



The Dynamic Learning Maps Core Vocabulary

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May 2013

Introduction

Augmentative and Alternative Communication (AAC) is an increasingly prevalent option for individuals with delays or disorders in their expressive communication abilities. For school aged children, the use of research based language selection and well-designed AAC systems are integral to academic success. Advances in technology and increased language acquisition research have propelled the field of AAC forward; however, this attention has not focused on school-aged children with significant cognitive disabilities. This problem is exacerbated by new academic standards and assessment requirements that are posing never before seen challenges for this population of children.

At the center of these new challenges are the Common Core Standards. These standards have increased the academic expectations and rigor for all children, including those with the most significant cognitive disabilities. In the United States, it is estimated that 1% of school-aged children have an intellectual disability (U.S. Department of Education, 2002) that is "characterized by significant limitations both in intellectual functioning and adaptive behavior as expressed in conceptual, social, and practical adaptive skills" and that originates before the age of 18 (American Association of Intellectual and Developmental Disabilities, 2009). In response to the development of the Common Core State Standards and the

expectation that children with the most significant cognitive disabilities access the standards, the DLM Core Vocabulary Project was initiated to determine the vocabulary that is necessary for students with significant cognitive disabilities to engage, learn, and demonstrate knowledge in an academic environment.

What We Know About Core Vocabulary

Several significant studies have been conducted in an effort to determine what vocabulary should be included on AAC systems (Banajee, DiCarlo, & Stricklin, 2003; Beukelman, Jones, & Rowan, 1989; Marvin, Beukelman, & Bilyeu, 1994; Trembath, Balandin, & Togher, 2007). In these studies, the language of typically developing children was recorded, transcribed, and the output was analyzed to identify the most commonly used words in the samples. While there is some controversy over this approach, this particular practice has long been considered the most effective way to determine what vocabulary should be used on AAC devices for children and adults with complex communication needs.

Core Vocabulary. The idea of core vocabulary is not new. A core vocabulary is comprised of the words that are used most commonly in the expressive communication (Yorkston, et al., 1988). The most significant traits of a core vocabulary are that it is relatively small in size and varies little across individuals or environments. Most core vocabulary work has linked the words to particular age ranges with a focus on social and needs-based communication.

The words in a core vocabulary are identified by studying the expressive vocabulary of individuals the same age as the individuals with complex

communication needs for whom the core is being identified. For example, a study conducted by Banajee, DiCarlo, and Stricklin (2003) attempted to identify core vocabulary for 50 toddlers (ages 24 -36 months) enrolled in childcare. Each child was determined to be functioning at age-appropriate developmental levels using the Ages and Stages Questionnaire (ASQ), a parent-completed child-monitoring system (Bricker & Squires, 1999). Audio recordings were taken from each participant during two different activities across three days in a childcare setting. The audiotapes were transcribed and analyzed to determine trends and commonalities within and across language samples. A total of 23 words accounted for 96% of the words this group of children used. Interesting the list included no nouns. The words in descending frequency of use were: I, no, yes/yea, my, the, want, is, it, that, a, go, mine, you, what, on, in, here, more, out, off, some, help, all done/finished.

Similar studies, which resulted in core vocabularies ranging from 250-333 words, were conducted with preschool aged children (Beukelman, Jones, & Rowan, 1989; Marvin, Beukelman, & Bilyeu, 1994; Trembath, Balandin, & Togher, 2007). All of the studies determined that 333 or fewer words accounted for at least 80% of all words used by the child participants. Unfortunately, no studies have investigated the core vocabulary of older, school-aged children. Furthermore, no studies have investigated the core vocabulary that is used most often in academic settings and activities. The DLM Core Vocabulary project addressed this gap in the literature by examining the vocabulary demands of the Common Core State Standards in mathematics and English language arts in combination with the extant core vocabulary research and implementation in AAC systems.

Fringe vocabulary. In direct contrast to core vocabulary is fringe vocabulary, or the vocabulary we use to communicate about specific topics in specific environments (e.g. scissors, paper, and marker for art class; fork, drink, and napkin for meal time). Like core vocabulary, fringe vocabulary is important for communication but it serves the primary purpose of adding personalization to AAC systems and is used less frequently than core vocabulary (Beukelman, Jones, & Rowan, 1989). In contrast to core vocabulary, fringe vocabulary is often made up of nouns. When used in combination with core, fringe supports a more rounded communication system that could be used across activities and environments.

The DLM Core Vocabulary Selection Process

The purpose of the DLM Core Vocabulary project was to identify a comprehensive list of core vocabulary words, spanning grades K-12, which reflect the research in core vocabulary in AAC and the vocabulary that is needed to successfully communicate while in academic settings where the Common Core Essential Elements are being taught.

AAC Core. The first step in determining a core vocabulary that reflected the extant research was to compile the vocabulary lists from four significant studies involving children (Banajee, DiCarlo, & Stricklin, 2003; Beukelman, Jones, & Rowan, 1989; Marvin, Beukelman, & Bilyeu, 1994; Trembath, Balandin, & Togher, 2007). Next, widely used commercial and public domain core vocabulary lists were collected and added to the list compiled from the research. These included core vocabulary lists developed for commercially available AAC systems (e.g., Gateway, TouchChat,

Word Power), by school systems (e.g., Oakland School District in Michigan), and AAC specialists (e.g., Gail VanTatenhove). A total of 23 sources were used to compile a complete AAC core vocabulary list comprised of 509 words.

All of the words were input into a spreadsheet and a count was conducted to determine the number of the 23 sources that included each of the 509 words. This count helped to prioritize the 509 words such that those that occurred regularly across the 23 sources had a higher count than those that occurred only on 1 or 2 of the sources.

Additionally, the U-score was determined for each word. A U-score reflects the frequency and dispersion of words in written English (Zeno, Ivens, Millard, Duvvuri, 1995), and provides an additional indicator of the relative importance of each word in academic contexts. Given that the goal of the DLM Core Vocabulary project was to identify the most important words for students with significant cognitive disabilities, U-scores for written text at the elementary level were selected rather than U-scores for the entire corpus of written English.

Academic core. Given that no research has been conducted to examine core vocabulary in academic settings for school-aged students, a different process was employed to determine the core set of words that are required for success in classrooms focused on the Common Core State Standards. Our first step was to identify all words in the Common Core State Standards in English language arts and mathematics that were specifically called out as words students need to say. This was done by examining each standard, grade K-12, and highlighting words that were explicitly called out (e.g. who, what, when, and where). Overall, there were very few

words in this category (less than 20) as the standards rarely state specific words that students are required to express orally.

Next, the standards were carefully analyzed to identify classes of words that were called out for expressive use (e.g., plural nouns, irregular past tense). These classes of words fell into categories: open-set and closed-set. Open-set categories of words are large and appropriate individual words are impossible to specify (e.g. nouns and verbs). Closed-set categories of words are limited in size and specific words can be identified (e.g. pronouns or prepositions). Words that were specified within closed-sets were added to the Core Vocabulary list along with the words explicitly called out in the Common Core State Standards.

The open-set categories as well as other expressive language demands of the Common Core State Standards were then operationally defined (see Appendix A). Each of the words in the growing Core Vocabulary list was then coded to indicate which of the 36 open-set word classes or expressive language demands the word would allow a student to accomplish. For example, each of the nouns in the Core Vocabulary list was given a score of 1 because they met the open-class category of nouns. Each of the adjectives in the Core Vocabulary list was given a score of 1 because they met the open-class category of adjectives. Some adjectives received another score of 1 because they were also opposite pairs (e.g., big and little), which is one of the expressive language demands called out by the Common Core State Standards. Each of the words in the Core Vocabulary list could have a maximum score of 36.

Weighting the Core Vocabulary Scores

The process described above resulted in a list of 596 words. Each of the words received a score on the following indices: (1) number of the 23 core vocabulary lists on which the word appeared; (2) U-score; (3) number of closed-sets the word addresses; (4) number of open-sets and other expressive language demands the word addresses. Summing these raw scores does not appropriately weight each of the words because the indices are not all equally important. For example, the U-scores for words on the list range from below 1 to 52,474 as words such as *congruent* appear very infrequently in elementary level written text and words such as *the* appear very frequently across all texts. As a result, each of the indices was weighted so that composite “importance” scores could be calculated for each of the words.

Weighting of AAC Scores. Each word received a score that reflected the total number of the 23 core vocabulary lists on which it appeared. This raw count was multiplied by 10 to make sure the utility of the word in face-to-face communication was given significant weight in determining the importance of the word in the DLM Core Vocabulary list.

Weighting of U-scores. This measure of frequency and dispersion in written English has a huge range with very few words in the entire corpus of written English having a U-score of 1,000 or more. The weighting system for U-scores was determined based on the U-scores that corresponded with the first 100, 500, and 1000 most frequent and disperse words. A weighted U-score of 10 was given to

words in the 100 most frequent and disperse words in written English. A weighted U-score of 5 was given to words in the 500 most frequent and disperse words in written English. A weighted U-score of 3 was given to words in the 1000 most frequent and disperse words in written English. No words on the DLM Core Vocabulary list appeared outside of the 1000 most frequent and disperse list.

Weighting of Open-class and Category Scores. The category scores were weighted based on the percent of words in the overall list that could be used to address an open class or category. For example, in the entire list of 596 words, there are 222 words (37%) that are nouns and only 1 that is a collective noun. This means that the single collective noun (*school*, as in a *school of fish*) needs a higher weight than any one of the 222 singular nouns that could be included. As a single word *school* has a higher weight than the other 221 nouns because it is the only collective noun that students could use to express their understanding of collective nouns.

To account for the percent of the 596 words that address each open-class or category, a score of 1 was assigned when 41% or more of the words could be used to meet a Common Core State Standard demand as called out in an open-class or language category. Scores were multiplied by 2 if 31-40% of the words could be used. Scores were multiplied by 3 if 21-30% of the words could be used, by 4 if 11-20% of the words could be used, and by 5 if 1-10% of the words could be used to meet a Common Core State Standard demand as called out in an open-class or language category.

Combining the Weighted Scores. Weighted scores for AAC, U-score, and Open-Class or category were summed to create a rank score. That rank score

serves as an indicator of the overall importance of a word or its priority as a word to include in supporting the expressive communication of students with significant cognitive disabilities participating in the DLM alternate assessment.

Summary

The DLM Core Vocabulary Project was initiated to determine the vocabulary that is necessary for students with significant cognitive disabilities to engage, learn, and demonstrate knowledge in an academic environment. Instead of identifying every possible word, the goal was to identify and prioritize the smallest set of required words. Furthermore, it is expected that students will understand many more words than are reflected in the DLM Core Vocabulary. This much larger receptive vocabulary will include all of the fringe words they encounter in academic contexts across the school day. The DLM assessment system will use the DLM Core Vocabulary as a guide in writing items and selecting texts, and students will only be expected to use the words on this list to express their understandings. However, this list is not an exclusive list of the words that students should learn to understand across their school career.

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