

WORDCORE™: WORD-BASED COMMUNICATION SOFTWARE FOR THE VANTAGE COMMUNICATION AID.

Russell T. Cross, MRCSLT

Prentke Romich Company
1022 Heyl Road
Wooster, Ohio 44691

Introduction

The Prentke Romich Company produces a number of different voice output communication aids. The success of these products depends heavily on the language software used that codes language using a structured symbol system. The most popular program is called “Unity® (1995). The two touch screen devices, Vanguard™ and Vantage™ use a version called “Unity Enhanced” that takes advantage of the large-screen technology.

In contrast, a new program was developed in response to the needs of the adult population who, because of a degenerative neurological condition, require a language system that is (a) based on words and spelling, and (b) is quick to learn. This program is called “AQLS™: Adult Quick Learning System,” which has both Iconic and Alphabetic versions. The Alphabetic version has a non-picture keyboard that uses words and a QWERTY keyboard along with Word Prediction to generate speech.

The AQLS software is designed to work on the PRC devices Liberator™, DeltaTalker™ and Pathfinder™, all of which use a 128-location keyboard. Although many people are able to access this configuration, there are still elements of the population for whom the small key size is an issue.

In March 2001, PRC introduced the Vantage communication aid, which weighs just over 3lbs and has a small screen of 7 inches in diameter. The device includes the Unity language software as standard and this is used successfully by many individuals. However, some clients asked if they could have a solution that would be based on words and letters rather than symbols, but on the portable Vantage platform rather than the larger 128-key platforms on those devices running AQLS. Although designed primarily for the Vantage device, it can run on any Vanguard using version 4.0 and above of the operating software.

Keystroke reduction focus

An important feature of the software design is that keystroke reduction was an explicit aim, but not necessarily rate enhancement. Keystroke reduction simply seeks to cut down on the number of selections necessary to produce a word, phrase, or sentence, as compared with regular spelling. Rate enhancement refers to the process whereby an aided communicator can produce communication output faster than other methods – again this is typically measured against regular spelling.

The relationship between keystroke reduction and rate enhancement is not necessarily linear. In fact, studies have shown that reducing keystrokes in a Word Prediction system can actually lower the communication rate (Koester and Levine, 1994a;1994b). However, this has to be balanced against other factors, such as fatigue, where a reduction in overall rate may be seen as an acceptable trade-off against reduced effort.

In WordCore, although one element of the system uses Word Prediction, other keystroke reductions are achieved by using sequencing and single-word pages. There is therefore a blend of methods used to reduce the effort an individual needs to expend in order to communicate.

Program Parameters

Before designing the WordCore program, a number of parameters were set in place.

1. 45 keys only: The Vantage is designed to have a maximum number of 45 keys. If a 128-key configuration was implemented on a 7 inch diameter screen, the keys would be so small as to be impractical to use.
2. Optimal keystroke reduction: The aim was to provide a large vocabulary that can be accessed with as few keystrokes as possible as compared with regular spelling.
3. Word Prediction would be integral: Unlike the Unity program that is designed to use Word Prediction as a 'back-up' to thousands of pre-stored words in icon sequences, WordCore expects the Word Prediction feature of the communication aid to be used.
4. Voice output is primary: With only 45 keys available, having literary devices such as periods, commas, shift keys, exclamation points and so on should be avoided. The principal aim of the device is to provide speech output not written output.
5. Words should be chosen on the basis of frequency studies: Although a number of vocabulary lists were consulted, the two most heavily used corpora were the "LOB" corpus (Hofland and Johansson, 1984) and the "Reading" corpus (Raban, 1987). The former uses written text sampling from many sources and the latter uses the spoken vocabulary of five-year olds in the UK.

These basic parameters enabled the author to set limits on the development and provide guidelines when clashes occurred when having to make choices. For example, the word "need" is excluded directly from the program (although it can always be added) on the basis that the word "want" IS included. "Need" and "want" are semantically almost synonymous and can be used as such. Functionally, "I need some help" is no different from "I want some help." Although frequency studies would suggest including both (Parameter 5) the limitation of 45 keys indicates that losing one of them would allow for the addition of another more semantically distinct word to the system.

Overall Structure

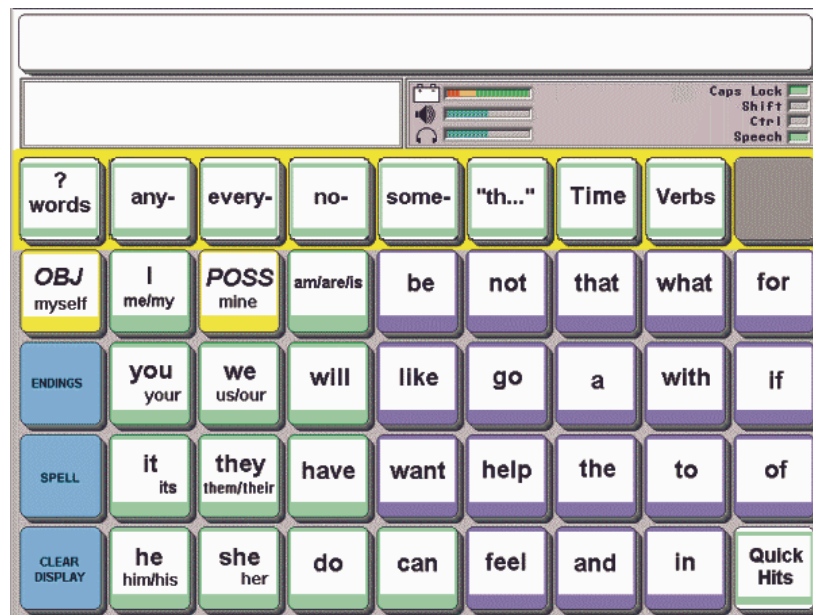
The WordCore program allows individuals to generate spontaneous vocabulary by using one of three methods:

1. Selecting a word directly from the CORE VOCABULARY screen.
2. If the desired word is not available via the Core, hitting SPELL will change to a screen that provides a spelling keyboard and WORD ROWS that contain up to 15 high frequency words that can be selected directly.
3. If the desired word is neither in the Core or the Word Rows, the individual can use the Word Prediction system to generate the word.

Here are the methods in more detail, complete with illustrations:

Core Vocabulary Screen

Here is the first screen the individual will see when turning on the device:



Selecting the keys will generate single words or phrases. The words are all very high frequency items. In the Core, there are some 140 words available that require one or two keystrokes.

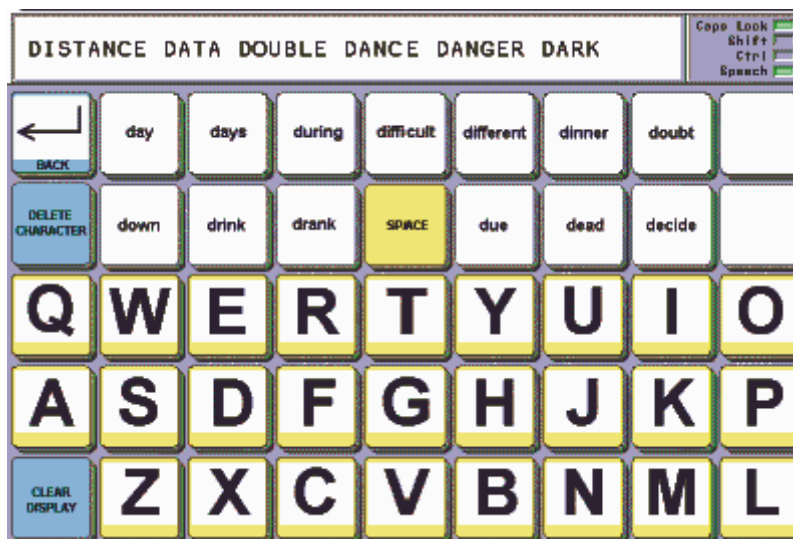
A significant feature of the program is that it uses sequencing to make maximum use of the small 45-key space available. This is seen best when generating phrases. Consider the following examples:

I mainy	do	“I do”	do
she her	do	“She does”	does
I mainy	have	“I have”	have
she her	have	“She has”	has

Each phrase is stored using the sequence highlighted. But after the first keystroke, the appearance of the second can change to the form shown in the final column. If a single page had been used with one-key-one-word, then it would have been necessary to have 6 separate keys to represent each word. However, by using a sequence, only 4 keys are needed, because the DO and the HAVE keys automatically change to accommodate the correct grammatical form. This saves potential key locations on a limited keyboard, yet it takes the same number of keystrokes to produce the phrases as it would have done with a page of 6 keys.

Word Rows

If a word isn't available in the Core, the client hits the SPELL key and is immediately provided with a spelling keyboard. Selecting the first letter of the desired word brings up a page containing a WORD ROW of high frequency items. For example, if the target word was “doubt,” here is what would appear once the letter “d” has been selected:



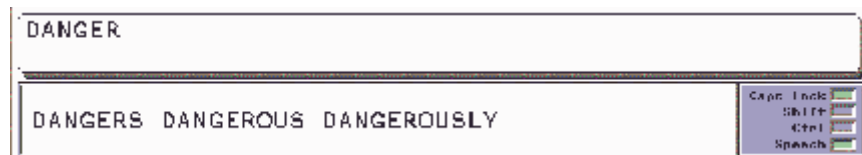
On selecting “doubt” from the Word Row, the program flips back to the Core, and the top row of the Core now includes a new row of possible ending for the word “doubt.”



Selecting an ending will produce “doubter,” “doubting,” “doubts” or “doubted.”

Word Prediction

If the word is not in the Core or the Word Row, the Word Predictor can be used. For example, if the target word above had been “dangerously,” the client could have selected “danger” from that list of D words above the Word Row, which would result in the following options being presented:



How The System “Learns”

The Word Prediction software in the Vantage has been selected to work on a Recency basis, that is, the word last chosen will appear in the first position of the Word Prediction window next time that letter is selected. So, if the client uses the “double” via the Word Predictor, the next time the “d” is selected, “double” appears as first in the prediction row. This has the effect of making recent vocabulary items be easier to select on subsequent occasions.

Words selected from the Core or Word Rows do NOT score on the Recency statistic so do not “push” predicted words out.

The overall effect of this is that the Core and Word Rows handle the high frequency vocabulary while the Word Predictor handles the less frequently used items. Over time, the system adapts to the individual's use of lower frequency words yet responds to what might be called local' needs. For example, the word “christmas” may be used very often during December, so it is predicted relatively quickly in the Word Prediction window. However, as the word is used less, it will be replaced by more 'current' vocabulary items.

Other Short-Cut Features

Selecting either “a” or “the” from the Core will immediately move the individual to the Spelling Mode. This is based on the linguistic observation that determiners are typically followed by adjectives or nouns, none of which appear in the Core. This saves a keystroke (Parameter 2.)

Selecting “a” also brings up the Spell screen that includes “an” as an option. This is so that there is no need to have both “a” and “an” in the Core screen, the variation being purely phonological and predicted by the presence or absence of a vowel at the beginning of the word following the indefinite determiner.

Project Development

The WordCore web site provides a focal point for on-going development of the program. Individuals can sign up to become part of the development team, and they will be eligible for free beta versions of the software.

<http://www.roughmagic.net/wordcore>

By using the Data Logging software available in the Vantage, team members will be encouraged to pool vocabulary generated by clients, which in turn will be used to modify the program.

References

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