

Chapter 8

Word prediction

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8 WORD PREDICTION

“Alan...refused to do any written work because he had failed so often. Word processing packages alone had been ineffective since his keyboard skills were fairly limited and his spelling was poor. [Using Co:Writer] Alan could produce well-presented work of which he was proud.”

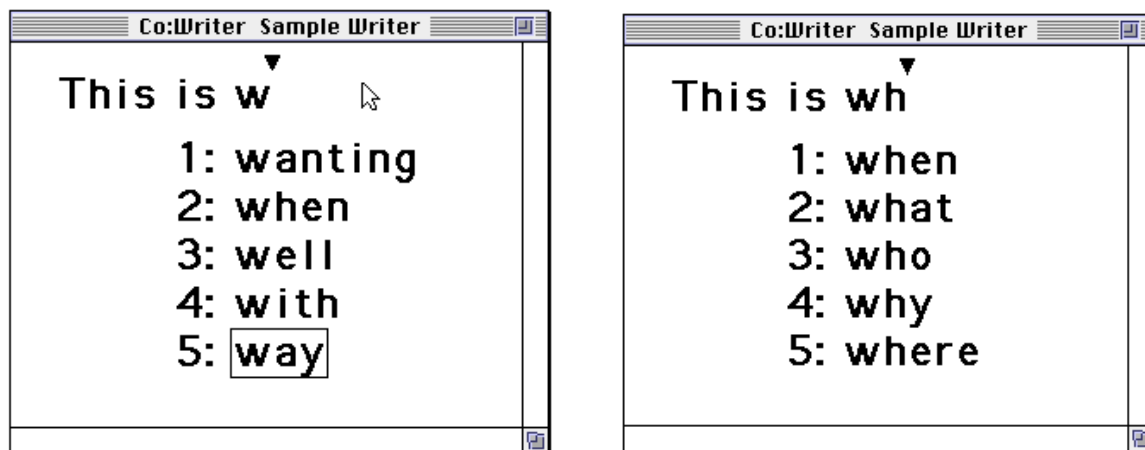
(Nisbet, L., 1995)

8.1 Word predictors

Word predictors analyse the words as they are written on the computer, and try to ‘predict’ the words that the pupil is most likely to want, from a dictionary or *lexicon* of words. The pupil types a letter and the program offers a list of the most common words beginning with that letter. If the required word is on the list, the pupil selects it with mouse or keyboard. If the word is not on the list, the pupil types the next letter and a different choice of words is offered.

In Figure 8.1, James wanted to type ‘where’ and so pressed ‘w’ to start. The predictor (in this case *Co:Writer*) offered ‘wanting’, ‘when’, ‘well’, ‘with’ and ‘way’. James scanned the list and since the correct word was not offered he typed the next letter – ‘h’ – and the predictor offered a set of words beginning with ‘wh’: ‘when’, ‘what’, ‘who’, ‘why’, and ‘where’. He then hit ‘5’ and ‘where’ was typed into the text. Sometimes when he was not sure about a word in the list he pointed at it with the mouse, and *Co:Writer* would speak it out.

Figure 8.1: Using a word predictor. In this case, the writer only needs to type 2 letters before the target word, “where”, appears on screen.



Word predictors can reduce the number of keystrokes needed to type by up to 50% (Venkatagiri, 1993) and so pupils with physical disabilities use them to reduce effort and increase endurance and therefore the amount that can be written in one sitting.

Word prediction can also help people with spelling difficulties because the writer only needs to type the first few letters of the word and then select it from the list of words offered. For pupils who have difficulties coming up with the next word in a piece of writing, a prediction program can suggest words the pupil may want to use. Lastly, many writers find the interaction with the predictor – the process of typing a few letters and seeing if the predictor ‘knows’ it – interesting and motivating.

Research at the University of Dundee (Newell et al, 1991a, 1991b, 1991c, 1992), has shown that use of word predictors can result in:

- an increased vocabulary;
- correct use of word endings;
- improved sentence structure;
- greater confidence, self-esteem and motivation to write.

Some literacy skills are necessary to be successful with word prediction. Pupils need to be able write the first one or two letters of the word correctly and then recognise the word in the list. Some writers cannot get the first letters right; others may miss the word when it is offered in the list or choose a different one by mistake. Some pupils also find that shifting attention between the text, the keyboard and the predicted list interrupts their flow of thought and slows them down.

8.2 Word prediction and early writers

Prediction is usually thought of as a relatively sophisticated writing technique for older learners but it can also be very effective with younger pupils, if viewed as a type of word bank. The key to this approach is to devise 'closed' learning tasks, and use a small lexicon with vocabulary matched to the exercises. Figure 8.2 shows a simple prompted writing task where the writer has to complete the sentence using the predictor and key words.

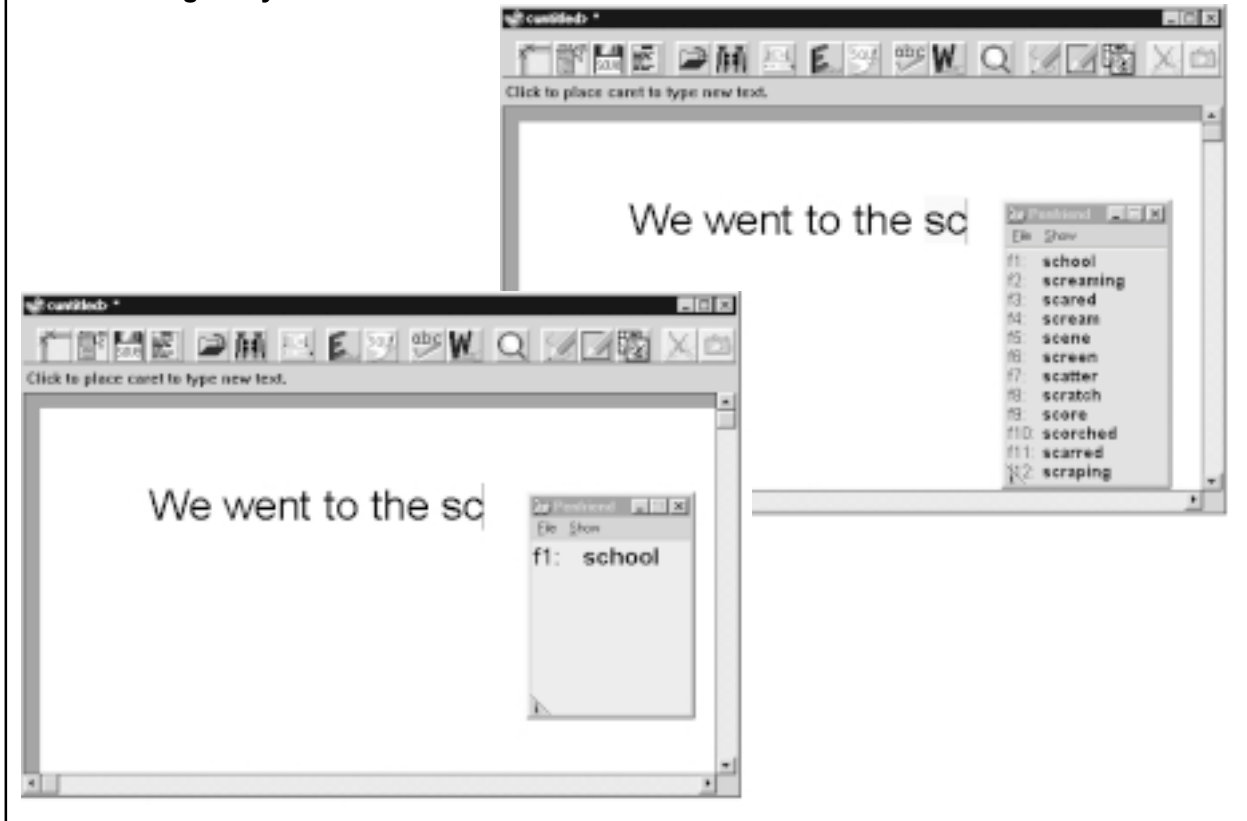
Figure 8.2: Early writing task using a predictor



It is essential to use a suitable lexicon for this sort of activity. A lexicon for older writers may have upwards of 8,000 words (the biggest lexicon for the *Co:Writer* predictor has 40,000), which is far too big and contains too many unusual words for young writers. A starter lexicon for young pupils might have less than 100 words, matched closely to the writing task, to make sure that the word appears in the prediction list.

The example in Figure 8.3 shows the difference when writing “We went to the school” using the 500 word and 10,000 word lexicons supplied with *Penfriend for Windows*. After typing “sc” of the last word the writer would be offered the desired word on it’s own with the smaller lexicon, but twelve words are offered with the larger lexicon. Early writers, or those with word recognition difficulties, will be more successful with the word predictor if the lexicon is prepared with only those words which they need, and does not offer other potentially confusing words.

Figure 8.3: Comparison between 500 and 10,000 word lexicons. Only one word – the desired word – is offered by the smaller lexicon, while the larger lexicon creates confusion by including many additional words.



8.3 Word prediction and writers with spelling difficulties

Word predictors may help writers with spelling difficulties provided the writer can:

- type the first one or two letters of most words correctly;
- select the correct word from the list.

Professor Alan Newell and his team at the University of Dundee pioneered development and research into the use of word prediction and found that some writers benefited from a 65% reduction in spelling errors when using the *PAL* word prediction (Newell & Booth, 1991c).

Like any supportive writing tool, prediction will suit some writers but not others. Using a predictor does require concentration and some degree of literacy. The writer must pay attention to the spelling of each word as it is written, whereas many writers prefer to concentrate on getting the words down on paper and check the spelling at the end. Prediction may also slow down the pupil and can break the flow of thought and writing. For this reason it is perhaps most useful for pupils who are not quick typists and who have significant spelling and reading difficulties.

Figure 8.4: Case study – effect of word prediction on writing

Donald is a very intelligent student in secondary but suffered intense frustration from his failure with written work. He was starting to be disruptive and uncooperative and this was causing his teachers and parents some concern. He is very imaginative and loves to write stories and poems, but these were often unintelligible (he used to spontaneously draw pictures and symbols in his text to convey words and ideas he could not put into language or spell). He started using a *Tandy WP-2* portable word processor (similar to the *DreamWriter 100*), with quite promising results. It helped compensate for his problems with handwriting, and increased the length and accuracy of his work, as well as improving his motivation to try and compose written work. However, the spellchecker could not cope with many of his spelling attempts, and did not give any support with his language organisation difficulties.

He was then given a Toshiba PC laptop computer running the PAL word predictor*, and started to do much better. He was reassured by the list of correctly spelled words displayed each time before he wrote a word. As well as the improved spelling, there was a noticeable improvement in the length of his work, his vocabulary as a whole, and his sentence structure, which had all been held back and affected by his spelling difficulties.

* *PAL* was one of the first word prediction programs. It was developed by the Microcomputer Centre at the University of Dundee, who pioneered much of the research into the use of prediction. It is no longer available: *PredictAbility* is the latest 'descendent' from the original *PAL* program.

Donald, described above, benefited from word prediction. The case study in Figure 8.5 is included to illustrate how prediction may not help the writer:

- Although supportive writing technology might improve a writer's speed and quality, it is unlikely to enable the pupil write as well as his or her peers.
- Predictors and spellcheckers help mainly with 'word level' difficulties – they do not necessarily help writers who have some difficulty planning and organising their work (although some pupils do find that their overall writing improves because they spend less time and concentration on spelling, and can concentrate more on content and meaning).

Figure 8.5: Case study – using a word predictor to improve spelling accuracy

Alan is in second year at secondary school. There is a discrepancy between Alan's general abilities and his writing:

- Alan's reading is satisfactory but he has significant problems with handwriting.
- Both Alan and other people find his written work is untidy and difficult to read.
- He writes slowly partly because of physical difficulties forming letters but also because of the time needed for him to think about spelling
- His writing is much better when copying from the board.
- He has difficulty with spelling a significant number of words.
- His spelling mistakes have a common pattern:
 - he often forgets to capitalise the start of sentences;
 - he may miss out one letter of double letter words (e.g. 'ading' instead of 'adding');
 - he sometimes splits words into two parts (e.g. 'on ly');
 - he generally start words correctly;
 - some mistakes are consistent (e.g. 'wen' instead of 'when');
 - generally he uses a phonetic approach to spelling:

suddinly	=	suddenly	yestirday	=	yesterday
throw	=	through	brace	=	brake.

Despite substantial learning support in primary school and in secondary school, these difficulties had continued into secondary.

Figure 8.5: Case Study – using a word predictor to improve spelling accuracy (continued)

Sample of Alan's handwriting.

Solubility and saturated solution
 When a solute is added to
 a solvent a solution
 is formed. How much solute
 we can dissolve depends on
 temperature of the solvent;
 the solvent used; and the volume
 of the solvent. When a
 solution contains as much
 solute as it possibly
 can at that temperature,
 we say the solution is
 saturated. No amount
 of stirring or shaking
 will dissolve more solute
 to dissolve. Only by
 heating the solution or
 adding more solvent is it
 likely that more solute
 will dissolve.

Alan had some experience with computers and word processors. He had completed a module in word processing and had a computer at home. He said that he used the *MS Works* word processor for homework but that he did not find it any quicker than writing, although he did use the spell checking facility to produce more accurate work.

Running a sample of his errors through the standard *MS Works* spellchecker revealed that it could identify and correct most of them, so Alan practised with a PC in the Learning Support department for a few weeks. He was also provided with a Franklin for use in class. Although his finished work with the computer had fewer mistakes, his writing was still very slow – around 2 words per minute for a 'free' writing activity. The reason for this was that he had to think about the spelling of practically every word (even simple words like 'was') before typing them.

Since Alan was generally able to type the first few letters of each word, a word predictor was loaned for evaluation. It was hoped that the predictor would increase his writing speed by reducing the need to spell every word; and that the built-in speech and 'smart punctuation' (automatic capitals after a full stop) would improve his sentence construction.

The evaluation was positive and the *Penfriend* word predictor was purchased for his use. Some weeks later the school was contacted to follow up Michael's progress. The head of learning support said that although his writing was better with the predictor, it was still slow because Alan preferred to draft out his work by hand and then write it with the word predictor. Often he missed the word on the list and needed to spellcheck the final version to produce a text free of errors.

- Good writing and editing strategies are essential if supportive writing tools are to be of any help – Alan’s technique, involving drafting by hand, and typing using the word processor was slow. As he becomes more accustomed to writing using the computer, we would hope there is less need for drafting by hand.
- Secondary school is getting too late to learn new tools and writing strategies: if you are involved with writers who may benefit from supportive writing technology, try to investigate and introduce the systems at primary school.

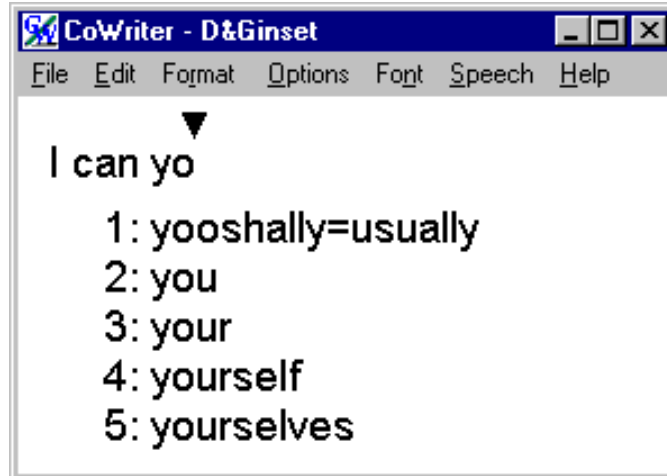
Handling idiosyncratic spellings using a word predictor

A word predictor can be used as a sort of single-word spellchecker and may be more effective than a standard spellchecker. The writer produces most of the text without using the predictor, and only opens the word predictor window to check particularly difficult words.

For example, most of the spellcheckers we tested in Chapter 14 had difficulty with split words like ‘*con tans*’ (*contains*) and ‘*all sow*’ (*also*), and longer, bizarre misspellings like ‘*choklis*’ (*chocolate*), ‘*scnis*’ (*science*) and ‘*vestidl*’ (*vegetable*). The better word predictors are able to offer these words after the first two or three letters have been typed.

If the writer cannot type the first few letters correctly, *abbreviation expansion* (see Chapter 6) can be used to adapt the lexicon to deal with these words. Abbreviation expansions can also be used to type long, difficult to spell words from a short abbreviation.

Figure 8.6 Using abbreviation expansion to handle idiosyncratic spelling



8.4 Word prediction and writers with learning difficulties

Word prediction programs can also help writers with more general learning difficulties, who have significant problems with all aspects of writing.

Donna’s story in Figure 8.7 shows that it is essential to set the program up to suit the learner and the task. In particular, she needed to use *Repeated Predictions* because she often failed to see the word when it was offered in the list the first time. *Adaptive Learning* was turned off and any new words which the learning support teacher knew would be needed were added to the predictor dictionary so that they were available for the pupil *before* she started to write.

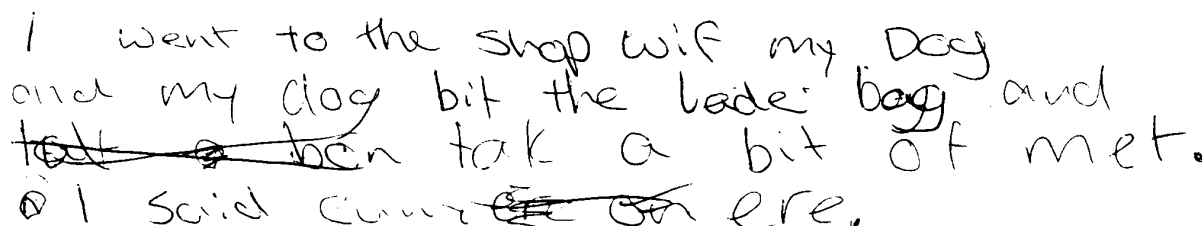
Figure 8.7: Case study - word prediction & speech output for a writer with moderate learning difficulties

Donna was introduced to *Co:writer* and *Write:Outloud* in S2, in an effort to help her become a more independent writer. She had moderate learning difficulties, a reading age of six, extreme difficulties with spelling and poor handwriting. Her main problems with reading and spelling were linked to her inability to use phonics past a basic level. In addition, her sight vocabulary was limited.

Donna accessed the curriculum through a reader and scribe or had work adapted where possible. Although she was often not at all motivated to work, she also did not always want a teacher writing for her. She liked to copy what the support teacher had written as it gave her a feeling of having done something for herself. The problem with this however, was that it was often full of mistakes due to Donna's inability to copy accurately.

Initial work with the predictor and talking word processor proved very positive even although Donna needed a lot of help and was very slow. An illustration of her first piece of work using the software is given below.

Before



I went to the shop wif my Dog
and my dog bit the lade bag and
~~take~~ ~~a~~ ~~bit~~ ~~of~~ ~~meat~~.
I said cum ~~ere~~ on ere.

After

I went to the shop with my dog. My dog bit the ladies bag and took a bit of meat. I said cum here.

Using the talking word processor and predictor, Donna's work improved and increased in volume. She also became better at thinking while working on the computer rather than having to write ideas and words on paper first. The biggest problems experienced by Donna using the predictor and talking word processor were:

- 1) She had difficulty coming up with the correct first letter of a word at times which meant she had to ask for help. Discussion prior to the writing task helped to some extent, as did typing the words Donna would need into the lexicon. It was also important that *Co:Writer* was set to its smallest lexicon to ensure that inappropriate words would not be offered.
- 2) She could not always recognise the correct word when it was read aloud by the computer due to the way that it was pronounced. The pronunciation of these words had to be changed using the *Pronunciation Exceptions Dictionary* so that Donna could identify the word.

8.5 Introducing word prediction to a writer

Most word predictors have several options and lexicons and so need careful setting up before they can be used productively.

- 1) Try using the program yourself, explore the various lexicons and settings, and read the manual.
- 2) Set up the lexicon so it contains an appropriate number and type of vocabulary. Add any new words which the writer will need (see *Adapting the lexicon* below).
- 3) Set up the options in the predictor. We suggest the following for writers with spelling and writing difficulties:

Lexicon size and type	adapted for the writer and task – see below
Adaptive Learning	<i>off</i> (usually – see below)
Save lexicon automatically	<i>on</i>
Smart punctuation	<i>on</i>
Affixes	<i>on</i> (but show the writer how to use it, and try it first)
Repeated predictions	<i>off</i> for writers with good word recognition skills, <i>on</i> for writers who tend to miss the word the first time it is offered
Recent word use	<i>on</i>
Next word prediction	<i>on</i> for older writers who know the word they are wanting to type; <i>off</i> if the writer is very young or gets confused or distracted by the next word list.
Fixed/dynamic prediction	<i>dynamic</i> for most writers, which gives more efficient prediction. <i>Fixed</i> is useful when the lexicon has been adapted with the words the user is likely to need.
Window position and size	adjusted to suit the user
No. of predictions offered	6 (more if the writer has good word recognition skills)
Text font, size and colours	adjusted to suit the user

- 4) When prediction, or any other supportive writing tool is introduced to a writer with spelling difficulties, it is helpful to use short exercises which let the pupil concentrate on learning to use the tool. Copy-typing exercises, cloze procedures, and story starters and writing frames are all useful techniques.

8.6 Adapting the lexicon...

It is absolutely essential that the word predictor lexicon contains the words the writer will need, and that they are offered as quickly as possible. If the required words are not in the lexicon, the predictor is useless to writers with spelling difficulties.

Most predictors let you add new words and edit the lexicon reasonably easily and quickly.

...for an early writer

To create a small tailored lexicon for an early writer or someone with a small writing vocabulary, the teacher starts with a suitable 'base' lexicon which has a core vocabulary appropriate for the writer and the task. The base lexicon can be as small as 500, 100 or even zero words. *PredictAbility* is particularly good in this respect because it is supplied with nine lexicons, with 0, 100, 200, 300, 400, 500, 750, 1,000 and 5,000 words and it is easy to 'upgrade' a writer's lexicon to a larger size. Some of the other

programs have much larger lexicons which may not be as useful for younger learners – see the features charts and reviews in Chapters 15 and 16.

...for a writer with spelling difficulties

Writers in later primary school, and early secondary pupils with spelling difficulties (but not general literacy or learning difficulties) will need a fairly large dictionary of 2,000 to 15,000 words – the standard ‘default’ dictionaries supplied with the predictor programs are usually suitable.

Most predictors have two techniques for adding new words to the lexicon.

The simplest is to start the predictor running and switch on *Adaptive Learning* so that any new words are learned by the program and added to the lexicon. Then the new words are simply typed into the word processor and automatically added to the dictionary.

Another technique is to use *Training by text file*. Here, a file containing the words you want to add is imported into the word predictor, which automatically extracts any new words and adds them to the lexicon. Most predictors have a training by text file facility.

If the writer can usually spell new words which are not in the dictionary themselves, correctly, adaptive learning can be used. Sometimes pupils are also motivated by ‘teaching’ the predictor new words for their own writing tasks. However, it is important to review the predictor dictionary regularly (once a week at least) to weed out any unwanted or mis-spelled words that are inadvertently added. Most of the word predictors collect or identify new words that have been added so that unwanted ones can be easily removed.

Many writers will have difficulty with spelling new words correctly and if this is the case *Adaptive Learning* must be switched off so that mis-spelled words are not learned inadvertently. If the writer needs to add new words, he or she should ask for help from a classmate or member of staff.

It takes time and effort to create an effective personalised lexicon and prediction settings for a writer and so it is important to make sure they are saved and backed up so that other users of the predictor do not accidentally use and corrupt them.

8.7 Word predictor summary

Word predictors are useful for pupils with writing difficulties because they:

- ✓ reduce the number of keystrokes needed for typing;
- ✓ can offer the writer a list of (hopefully) appropriate correctly spelled words.

Word predictors are worth investigating if:

- ✓ the writer is a slow typist;
- ✓ the writer has to think about the spelling of most words;
- ✓ the writer can usually get the first few letters of the word correct.

Things to look for in a word predictor:

- ✓ effective word prediction (see Chapter 15);
- ✓ suitable standard lexicons for the writer and the topic;
- ✓ good lexicon/dictionary editing tools;
- ✓ other support features: speech output, built-in spellchecker, on-screen keyboard, links to switch-operated special access programs.