or table, tables) also alter the word semantically by designating tense or singular or plural count, the essential nature of the word's meaning remains the same (Cruse, 1986). Therefore, responses that address inflectional derivation should be treated as if the child had explained the requested word (i.e., these should not be considered morphologically related word forms). The correct definition of a related word form has previously been suggested as a component of a word knowledge continuum (WASI, 1999).

Connotation. *Webster's Encyclopedic Unabridged Dictionary* (2001) defines the verb *connote* as "to signify or suggest in addition to the explicit meaning" (p. 432; emphasis added). In addition to the explicit meanings of words, we often use the emotional senses of words, or connotations. Beck et al. (1987) suggested connotation as a category of word-meaning understanding; they explained, "One might have some

general information about a word, such as understanding that *altruism* has a positive connotation, but knowing nothing about its specific nature" (p. 148).

Only nondefinitive attributes. Clark (2003) aptly describes the process children engage in as they begin to determine the lexical constraints of a word's meaning:

> When children assign a meaning to an unfamiliar word form, they must take into account all kinds of information: the locus of attention at that moment, the kind of object or event that is physically co-present, other terms that may contrast with the new word, plus any other information seen as pertinent. This encompasses many things: children's perceptual and conceptual categories so far, any preferences children display when they hear unfamiliar words, their knowledge about social interaction and about the inferences licensed in different contexts. (pp. 132-133)

Depending on prior knowledge and experience, a child may attend to particular attributes of a word's meaning. However, these attributes may not entail the essential meaning of the word. In the past, researchers have suggested three categories that are akin to nondefinitive attributes: (a) *an attribute that is correct but not definitive* (WASI, 1999), (b) *partial definition attribute* (Drum, 1983; Konopak, 1988), and (c) *partial concept knowledge attribute* (Jenkins & Dixon, 1983).

Syntactic placement with dummy subordinate. The use of a dummy subordinate signals that the child is unable to access a proper subordinate in his or her lexicon (Watson, 1985). For example, if a child explains the meaning of *rescue* as "rescue somebody," *somebody* is the dummy subordinate. This response suggests that the child has some word knowledge, such as syntactical understanding, but lacks knowledge of the word's essential meaning.

Identifying a word by its opposite. Carey (1978) described an experiment that found "a point in development when the word *less* is incompletely represented as a synonym of *more* or *some*" (p. 268). In fact, linguists suggest that adjectives are schematically organized by their relation to their opposites. Miller (1991) explained, "The basic semantic relation organizing adjectives is antonymy" (p. 196). There are six ways antonymy can be expressed: "contradictory terms (*perfect/imperfect*), contrary terms (*black/white*), reverse terms (*constructive/destructive*), contrasted terms (*rich/destitute*), relative terms (*brother/sister*), [and] complementary terms (*question/answer*)" (Miller, 1991, p. 197).

Contextual Knowledge (Level 2)

Researchers have suggested that contextual understanding belongs on the word knowledge continuum. Leung and Pikulski (1990) described this category as using a word in an appropriate and meaningful context. Dale (1965) defined it as a contextual placing of the word. Linguists have described contextual knowledge as a *functional definition* that often consists of anecdotal descriptions (e.g., Anglin, 1977). These ideas are

vague.What, for example, do these researchers mean by "appropriate," "meaningful," "placing," or "anecdotal descriptions"? Contextual responses on the proposed continuum of young children's semantic knowledge are defined as using at least one idea that (a) is referred to by a specific noun or verb and (b) reflects the word's essential meaning (McNeil, 1987), definitive attributes (Miller, 1991), or canonical traits (Cruse, 1986).

Miller (1999) suggested that "contextual representation is an abstract cognitive structure that accumulates from encounters with a word in various linguistic contexts and enables the recognition of similar contexts as they occur" (p. 10). Therefore, increasing knowledge of appropriate contexts in which the word may be used demonstrates increasing depth of word knowledge. It also supports word learners' increasing ability to deduce a decontextualized meaning. This occurs through a "process of generalizing, categorizing, and abstracting" (Schoonen & Verhallen, 2008, p. 213).

Three sublevels of contextual response distinguish between increments of contextual understanding: emerging contextual understanding, developing contextual understanding, and advanced contextual understanding (see Table 4). These are demonstrated by increasing ability to use a word in meaningful contexts. Sample responses at each sublevel are presented for the word *rescue* to facilitate the reader's ability to compare differences in response quality across the three sublevels:

- Emerging contextual understanding: Expression of one idea in a contextual response, for example, "Superheroes rescue people."
- Developing contextual understanding: Expression of two different ideas in a contextual response, for example, "Superheroes rescue people (Idea 1) and firefighters rescue people (Idea 2)."
- Advanced contextual understanding: Expression of three or more different ideas in a contextual response, for example, "Superheroes rescue people (Idea 1) and firefighters rescue people (Idea 2). You rescue people who are in trouble (Idea 3)—like in a burning building (Idea 4)."

Decontextual Knowledge (Level 3)

Decontextual word-meaning understanding is a generalization of meaning or definition-like understanding (Fukkink, 2005; Van Daalen-Kapteijns et al., 2001). Previous continua developers have suggested two categories of decontextualized knowledge: synonyms (Leung & Pikulski, 1990; WASI, 1999) and definitions (Drum, 1983; Konopak, 1988; Leung & Pikulski, 1990).

Words are said to be synonymous if, in context, one word can be replaced by the other without changing the meaning of the statement (e.g., Clark, 2003; Miller, 1999). This ability to provide another word that maintains the meaning of the sentence demonstrates an understanding of each of those synonymous words' essential defining

characteristics. Therefore, *synonyms* are included as one way in which a child might demonstrate her decontextual word-meaning understanding.

Researchers have suggested that use of formal definitions may actually represent metacognitive knowledge of a linguistic form of presentation (Snow et al., 1991). Therefore, instead of using children's construction of formal definitions as the criteria for decontextual knowledge, four aspects of formal definitions are considered components of a young child's expression of decontextual knowledge: (a) a word that is synonymous (Cruse, 1986), (b) the essential nature of the word's meaning (McNeil, 1987) or its canonical traits (Cruse, 1986); (c) its definitive attributes (Miller, 1991); or (d) superordinate concept (Miller, 1991). To be considered decontextual responses, children's expressions of understanding must not (a) include inaccurate information or (b) be couched in a contextual example. For example, consider the following response: "It's something you put things in." This captures the essential property of the word *container*—to hold something. Furthermore, it does not include misinformation, nor is the response couched in a contextual example. Decontextual responses are categorized as one of three sublevels: emerging decontextual understanding, developing decontextual understanding, and advanced decontextual understanding (see Table 4). Each demonstrates successively more word knowledge based on increasing expressions of the four elements:

- Emerging decontextual understanding: One element of decontextual knowledge is expressed, for example, "You *save* somebody [synonym]."
- Developing decontextual understanding:Two or more elements of decontextual knowledge are expressed, for example, "Saving someone [synonym] or helping someone when they are in trouble [essential nature]."
- Advanced decontextual understanding: Three or more elements of decontextual knowledge are expressed, for example, "Saving someone [synonym] or helping them when they're in trouble [essential nature]—like getting someone out of a bad situation [definitive attribute]."

Paired Knowledge (Level 4)

The highest level of word knowledge expressed by young children was paired knowledge (i.e., expression of both contextual and decontextual understanding). Vygotsky (1962) described complex concept formation as including both decontextual (generalized knowledge) and contextual (particular knowledge) word-meaning understanding:

> When the process of concept formation is seen in all its complexity, it appears as a *movement* of thought within the pyramid of concepts, constantly alternating between two directions, from the particular to the general, and from the general to the particular. (p. 80)

The *particular* of which Vygotsky speaks refers to concept knowledge gleaned from each situation (context) in which a word is used. The "general" concept knowledge in this quote represents generalizations the language user makes across situations. General concept knowledge allows for understanding a word's meaning outside of any specific context. This is decontextualized knowledge. "From the particular to the general, and from the general to the particular" describes the iterative process that occurs as a language learner adds incremental knowledge to his or her understanding of a word's meaning. Vygotsky highlights the need for both contextual and decontextual knowledge, and he asserts that neither alone is sufficient to gain complex understanding of a word's meaning. Similarly, Miller (1991) suggested that "sufficient information" to construct conceptual understanding includes "more than a disambiguating synonym" (p. 154). This information "must include a phrasal definition (and sometimes excerpts illustrating usage)" (p. 154). These perspectives point to the conclusion that paired decontextual and contextual knowledge—together—represent more advanced word knowledge than either contextual or decontextual understanding alone. To represent increasing depth of word knowledge within paired understandings, responses were categorized as one of four sublevels: pre-emerging, emerging, developing, and advanced (see Table 4). Each demonstrates successively more advanced word knowledge:

- Pre-emerging paired understanding: At least one aspect of decontextual knowledge and one or more schematically related examples are expressed. The response is considered pre-emergent because of the use of schematically related examples instead of a contextual example, for example, "Save somebody [synonym]—like a superhero flies through the air [schematically related understanding]."
- Emerging paired understanding: At least one aspect of decontextual knowledge and one contextual response are expressed, for example, "Save somebody [synonym]—like from a burning building [contextual knowledge]."
- Developing paired understanding:Two or more aspects of decontextual knowledge and at least one contextual response are expressed, for example, "Save somebody [synonym]—like getting people out from a burning building [contextual knowledge], or helping somebody who's in trouble [essential nature]."
- Advanced paired understanding: Three or more aspects of decontextual knowledge and at least one contextual response are expressed, for example, "Saving someone [synonym]—like getting people out from a burning building [contextual knowledge], or helping them when they're in trouble [essential nature]—like getting someone out of a bad situation [definitive attribute]—like helping a lost dog find his way back home [contextual knowledge]."

Implications

The continuum has two practical uses for early childhood vocabulary research and instruction. First, the continuum provides the starting point for creating an assessment

instrument to measure the depth of children's semantic knowledge. This can be used to determine the qualitative impact of instructional methods on children's vocabulary learning. Second, the continuum categories identified in this study provide a construct that teachers can use to guide their assessment-based instruction of vocabulary.

Creating an Assessment Instrument

The continuum described in this article provides a starting point for creating an instrument to measure the depth of young children's semantic knowledge. Such an instrument could measure qualitative distinctions in outcomes among different methods of vocabulary instruction. Consider two instructional scenarios: (a) a brief explanation of a word's meaning while reading a storybook aloud and (b) extended instruction of a word's meaning using contextual examples and interactive discussion. These two approaches are likely to result in qualitatively different outcomes. For example, a brief definition during a story may result in children gaining schematically related (Level 1) or emerging contextual knowledge (Level 2) about the word's meaning. However, extended instruction may result in children gaining contextual knowledge (Level 2), decontextual knowledge (Level 3), or paired knowledge (Level 4).

Knowing the qualitative impact of specific teaching methods on children's depth of semantic knowledge would assist teachers in aligning their teaching methods with their instructional objectives. For example, a brief explanation of a word's meaning while reading a storybook aloud would be an adequate teaching method if the instructional objective was to comprehend the text in which the word occurred. However, if the teacher's objective was to develop a fluid and flexible understanding of the word's meaning, she might engage in extended instruction across several days. Without accurate assessment of incremental changes in children's vocabulary knowledge outcomes, one cannot determine the nuanced impact of vocabulary teaching methods to inform instructional decision making.

Assessment-Based Instruction

Assessment informs instructional decisions across major areas of literacy: concepts about print, phonemic and phonological awareness, phonics, orthography, decoding, and comprehension (Applegate, Quinn, & Applegate, 2004; Bear, Invernizzi, Templeton, & Johnston, 2008; Clay, 2004; Cooter, Flynt, & Cooter, 2007; Kibby, 1995; Schwartz, 2005). Given the importance of optimizing children's vocabulary acquisition, a diagnostic approach to vocabulary instruction makes sense, as well. This is especially true for young children with low vocabulary levels.

The continuum provides a construct that can help teachers make assessment-based decisions regarding children's vocabulary knowledge. For example, recall from the opening transcript Jose's understanding of the word *appear*. He thought *appear* pertained only to magically induced images. Using the semantic continuum, one can categorize Jose's response as an underextension (Level 2). This response signals the need

to provide Jose with multiple additional examples of the meaning of *appear*. Such instruction will add depth to Jose's understanding of *appear* so that he can acquire contextual knowledge (Level 3). Subcategories of knowledge within levels also guide instructional decision making. For example, identifying that a child has phonological confusion between two words (a subcategory within Level 0) signals the need to focus instruction on phonological and semantic discrimination between words.

Conclusion

Previous continua have suggested potential aspects of increments of semantic knowledge (Beck et al., 1987; Dale, 1965; Drum, 1983; Jenkins & Dixon, 1983; Konopak, 1988; Leung & Pikulski, 1990; Nagy et al., 1985; Wesch & Paribakht, 1996; WASI, 1999). Although these continua made a significant contribution to the field of education by considering incremental knowledge as part of vocabulary assessment, they were limited in three ways. First, previous continua were developed with older children and adults in mind and thus did not take into consideration the potentially different kinds of semantic knowledge that young children might have. Second, other than Drum (1983), previous researchers have not compared their theoretical understanding of levels of incremental word knowledge against empirical data. Third, categories within previous continua were not operationally defined to ensure interrater reliability.

This study extends previous research on semantic continua in three ways to address the aforementioned issues. First, to refine and extend categories of semantic knowledge germane to young children, and to organize these categories hierarchically, research related to semantic knowledge was reviewed across three academic disciplines: education, linguistics, and developmental psychology. Second, findings from a literature review were cross-checked against empirical data derived from an analysis of 56 children's understandings of the meanings of 28 words (Christ et al., 2011). Cross-checking the research literature and empirical data enhanced the content validity of the continuum's categories, levels, and hierarchical organization. Third, the assessment categories were operationally defined, and each subcategory included samples of children's responses. The operational definitions and sample responses contributed to the high interrater reliability found when using the continuum to identify children's semantic knowledge (Christ et al., 2011).

A gap in vocabulary knowledge exists between low-SES and upper-SES children. Vocabulary knowledge is highly correlated with reading comprehension (Anderson & Freebody, 1981; Biemiller, 2003; Gordon-Pershey, 2003; Hart & Risley, 1995) and academic success (Biemiller, 2001; Chall et al., 1990; Hart & Risley, 1995). Thus, supporting vocabulary development is a critical aspect of school success and a matter of educational equity for low-SES children. Therefore, it is imperative that educators develop effective research-based methods to teach vocabulary in early childhood (Biemiller, 2003; Coyne et al., 2004; Weizman &Snow, 2001). This hinges on the ability to accurately assess the effect of instructional methods. The continuum serves

as a foundation for the development of an instrument to assess changes in the depth of young children's semantic word knowledge. This will provide a means of more accurately assessing the qualitative effect of instructional methods. It is also necessary to have a means of aligning instructional methods with the needs of learners and teachers' instructional objectives. The continuum provides a construct to guide decision-making for vocabulary instruction in early childhood classrooms.

Acknowledgments

I am grateful for the support of the Mark Diamond Research Fund of the Graduate Student Association at the University at Buffalo, State University of New York. I am indebted to my mentors, Michael Kibby and William Rapaport, for inspiring my interest in this area of research, and to my colleagues, Karen Wieland and X. Christine Wang, for reading and providing feedback on many early drafts of this continuum. I am also grateful to Robert Schwartz, Ron Cramer, and the *JLR* editorial team and anonymous reviewers for their incredible and steady support in revising the final drafts of this manuscript.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The author(s) received no financial support for the research and/or authorship of this article.

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Bio

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