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SOME COMPUTER STRATEGIES FOR ACHIEVING LITERACY IN AUSTRALIAN LANGUAGES: THE YINTARRI PROJECT

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Yintarri is a West Australian government community school situated at Coonana: 180Km due east of Kalgoorlie. It has about sixty children who enter school speaking Wangkatja, a Western Desert language. There is no formal bi-lingual program; the language of instruction being English. The Yintarri Project is an International Literacy Year (ILY) funded program which uses touch-sensitive boards with microcomputers to assist in the development of literacy in both Wangkatja and English. This is accomplished, at Yintarri, with Concept Keyboards and Acorn BBC micro-computers though the same facilities could be provided with all other major types of computer. The project won a major ILY Literacy Achievement Award for its 'Outstanding Contribution to Literacy'.

There are three computer strategies using touch-sensitive boards which are particularly powerful aids for achieving literacy in any language; touch-exploring, language-controlled software and word processing. These will now be briefly introduced and will be followed by a discussion of the use of touch-exploring and word processing at Yintarri; language-controlled software for implementation in Australian languages is still under development.

TOUCH-SENSITIVE BOARDS

Touch-sensitive boards contain a rectangular array of touch cells which can be programmed individually or in groups. Each unique cell, or group of cells, is known as an 'object'. The content of an object will depend on the application to which a touch-sensitive board is coupled. A variety of object content is possible with touch-exploring and word processing: letters, phonemes, morphemes, whole words, phrases or even sentences. Representations of the objects are drawn or printed onto a paper overlay which is placed over the touch-sensitive board. As each object representation is touched the associated letters or words appear on the V.D.U. screen.

An important aspect of overlay design is the mediation between what appears on the screen and what is

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'printed' on the overlay. How object areas are represented can vary from concrete materials such as feathers, shells, etc., through a range of increasingly abstract representations such as photographs, illustrations, pictographs, ideographs and, ultimately, the letters which appear on the screen itself as the objects are pressed. Many of these aspects are discussed by Johnston (1989) and Michael (1991).

TOUCH-EXPLORING AND TOUCH-SENSITIVE BOARDS

The touch-exploring strategy lends itself to a wide range of activities (see below); the strategy gets its name from the *Touch Explorer*, an MESU Blue File Program. A typical touch-exploring activity would be to use a copy of an Aboriginal painting as an overlay. As 'object' areas of the painting are touched, words appear on the V.D.U. to tell the story of that part of the painting. The essential difference between touch-exploring and word processing uses of touch-sensitive boards is that the 'words' associated with the touched object remain on the screen only until they are replaced by the 'words' associated with the next object which is touched; whereas in word processing, 'words' accumulate.

LANGUAGE-CONTROLLED SOFTWARE AND TOUCH -SENSITIVE BOARDS

Language-controlled software allows students to control visual images on a V.D.U. This is done by constructing grammatically correct sentences which are selected, word by word, by touching objects on an overlay placed on a touch-sensitive board or by some other selection device. The image, which may be dynamic, is then printed complete with the sentence that initiated the action. Language-controlled software is not a new concept. Several examples are available for English; 'Frog and Dog', from the Compass Software 'Windows Into Literacy' series and 'Moving In', Mushroom Software, are typical.

The use of language-controlled software falls somewhere between touch-exploring and word processing. It allows the use to create meaning with a 'sentence' of words and then it checks that the 'sentence' is grammatically correct before it acts on it, unlike word processing where meaning is entirely under the control of the user and is not self-checking.

The Ministry of Education, W.A., is currently developing language-controlled software which a teacher will be able to implement in any Australian language for which there is an adequate linguistic description; the concept is fully described in Dench, 1990.

WORD PROCESSING AND TOUCH-SENSITIVE BOARDS

An important aspect of a touch-sensitive board linked to a word processor is that the spatial arrangement of the objects can suggest a touch sequence that provides a scaffold for some grammatical purpose, e.g. a left to right sequence of pressed objects might produce a sentence. This is a powerful instructional strategy for achieving early literacy skills in English: its potential with Australian languages may be even higher (Dench, 1990, p.642). As literacy skills grow, the touch-sensitive board can still be used to provide less structured support for the writer, e.g. alternative keyboard, thesaurus, wordbank, and topic dictionary uses.

With the above three computer-using strategies, students are able to focus on whole words and how they work to create meaning. They do not have to worry about the mechanics of spelling and/or letter formation. They have '...total control over print long before they can formally read or write...' (Dewsbury, 1989). A more detailed account of the possibilities of the touch-exploring and word processing strategies is now given, followed by suggestions as to how language-controlled software might fit in when it becomes available in mid-1991.

USING THE TOUCH-SENSITIVE BOARD

Michael, 1991, lists a whole range of board-using strategies. The many uses discussed have been devised and collected by the Ministry of Education's Computers in Education Project team and teachers with whom the team have worked. One of the most notable features of using touch-sensitive boards is the creative ways in which practising teachers find to use them. The following discussion is directed to those strategies which seem most appropriate to acquiring literacy in Australian languages by speakers of those languages. It will show how the various strategies can be used to compliment each other.

PICTIONARIES

With 'pictionaries', the overlay is a picture of a scenario which is familiar, relevant and interesting to the user and likely to stimulate the use of words within the user's vocabulary. The touch-sensitive board is programmed as a touch-explorer to reveal information about the object touched. The same overlay can be used at many different levels of literacy by creating different programmes to match the different levels of achievement. At the simplest level, and depending on the level of graphic detail on the overlay, the board is programmed to reveal the name (noun) or the action (verb) of the objects touched. The text revealed by a touch might range from a single noun or verb e.g. 'man' *(wati)* or 'emus' *(karlaya tjurta)* or 'spearing' *(wakarni)*etc. to short phrases e.g. 'old woman sitting' *(minyma nyalpa nyinanyi)*, 'two children on a branch' *(tjitji kutjarra yammirringka)*, etc.

With the computer systems at Yintarri, the text displayed when an object is touched establishes and/or reinforces sight vocabulary. Digitised voice sounds are not possible thus the students are encouraged to say the words on the screen. The lack of voice sound could be partially overcome by using those old Language Masters gathering dust on a shelf somewhere. The text displayed on the screen could be pre-recorded so that students could select a word match from the Language Master cards and play it back to confirm the sight/sound relationship. Similar, but more powerful, environments can be created with other computer technology. The Concept Keyboard with the Amiga computer and its Notepad software can give access to digitised speech. Similar uses of the 'pictionary' strategy with digitised voice can be achieved with various hypercard-like environments on a number of different computer systems.

CLUE SLEUTH

The overlay for 'clue sleuth' is a large picture which is the scenario for the trail of clues programmed into a touch-explorer application. It would be an advantage to use the same picture overlay as used in the 'pictionary' strategy particularly when the same elements of text are used as the basis of clues because these have already been rehearsed in 'pictionary' exploration. The level of text sophistication can be chosen to suit the literacy level of

the user; from simple clues (see Table 1) to more complex clues which require both greater visual discrimination and more literacy in order to successfully follow the clue trail.

TABLE 1: kaarnka clue sleuth

start	nyangatja kurranyu	start here.
1st clue	'k' walkatjurra waruku pitja	write 'k' go to fire.
2nd clue	'aa' walkatjurra. karlaya kutjarraju pitja.	write 'aa'. go to two emus.
3rd clue	'rn' walkatjurra. piyarrpiyarrpa tjurtaku pitja	write 'rn'. go to galahs.
4th clue	'k' walkatjurra kurrkartiku pitja	write 'k'. go to goanna.
final clue	'a' walkatjurra paluru maru paluru parrpakarni palunya kuka ngalkula paluru tjirta nyaanya?	write 'a'. it is black. it flies. it eats meat. it is a bird. what is it?

Note: the phonetic sounds of k-aa-rn-k-a ('crow' - kaarnka) have been used as the evidence to be collected rather than the individual alphabetic characters. There is no point in having a close relationship between orthography and vocal sounds unless it is exploited. Such relationships are irregular in English and difficult to exploit.

EXPLORE A STORY

An overlay, or series of overlays, is created in a touch-explorer or word processor application rather like 'big book' activities where each page of the book is an overlay file. Touching individual words or parts of the

picture reveals further details or enlargements of the story. This strategy would be ideal for Australian languages where there is a rich tradition of sand or bark painting. It could equally well be applied to illustrations of traditional pursuits or cultural objects - hunting, gathering, tool making, etc. - where, for example, touching details of a spear-thrower *(mirru)* reveals more details of that part's cultural significance.

MAP MAKER

'Map maker' is a touch-explorer application where text clues are used to draw a map or scene on a blank (or partly complete) overlay. This strategy can be used from very early levels of literacy to very advanced levels. It is constrained to some degree by younger students ability to draw but this can be overcome in various ways, e.g. following text instructions to cut and paste pre-printed 'cartoons', or place two or three dimensional plastic or fuzzy felt shapes, or colour in pre-drawn shapes or areas. More advanced levels of drawing ability and literacy can require exploration of the adjacent cells of the touch-sensitive board to define precisely what is to be drawn. For example, a 'dry creek bed' *(karru)* must go from somewhere to somewhere else, therefore exploration of the adjacent cells is needed to determine how the creek bed continues. 'Map maker'; is an ideal comprehension activity because at the completion of the task it gives a teacher an immediate visual representation of the student success.

SENTENCE MAKER

'Sentence maker', a word processor strategy, represents a radical change from the previously mentioned strategies; here the user begins to create meaning with words rather than merely responding to word or picture cues. The 'sentence maker' strategy is not self checking, unlike language-controlled software (discussed here under). However, overlays can be designed to guide the user towards a correct outcome using differing levels of scaffolding depending on the expected level of literacy of the user.

Strong scaffolding can be created by a strict left-to-right or top-to-bottom sequence of touches. Fig.1 illustrates a near-absolute left-to-right layout which was used successfully by Year 1 Bardi students at One Arm Point, near Broome. These students were barely able to write their

own names but had a small sight vocabulary. With the Concept Keyboard layout they were able to print sentences which they then illustrated and were able to read.

Light scaffolding may be achieved in a number of ways. One possibility is to group grammatically identical elements of text in one part of the overlay and surround them by a coloured boundary (Fig. 2a). This colour, with others, becomes a cue on the heading of the overlay where some grammatically correct 'colour' sequences are indicated (Fig. 2b). A loose left-to-right sequence is illustrated by Fig. 3 which attempts to organise the tense, mood and aspect elements of a selection of Fitzroy Valley Kriol verbs (information drawn from Hudson, 1983, but overlay untested in a classroom). Fig. 4 shows an almost completely unstructured Wangkatja overlay (for male students) which includes an alternative keyboard (organisation suggested by Hudson, personal communication) using the Western Desert orthography (McGregor, 1988) together with a selection of nouns and verbs with tense suffixes which might be used by a more literate student writing about a hunting trip.

THE ROLE OF LANGUAGE-CONTROLLED SOFTWARE

Language-controlled software logically fits somewhere between the earlier use of touch-exploring and the first use of touch-sensitive boards with a word processor. With touch-exploring, students acquire some sight vocabulary from the graphic-word correspondence and become able to combine their knowledge of the spoken language with their sight vocabulary to generate 'sentences'. The software will reward correct constructions with a graphic action which is precisely related to the meaning of the sentence. Students successful with language-controlled software can then move on to more complex touch-explorer applications and to use of word processor overlays with progressively less scaffolding.

The value of the language-controlled software under development is that it will be able to create locally-relevant scenarios in the home language of Aboriginal students who use it and allow the use of literacy strategies which are found to be successful in urban English-speaking contexts. The importance of relevance cannot be under-estimated in early literacy achievement. One of the first word processor overlays the author helped to design was for a group of Bardi students who were working with the Salisbury list, a basic core vocabulary. The very first

user paused in the middle of constructing a sentence to look for a word that was not there. The overlay was quickly amended to include local words such as 'dugong', 'turtle', 'mangroves', 'boat','beach' and 'swim': words generally more complex than the Salisbury list but within the user's sight vocabulary. Words not relevant to that coastal community were deleted. This incident demonstrated the need for overlays to be a reflection of self as discussed by McDonald (1986). She adds that the '...need for a real audience and a known audience is of even more significance (for Aboriginal children) than it is for Anglo-Australian children...'(p.13). Touch-sensitive boards with well designed overlays open up many opportunities for Aboriginal children and could be a critical element in their development of literacy.

Language-controlled software may also have a role in transferring literacy skills from a known language to a new language. A small demonstration language-controlled software program was constructed in Watjarri, a Western Desert language of the Geraldton-Meekatharra region. It was trialled on a class of upper-primary students who had commenced to learn Watjarri, e.g. the names of animals, but who had no knowledge of the syntax of Watjarri. Within an hour of using the demonstration software in a discovery mode with no further language instruction, they were able to construct Watjarri sentences and explain how the syntax of Watjarri differed from that of English.

EXPERIENCE AT YINTARRI

The Yintarri Project was set up from the basic premise that providing opportunities to become literate in the home language, Wangkatja, would improve English achievement, in particular, and attitudes to literacy, in general. From the beginning of the project there was simultaneous use of both Wangkatja and English though most of the written work continued to be in English. Apart from the basic bi-lingual premise, there was no specific theoretical basis for the practice implemented, although there was an awareness that the computer strategies planned for use would be in keeping with Aboriginal learning styles: (Folds, 1986). Each teacher and group of AEWs were left to explore for themselves the computer resources made available to them and to fit them as appropriate into the curriculum. Some significant observations emerged from this exploration.

Lower primary:

This class group most extensively explored the possibilities of a bi-lingual approach with computers. The children's work in both Wangkatja and English was combined into personal and class readers. By the end of the year, the teacher, Peta Marsden, had developed the use of parallel Wangkatja and English scaffolds in the 'sentence maker' strategy and gave the children a free choice of whether they wrote about an event in Wangkatja or English. She observes that the choice was about fifty-fifty; however, those that chose Wangkatja were more successful in reading what they had written and were enjoying correcting her mispronunciation of their work.

Middle primary:

This group used extensive labelling of classroom resources and displays in both Wangkatja and English. Written work in Wangkatja was generally restricted to substituting Wangkatja nouns for English nouns in English scaffolds, e.g. 'The *karlaya* (emu) ran fast'. There must be some anxiety about this approach particular with reference to the upper primary observations as it will tend to lead to incorrect syntax when Wangkatja is written. This raises the issue as to how separate the use of two languages should be kept.

Upper primary:

Wangkatja scaffolds, Fig. 2a for example, were regularly used in the 'sentence maker' strategy. There was a tendency, however, for some children to impose the surface structure of English onto Wangkatja, e.g. a noun-verb-noun order with no suffixes, thus ignoring their oral knowledge of Wangkatja and the recommended patterns (Fig. 2b.). Even when the correct surface structure was used some children tended to drop the *-ngku* suffix. Regular spelling tests were also held in both Wangkatja and English and led to the conclusion that spelling was better in the home language which is not surprising considering the more regular orthography.

Lower secondary:

Similar strategies were used as for the upper primary group. It was interesting to note that here, where the English literacy was highest, the use of Wangkatja scaffolds was also the most accurate.

Although Yintarri Community School has received a

Literacy Achievement Award for its use of touch-sensitive boards for a bi-lingual literacy program it must be stressed that the award was as much for the concept as it was for the execution; the experience is still very formative. Three of the four teachers at Yintarri are in their first year of teaching and are still coming to grips with the task of teaching non-English speaking background students, a task for which they have had negligible training, and with the use of computers for which they also have little background. The effort has been very much a cooperative one; teachers together with the Aboriginal Education Workers (AEWs), with occasional assistance outside assistance from the author, have grown in their awareness of the potential of touch-sensitive boards to improve both the literacy attitudes and skills of the students in both English and Wangkatja. Overlays are now being generated from the combined initiatives of teachers and AEWs. With most of the staff continuing at Yintarri in 1991, it is believed that continuing use of computer resources within a more rational framework will produce further literacy development. There is also the possibility that progress will be enhanced by the introduction of language-controlled software.

CONCLUSIONS

The community's attitude to the use of Wangkatja in the school is yet to be fully articulated. The use of computers to promote literacy attitudes and skills has used both English and Wangkatja within a largely traditional Anglo classroom environment. Although the use of a range of computer strategies has had a marked impact on students' literacy skills, particularly in the younger children, this may have been diluted somewhat by the lack of an explicit plan for the promotion and use of Wangkatja in the school curriculum. Perhaps the Ministry's new bilingual program, to be trialled in the Kimberley in 1991, will help this articulation.

The biggest issue to be resolved is to what degree a formal program in Wangkatja should be separate or parallel to an English program. Harris, 1989, warns that the home language may be trivialised by being taken into the school to be taught. He argues for significant culture domain separation within a two-way school curriculum design; the two langauges being used for different purposes. For Yintarri this would imply that literacy in Wangkatja would

only be used for recording and transmitting Wangka culture rather than as it currently does for purposes which might be identified as Anglo. Although the Yintarri approach has been considerably weaker than Harris would recommend, Cummins (1990?) suggests a school gives strong messages in a variety of ways about how it values the home culture and language. Cummins' views suggest that student empowerment occurs as teachers begin to legitimise the home language and de-legitimise the deficiencies in their students' second language, English. Early experience at Yintarri supports this view. However, it is clear that a long-term perspective needs to be taken in any future program so that the strategies can be articulated and carried through staff changes which will inevitably occur at such a remote school. Therein lies the main challenge for the Yintarri Community School.

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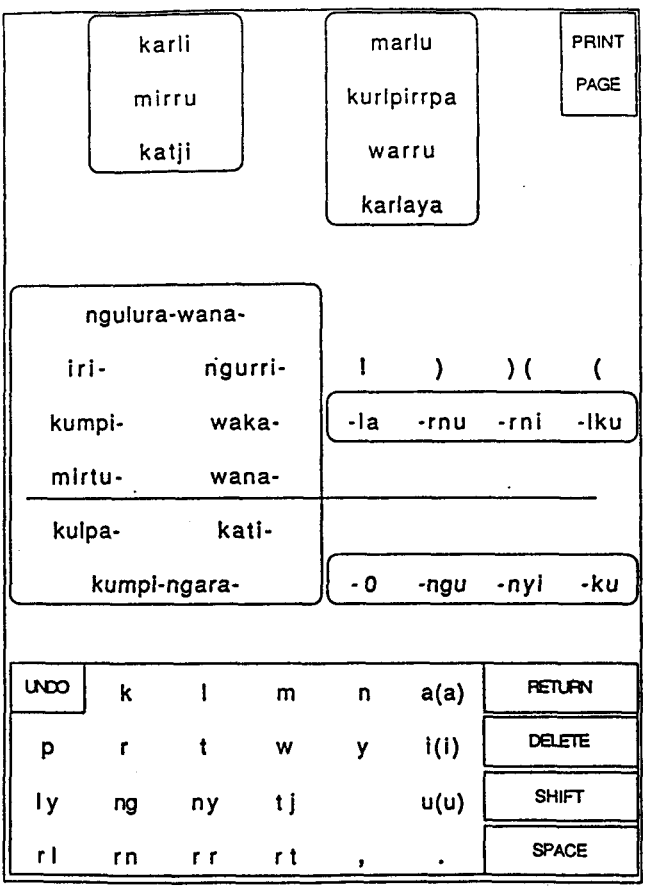

Fig 4: 'Unstructured' Wangkatja hunting overlay

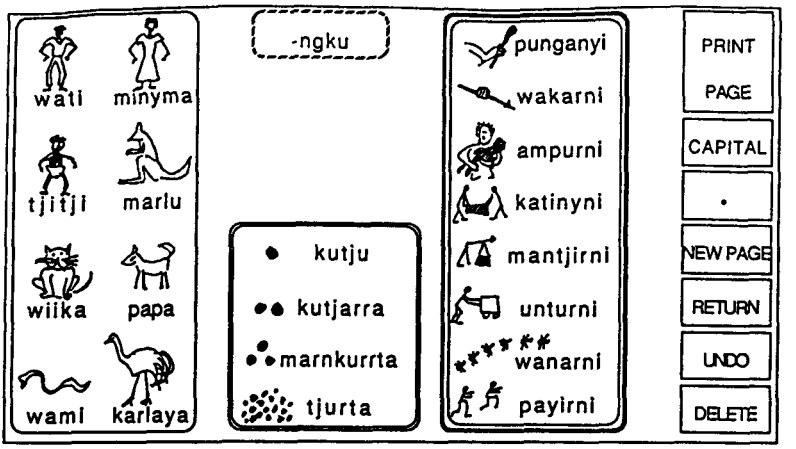

Fig 2a: 'Semi-structured' Wangkatja overlay

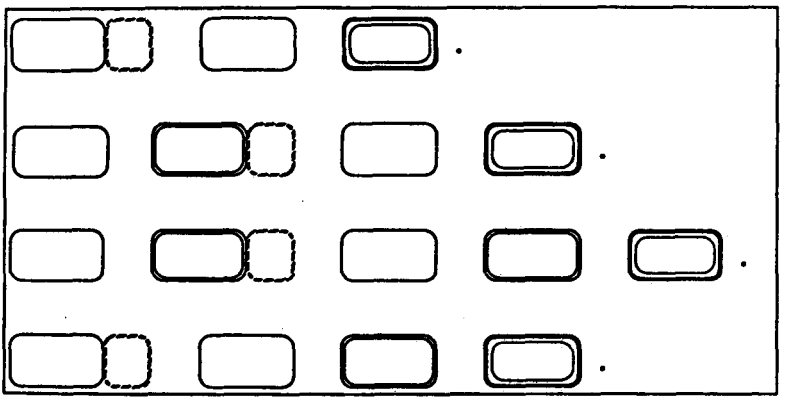

Fig 2b: Legal Wangkatja 'colour' sequences

Note: Different box edges indicate colours used

neba	labda	garra	tok	kol		-ap	-bat
bin	masbi	kip	tjak	ab	-am	-at	pinij
yusda	maitbi	kipgoan	bay	grow		-araun	najing
shuda	nili	stil	faind	fil		-awei	orlataim
shudbi	wanda	yet	siy	breik	-im	-oba	orlas
shudn	les	jes	id	gib		-of	ebritaim
	kin	stat	kuk	kaund		-bek	
	kan	stap	run	duw	-um	-dan	
	don	trai			-in	-in	
	masn	trayinda			-ing		

Fig 3: Fitroy Valley Kriol