# Dynamic Screen Communication Systems: Part 1

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*This paper was presented at the CM'99 National Symposium, University of Lancaster, September 1999, as a workshop session, with discussion of examples, and demonstrations projected directly from dynamic screen systems running on Dynavox and Dynamyte devices, Cameleon II, and Freestyle, as well as standard PC and Mac G3 PowerBook laptop computers. This paper covers only the first part of the workshop; the second part, which is to do with the introduction and implementation of a dynamic screen communication system, will be published in a later issue of this journal.*

## Component Parts of a Dynamic Screen Communication System

Dynamic screen communication systems are proliferating, in the field of AAC, and growing in popularity (especially, perhaps, in the education sector and amongst parents, who find the visual aspect of these systems reassuring, and who like the way you can explore the system without needing any previously acquired specialist knowledge). However, as advertising materials abound and symbols and pages flash past, it is easy to become confused by dynamic screen communication systems. This workshop was an attempt to provide an overview.

To help to 'untangle' some of the complexities, it is firstly important to note that dynamic screen communication systems include four main components. It's important to distinguish between:

1. The symbol system used
2. The vocabulary (choice of symbols made available, and their organisation and layout)
3. The software program used to display the vocabulary
4. The hardware devices which can run the software which displays the vocabulary

## Pre-stored Vocabularies

In our view, it is well worth considering using a pre-stored vocabulary, rather than starting to create one from scratch. (In the UK, we would suggest that it is only fairly recently, since there have been pre-stored vocabularies around, that the use of dynamic screen software has really taken off and become more widespread and successful.)

Some advantages of pre-stored vocabularies include:

- they save time (many hundreds of hours of planning and development work)
- they are highly cost effective (since development time is money)
- they capitalise on the skills and experience of experts (e.g. workers in specialist services who see lots of AAC users)
- they minimise technical hassle (allowing practitioners to concentrate on personalising the system to the needs of the user, and on teaching and using the system)
- potentially, they provide a ready-made low-tech system as well as high tech (using printouts of the screens)

Some possible disadvantages of pre-stored vocabularies might include:

- There may still not be a suitable vocabulary available for a particular type of user
- Practitioners may feel they are forcing the user to fit the available vocabulary, rather than tailoring the system to the client (although most people prefer to criticise and alter an existing system, rather than starting with a completely blank screen)
- Practitioners may feel that the documentation of existing vocabularies is inadequate for giving out to parents/ staff, and do not approve of simply leaving people to 'explore' an extensive and complex system on their own.
- Someone may *want* to design their own system
- A user may already have a well-used low tech system that needs to be mirrored on a high-tech system (rather than a completely different new one being introduced)

This last may be a false assumption - although theoretically you can create an electronic version of a paper-based symbol book, this may not be a sensible approach. It might end up being unnecessarily cumbersome and miss out on some of the attractive features of electronic implementation. It might turn out in practice to 'behave' differently from the paper version for the user (e.g. by having a different effect on listeners, and thus altering the kind of listener feedback that the user receives).

The following pre-stored vocabularies for dynamic screen communication aids are currently available in the UK:

| Symbols | Vocabulary | Program | Device |
|---|---|---|---|
| **PCS** | IDV | Talking Screen, Winspeak | Cameleon, Norand Penkey or any PC |
| **PCS** | QuickFire | Clicker 3 | PC with processor speed 200MHz or above |
| **Rebus** | IDV Chailey | Winspeak Talking Screen | Any PC |
| **Dynasyms** | Gateway Dynavox exemplars & cs user, wseadult, speller | Dynavox 3100 | Dynavox/myte or any PC |
| **PCS** | SDPro exemplars & BeginIT Dynamically Speaking UP Dynamically | SDPro | Freestyle iBook/PowerBook Any Mac |

IDV=Ingfield Dynamic Vocabularies
SDPro = Speaking Dynamically Pro

## New Vocabularies in Development

The authors are currently developing new pre-stored vocabularies. Millar and Larcher are collaborating on a CALL Centre project in Edinburgh, funded by the Scottish Office Education Department, to develop a vocabulary suitable for use by a young but cognitively able child who would be following the 5-14 National Curriculum possibly in a mainstream Primary

school. This vocabulary, provisionally entitled ***CALLTalk,*** is currently in pilot use by one child with cerebral palsy in a Scottish school and is intended to be made available to other 'beta-tester' sites early in 2000, and made available for sale to others in due course after that. The current version is on two platforms, Mac and Dynavox, and is primarily designed for direct access, rather than switch and scan access. If further development is funded, this aspect may be considered, as well as a 'trainer' version for users at earlier cognitive levels.

Robinson has been developing a vocabulary for a particular client of the Communicate Centre in Newcastle, who is an ambulant teenager with moderate learning difficulties, using a Dynamyte communication aid. Again, this system is primarily designed for direct access. It has been in use by the client for some time now, and he has shown excellent progress in many areas. This vocabulary is referred to for the moment as the ***'Newcastle system'***, and is also due to be marketed, possibly later in 2000.

The details of implementation of both systems are outlined below:

| Symbols | Vocabulary | Program | Device |
|---|---|---|---|
| **PCS** | CALLTalk | Speaking Dynamically Pro | Freestyle, PowerBook, iBook or any Mac |
| **Dynasyms** | CALLTalk | Dynavox 3100 | Dynavox/myte or any PC |
| **** PCS*** | *CALLTalk* | *Dynavox 3100* | *Dynavox/myte or any PC* |
| **Dynasyms** | Newcastle system | Dynavox 3100 | Dynavox/myte or any PC |

* Potential development

## Comparing the different vocabularies

The following table is an overview of the kind of user these vocabularies were designed for:

| Vocabulary | Age | No. of locations | Other |
|---|---|---|---|
| **BeginIT** | 18-36 months | 8 or 12 | very young child or mild/moderate/severe delay |
| **CALLTalk** | 4-12 years | 30 or 35 | cognitively able child, including text & prediction |
| **Chailey** | 3-19 years | 24 | Severe physical disability plus visual/learning difficulties |
| **Dynavox - csuser** | teen/adult | 70 | symbols |
| **Dynavox - speller** | fully literate | 70 | spelling/word prediction |
| **Dynavox - wseadult** | adult | 60 | words - NO symbols |
| **Gateway** | 7-11 years | 54 or 72 | good language learning & literacy potential |
| **IDV (4 levels)** | 3-12 years | 18-60 | Key stages 1&2, physical disability |
| **Newcastle** | teenager | 54 | moderate/severe learning difficulties |
| **Speaking Up** | 4-12 years | 20 average | receptive language 4-12 years |

We carried out a test, to see how some of these vocabularies compared (IDV, Chailey, CALLTalk, Gateway & Newcastle systems). With each, we generated a 'test sentence' (e.g. that a child might want to say at classroom 'News time). The test sentence was "*I am feeling sad, my guinea pig is dead.*" Some issues that arise from this kind of exercise include:

- the number of keypresses required (important for users with severe physical disabilities and slow accessing)
- the availability (or not) of specific vocabulary, and room (or not) for the addition of personalised vocabulary
- the logic of where specific words are stored (relevant to the visual/cognitive/memory load on users, ease of navigation - i.e. whether you keep getting lost or not - and the overall speed of use)
- the number of page changes involved- and whether these were self closing popups or pages that required the user to hit a 'go back' key (relevant in terms of the overall speed of communication)

All of these factors interact with each other in complicated ways to make up 'ease of use' (which will be different for different types of user). There was little time for discussion of the results during the workshop; below we can speculate on some possible implications:

- **In IDV,** the system was extremely efficient (13 keypresses, six page changes) - though the word 'dead' was not available - we could only say "*my guinea pig is sick*". If 'dead' was spelled out, the total was 15 keypresses). However, with a more complex sentence structure and/or more esoteric vocabulary, the user might find themself unable to proceed, or involved in a much longer series of keypresses and page changes.
- **In CALLTalk,** on both Mac and Dynavox, all the vocabulary was available, but it took more keypresses and page changes to get to it (20 keypresses and 11 page changes plus 3 automatic popup closures). However, because the grammatical 'little words' are stored in permanent popups (i.e. available from anywhere in the system), it is theoretically possible to access an almost infinitely wide range of sentence structures and vocabulary without unduly increasing this number of keypresses and page changes (i.e. there may be more 'room for growth' in CALLTalk design.) Another difference is that there are fewer symbols per page to scan: it might actually be quicker for a user, depending on accessing capability, to change page than to search through very large numbers of symbols on one page.
- **In the Newcastle system,** it took 18 keypresses and 13 page changes (some self-closing popups) to reach the sentence "I am feeling sad, my guinea pig died". (N.B. Dynasyms do not offer a symbol for 'guinea pig', so a modified 'anteater' had been pressed into service...)
- **In the Chailey communication system,** the test sentence took 32 keypresses, and 24 page changes. This is explained by the logic of the Chailey system, where emphasis is placed on absolute and utter consistency, requiring the user to go back up to the Top Page (category index) and back down through the entire hierarchical choice 'tree' for every single word,

giving 4 keypresses and 4 page changes per word, (whereas the other systems use a less precise logic, and either predict the sort of language likely to be used in association with certain vocabulary, or provide access through some kind of 'sideways' link (e.g. popups). In spite of being laborious, this may be an advantage to users who have learned to access words through this cast iron routine and structure. It may be an indication that the Chailey System supports users who function communicatively at the level of single key words, but does not facilitate the construction of sentences. (N.B. The Chailey system does not offer either 'dead' or 'sad'. If both words were spelt out, it would bring the total to 41 keypresses and 24 page changes, otherwise we can only say, "I am hurt, my guinea pig is hurt.")

Each system was tested by its author who knew it well, therefore there were no keypresses wasted through 'getting lost', or failing to find the required vocabulary in the expected place and having to go back up to the top page to try again. A proper test of the logic of the system design would really have looked at how easily a 'naive' user managed to generate the test sentence. It would also be interesting to see by how many keypresses and page changes their efforts differed from those of the experienced user.

(N.B. We did not time the overall speed of use with each vocabulary, as we were 'talking through' the process as we demonstrated, which took up additional time.)

## Choosing a System

The informal 'test' above is only a rough indication of some of the relevant factors - it is far from being the whole story. A large number of interacting factors have to be weighed up in the process of selecting the most appropriate dynamic screen communication system for a specific user, in their own particular setting.

## Hardware

- portability - size, weight
- screen angle, brightness, touch screen option?
- robustness
- battery life
- processor speed of processor (affects speed of page changes especially)
- specialist versus standard computer equipment
- availability and quality of technical support
- mounting options available
- cost

**Discussion**

Dynavox was chosen for the Newcastle teenager, as an established dedicated system that could make the transition with the user from school into adulthood. Freestyle, as a version of an Apple Mac based system was chosen for the Scottish Primary school child, as he is in a remote rural area where school staff have only difficult and occasional access to specialist AAC input, but are familiar and knowledgeable with Apple Mac.

In general, we find that a system that can be introduced and practised at first on a standard classroom Mac or PC is welcomed in school settings. Especially given the increasing awareness of under-use of AAC systems, education authorities are unlikely to sanction purchase of a communication aid costing several thousands of pounds without solid evidence that it will be of benefit to the pupil, and can be managed by staff in the classroom setting. If staff and user are introduced to the system and cover the early groundwork on a computer that they know, then a much more convincing case can be made for later purchase of expensive dedicated equipment such as Freestyle or Dynavox/myte.

## Software

- robustness
- ease of programming
- range of features - access to other applications, e.g. a word processor
- quality of documentation
- staff familiarity
- availability of training
- availability and quality of support
- cost

**Discussion**

All of the main dynamic screen software applications are more or less robust, but there is variability in the documentation and training supplied with each. One major reason why the IDV vocabularies are proving popular, we believe, is the accompanying Workbook which provides a wealth of ideas for introduction, teaching and use of the system, in the form of a structured language/communication programme.

## Environmental Factors - the support team around the user

- local team experience
- local team time availability
- specialist support available to local team
- training available to the local team
- attitude and motivation of local team
- number in the class (where the user is a child)

**Discussion**

In our view, there is no such thing as 'the right AAC system' for a communication individual, there is only a 'workable AAC system' within the user's particular context. The above factors will determine how workable any system is within a given context.

## Environmental Factors - features of the individual user

- the match between user age and cognitive ability
- the need for:
  - access to curriculum software used by peers
  - development of literacy skills
  - printed output

**Discussion**

One of the key advantages for school use of the Speaking Dynamically Pro software for the Primary school user of CALLTalk is its flexible ability to launch other applica-

tions - e.g. a word processor, on-screen keyboards and wordbanks, 'My Diary' page, pre-prepared worksheets, MathPad - an on screen sum layout program - and so on - from within the communication aid (and to return to the heart of the communication aid automatically, when use of the other application is finished). In our view, a major disadvantage for school students of many AAC systems, is the difficulty of getting language work printed out.

## Special Features of Particular Hardware and Software

Additionally, different devices and programs may have features which may be of particular interest to meet specific users' needs, such as visual difficulties. For example:

- search features (Dynavox)
- macros (Talking Screen)
- cell magnification (Talking Screen, SDP)
- word morphology (Dynavox)
- auditory scan
- possibility of and contrast between prompt voice and output voice

## Issues in Designing a Dynamic Screen Vocabulary Structure

If you do decide to create your own vocabulary from scratch, instead of using an existing pre-stored system, the following factors will need to be considered:

### Overarching issues

- The quantity (size) of vocabulary may conflict with speed of delivery. For example, the more words there are, the more pages and page changes there will be, therefore the slower communication will be.
- Speed of access can be affected by visual and cognitive factors as well as factors to do with physical difficulties. For example, it may be quicker for a user with limited visual scanning ability to scan through fewer symbols on different pages, than a large number of symbols on the same single page.

### Visual Presentation

Try to evaluate the impact of :

- number of cells on the screen, and the size of each cell
- symbol size and text size within the cell
- the relative size of symbol and text
- cell shape and the relative position of symbol and text
- colour of symbol, background, text, border (if lots of different coloured backgrounds are used, it might be visually clearer to use black and white symbols rather than coloured symbols)
- highlight colour and style
- border colour & width
- spaces between cells
- regular or irregular cell size within pages and between pages

### Cognitive Load

- Number, range, consistency, and presentation of navigational styles - page 1/page 2, branching tree structure, popups, use of index...
- consistency of location of key items - functions and vocabulary categories
- colour coding
- visual presentation
- auditory prompts

Consistency is the key to ease of use.

The use of colour coding is worthy of particular consideration. If this is used, it may be based on the grammatical function of each word (e.g. IDV, where living things are yellow, other nouns are red, verbs green, adjectives blue etc.) or designed to support navigation through the system (e.g. in CALLTalk, all permanent popups are yellow, pages are pale blue, computer application launchers are white, 'all on one page worksheets' are pale green and so on).

### Access Factors

- speed of access
- scanning styles available - half, quarter, row/column
- number of adjustments available - touch screen /mouse settings, touch screen viewing angle, mounting etc.
- number of key presses
- number of page changes

If a user has severe physical accessing difficulties, consideration of these will take precedence over many others aspects of system design.

## Teaching and Learning a Dynamic Screen System

The second part of the workshop focused on how a dynamic screen communication system might be introduced and taught to users, how the system can be supported, for school staff, parents and families, and how the system can be managed progressively over time. This will be written up in a future issue.

If anyone would like further information about either the CALLTalk or the Newcastle system, please contact the authors.

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Information about other vocabularies, software and hardware mentioned in this article can be obtained from these sources:

Cameleon, Chailey Communication System, IDV vocabularies and workbooks - from *Cambridge Adaptive Communication* (see inside back page)

Clicker 3, Quickfire - from *Crick Software*, Tel: 01604 671691 Email: info@cricksoft.com

Freestyle, Speaking Dynamically Pro & vocabulary exemplars - from *Don Johnston Special Needs* (see page 20)

Gateway, Dynavox, Dynamyte - *Sunrise Medical* (see page 4)

Winspeak - from *Sensory Systems* (see page 28)