

Talking back and writing: Using a speech synthesiser and strategy instruction with students who have difficulty writing.

Lois Wilkinson
Education Department
Massey University
Palmerston North
and
Bill Anderson
Palmerston North College of Education
Palmerston North

Paper presented at the Joint AARE/NZARE Conference, Deakin University, Geelong, 22-26 November, 1992.

Children with learning difficulties in New Zealand constitute a mainstreamed group for whom there is variable recognition in terms of finance and resources (including teachers) to meet their special sets of needs. Children who are experiencing difficulties with writing receive little regular, additional or remedial instruction. However in later grades at school, writing assumes an increasingly important role as more and more evaluation of subject areas is based on the content accuracy and logic of a written product. Logical writing and the skills basic to this are therefore requisite skills for all students. In North America research that has focussed on the compositions and writing processes of students with learning disabilities shows that these students at all levels are less productive or fluent (Nodine, Barenbaum & Newcomer, 1985) and that their compositions are less cohesive (Newcomer & Barenbaum, 1991) and contain more errors of both transcriptional and syntactical nature. Rather than narrowing as students mature, the gap between composition achievement of students with difficulties and those without tends to increase (Houck & Billingsley, 1989). The reason for this increase is likely to lie in a combination of factors. Metacognitive interviews with students with writing difficulties showed that their understanding of the planning processes involved in the production of a piece of writing was incomplete (Wong, Wong & Blenkinsop, 1989). These students had a limited conception of the nature of revision, concentrating mainly on mechanical errors in punctuation and spelling, rather than on text-meaning alterations (Graham, Harris, McArthur & Schwartz, 1991). Further, they did not reflect on the goal of their piece of writing and had more difficulty than other

students of similar age in maintaining a holistic plan. The lack of specific remedial instruction in writing for these students is suggested by several researchers (e.g. Christenson, Thurlow, Ysseldyke, & McVicar, 1989) as a factor in their failure to improve. This is supported by the reports of positive effects on productivity, cohesiveness and accuracy when specific instruction in aspects of writing have been used in intervention (Lynch & Jones, 1989).

Generally, researchers have found that increasing students' awareness of the cognitive processes involved in learning activities, and building on this heightened awareness with a relevant metacognitive strategy, has helped overcome the problems faced by students with learning difficulties (Mulcahy, Marfo, Peat and Andrews, 1986; Reid, 1988). Metacognitive strategies give students a plan with which they can act and, when the plan is successful, motivation increases and passivity decreases. Several studies have shown that 'teaching' a metacognitive strategy had a beneficial effect on the fluency, planning and revising of compositions of students with writing difficulties (e.g., Wallace & Bott, 1989). A comprehensive review on the effects of strategy intervention as well as other types of intervention on writing is provided by Graham et al. (1991), who concluded that "...strategy instruction is a productive method of improving what and how students with LD write..." (p.102).

Computers and Writing

Arguments for the use of the computer as a writing tool in schools come from a large number of studies that focus on both the writing process and the written product. In a recent comprehensive review of this literature, Cochran-Smith (1991) summarises the major findings, and indicates that student writers using word processors: revise more, write more, spend more time writing, produce neater, more error-free texts than they do with paper and pencil, and generally have a positive attitude toward using a word processor for writing. Cochran-Smith says that "...word processing, in and of itself, generally does not improve

the overall quality of students' writing..." (1991, p.114), but also that when word processing use is accompanied by instruction in which writing is portrayed as a meaning making activity, writing with a word processor "...may facilitate the production of discovery centred texts and increase meaning level revisions..." (p. 114).

Very few studies have considered the use of word processors specifically for writing by students with learning disabilities. The first major study in this area (MacArthur & Graham, 1987), found no evidence of improved or significantly altered revising behaviour or written products by learning disabled (LD) students as a result of the use of word processors in writing. This finding was supported by Outhred (1989) who found there were no

significant differences between handwritten and word processed compositions in numbers of mechanical errors or ratings of quality.

These latter results are not surprising. To argue for positive effects because of word processor use by itself, is simplistic. The impact of computers on writing depends on the social and instructional context, where the word processor is a vehicle that opens up the writing process and enables writing to be easily analysed, reviewed, edited and improved. Within this view of word processors as part of the instructional process-writing environment, studies have shown students with writing difficulties gain benefit from word processor based instruction in contrast with conventional instruction methods (Dalton & Hannafin, 1987). Also, word processing facilitates the learning of revision skills in an instructional context that teaches those skills (Graham & MacArthur, 1987) - a finding endorsed by Morocco & Neumann (1986). In her review, Cochran-Smith (1991) supports these individual conclusions. Her comment that "...the ways word processing is used for writing result from the interaction of teachers' goals, the social organisation of classrooms and the features of word processing..." (p. 147), points to the need to actively develop instructional and social contexts in which students can best utilise the word processor as a powerful tool for writing. This emphasis in the area of word processor use meshes neatly with the strategy instruction approach advocated as a means of helping LD students develop and improve written skills.

The addition of speech to word processors to enable text to be read back to the writer may, within the appropriate instructional context, enhance aspects of the writing process. Rosegrant (1986) in a six month study of the use of a word processor and speech synthesiser, suggested that students who hear their writing are able to develop a more 'critical ear' and thus revise more effectively. As the students hear the computer "speak" their written words, they may be encouraged to take the perspective of audience, rather than author and understand that writing is about communicating meaning to others.

Such changes will not occur automatically. Borgh & Dickson (1992) provided a group of students with access to a word processor with speech synthesis with the expectation of students writing longer texts, editing more, and writing higher quality stories than they would with access to a word processor without speech. They also predicted that writers would report increased motivation and increased audience awareness. Students did edit more on a keystroke basis when using the talking word processor, but there were no differences in length or in quality between texts produced with or without speech feedback. Students did report increased motivation to write with the talking word processor, but there were no apparent differences in audience awareness between the two conditions. A possible explanation for

the lack of significant changes lies in the expectation that students will utilise the potential of speech feedback to change their approach to composing. However, as Cochran-Smith (1991)

points out students merely assimilate the capabilities of word processing, and presumably speech feedback to their models of composition when use is not accompanied by instructional intervention.

Strategy instruction and word processing

The study reported here then, investigated the combining of a word processor with speech feedback with metacognitive instructional approach as a means of improving the planning and revising elements of the writing process (the fluency and quality of compositions) of mainstreamed students with writing difficulties. It was hypothesised that the 'package' would increase both the productive and revision elements of the writing process. Specifically, the word processor and printer would provide the students with neater products, the speech-feedback would provide the chance to be their own critical or satisfied audience and simultaneously model a read aloud editing method. The experience of repeated listening to their own text may also allow the students to maintain a holistic sense of each piece of writing. As their own audience students should be able to hear errors and make decisions on the meaningfulness and/or completeness of their writing. The metacognitive strategies chosen were designed to cover planning processes involved in writing as well as the revision and editing processes. They were designed to increase self-talk and an active attitude towards writing, revising and editing.

The combination of strategy instruction related to writing skills and use of a talking word processor thus appears to afford students with writing difficulties the opportunity to develop written language expertise.

Method

Participants and setting

The study was conducted in a provincial city primary school in an open-plan class area used by two classes of Year Five and Six students. The two teachers combined for some theme work but at other times the classes operated independently. There was more independent work by the classes in the second term as trainee teachers were on placement, and the classes worked with each trainee. Two computers in the area were available for use by both classes. These computers were incorporated into some theme work and these were also used by mainstreamed students with special needs.

Four students described by their teachers as "having difficulties with writing" were chosen from their classes by the teachers at the beginning of Term One. A fifth student, described by his teacher as "an average writer", also became part of the group.

Shaynna and Stephanie were Year Five girls; Ron, Jon and Jarred were Year Six boys. One student had previously been identified as a special needs student, and had taken part in a remedial reading programme. He was not taking part in any other individualised programme during the course of this present study. None of the other students had received any remedial instruction. Teachers were asked to choose students with writing difficulties only, if possible, but pre-testing showed that both Ron and Jon were reading approximately two years below their chronological age at the beginning of the year.

Procedures

The study took place over a period of approximately seven months, and could be divided into the following phases:

Phase 1 baseline data collection (variable, from one to four weeks)

Phase 2 strategy instruction outside the classroom environment (one week for each student)

Phase 3 post intervention with support available (throughout the first term, and including the first six weeks of term two)

Phase 4 post intervention with little support available

Two formal meetings were held with the class teachers. The first was held prior to the beginning of the study and the second at the end of Phase 3. At the first meeting, teachers' cooperation was sought to encourage the students to use the computer for any writing, as the writing done by the students in this study was to be that required by the normal classroom curriculum. The goals of the programme were discussed with the teachers, and they learnt how to use the computer and software. The second meeting was a formal semi-structured interview with each teacher. The children and their parents were informed of the aims of the study and permission for their participation was sought and obtained. All children expressed pleasure at being able to participate. Parents were invited to a meeting about the research and this was attended by three mothers.

Baseline observational data was collected for one week prior to pretesting and intervention beginning. As no specific test data existed on these children, pretesting was conducted with each child prior to their week of instructional intervention. Tests given were the Burt Word Recognition Test, Westwood Spelling Test, The Test of Written Language, 2nd edition (TOWL-2), and a test of academic self-concept, the Perception of Ability Scale for Students (PASS). The children were also interviewed to determine how they went about producing a composition. The intervention was carried out by the two authors, one providing the instruction in strategy use and the other instructing in the use of the software (including control of the speech synthesiser) and the ways in which text could be revised

or altered.

After Phase 3 post-testing with standardised tests was conducted.

Instructional Procedures

Software

A Toshiba laptop T1200LE complete with the integrated package First Choice provided the word processor facility for this study. Provision of a laptop computer meant that students could take the computer home to work on their writing if they wished. A speech synthesiser incorporated in the computer (Soundproof, developed by Pulsedata for sight impaired people) could be activated by the students whenever required. Once the synthesiser was activated, students were able to specify whether to read words, lines, sentences or paragraphs, and could also navigate around the text and choose to read different text segments. As each word was read, it was highlighted on the screen by appearing in inverse screen attributes. Because the synthesiser was a screen reader, it could be directed to read the contents of windows that appeared over the text such as spell checker windows or menus. Output could be through either a built in loudspeaker, or a set of headphones that cut off the loud speaker. Writing or editing could not be carried out while the synthesiser was activated. All class students were familiar with word processor use. The students in this study were given additional instruction in the operation of the First Choice word processor. Instruction in speech synthesiser use included elements relating the speech output to the text. Students were given the instruction to listen to their story, or part of it, "...so that you can be sure that it makes sense...". They were told to listen to a sentence and be sure it made sense before going on to the next.

Strategies

As each student was tutored individually the instructional period was 6 weeks long. (the classes attended a camp two weeks after we began the project). The instructional steps were as follows: Following an introductory lesson with the computer the students were given their first strategy lesson.

1. Lesson one included an introduction to using strategies and revision of the components of a good story. This built on the information they had given in regard to their knowledge of composing. Two strategies were introduced:

- (i) the concept of POWER writing; and
- (ii) the Bare Bones diagram as the basis for self-questioning.

This lesson emphasised the 'planning' pre-writing aspects of writing. They were asked to analyse a story written by a student of similar age in terms of the 'writing' elements discussed.

2. Strategy lesson two revised strategy use and the planning strategies and then focussed on the organisation of ideas. For narratives the idea of a story map development was discussed and

another student's story was used in an analytical way as a model. Students were then required to write their first piece on the computer using both a story map and the 'bare bones'. self-questioning and self-talk were modelled and encouraged.

3. Strategy lesson three extended the organisational aspects for expository writing by introducing the use of a 'spidergram' for the collection of relevant knowledge. Each student constructed a spidergram and used it as the basis of a short expository piece of writing.

4. Strategy lesson four revised the concept of power writing and introduced the COPS editing plan as a means of improving the accuracy of their writing. The revising and ease of editing capabilities of the computer with Soundproof package had been introduced and practised and the lesson progressed with active incorporation of the COPS on one of the products written during the week.

In this lesson the notion of 'think aloud' was modelled as a means of both producing text and altering it in some way. The concept of audience and also of being satisfied with a piece of writing was reinforced during Soundproof use.

During Week 6 of the intervention phase each student was given a revision lesson on POWER, Barebones and COPS, while the student who received instruction last, received his revision lesson two weeks later. To reinforce strategy use, posters were placed near the computer and reminders to use strategies were taped on to both the computer and printer. As the year progressed it was apparent that the children were being required to do very little expository writing. For this reason use and reinforcement of the spidergram organising strategy was not continued.

Throughout Phase III reminders were given verbally to individual students especially those who were seen to be off-task or having difficulty with the classroom task.

Data Collection

During Phase III observations were made during students' writing lessons. Note was taken of the five students' participation, use of computer, use of Soundproof, use of conferencing procedures, strategy use and productivity. All the files saved on disk were printed and versions of the same story were compared for length, evidence of revision, editions, and the errors corrected and remaining were classified. Errors were categorised as:

1. causing meaning breakdown
2. grammatical
3. spelling.

As many other samples of writing were collected as possible and these were analysed in a similar manner.

Within the study reported here, the way in which the package we devised would operate within the classroom setting was of particular interest. Graham et al. (1991) suggest that "...instructional writing research involving students with LD needs to move into the classroom... (and) ..even though

most...research did occur in school settings, it is unclear...if teachers would use the same procedures in their own classrooms" (p. 110). Clearly this move to take account of classroom conditions reflects the same concerns expressed by Cochran-Smith's (1991) call for consideration of the instructional and social context of word processor use. In reporting results and the discussion that follows we intend to focus on those

individual and classroom factors that had an impact on the development of the writing process for the children who participated in the study.

Results and Discussion

Since the intervention occurred in the classroom, the classroom context was constantly interacting with the programme and that interaction became a very important feature of the project. The five children all showed different patterns of responses to the intervention and the class context, and the changes observed for each child will be noted and discussed separately first.

Following that we shall identify and discuss some more general factors that influenced student writing.

Ron

Ron's writing behaviour was characterised by short spells of activity and quite long spells of apparent inactivity, but Ron was rarely distracted by others in the class while he was writing. When writing, Ron worked quite slowly, and there was no appreciable difference between his writing speed on or off the computer. As an example, he wrote the following, listened and edited using Soundproof in just over twenty minutes:

He would often consult SpellWrite, an alphabetised list of frequently used words, but his search behaviour was limited to locating the initial letter of a word and scanning all words with that beginning. Quite often it was Ron's use of Soundproof that initiated the SpellWrite search. Ron was a consistent Soundproof user and eventually moved to combine the spell checker and Soundproof. As many of his initial attempts at spelling words were errors that gave no clue to the spelling checker in terms of options, the spell checker frequently only confirmed Ron's belief that he had made a mistake. Using Soundproof he was often able to shape words to enable the spell checker to provide alternatives from which he would most often choose the correct spelling.

On several occasions Ron was observed using the "Bare Bones" strategy. With two notable exceptions the quantity of text produced by Ron was not great. Those two exceptions were quite similar in content, with an emphasis on violent incidents.

The error analysis showed that most of Ron's word-processed and soundproofed compositions had an improved words/error ratio in comparison with his early draftbook work. A recent improvement had occurred in his draftbook work also. Ron's use of teacher conferencing was spasmodic. If he decided to queue for a conference, he often placed himself quite distant from the teacher with the result that most of writing time passed before it was his turn. If he was then sent back to do his own proof-reading, he often did not get a conference. Prior to the intervention, Ron said that writing was easy if he knew what to write but that he had trouble starting sometimes. He had only published once "as the teacher wanted it done " He gave 'checking spelling with a dictionary' and 'ensuring that sentence beginnings had capitals' as his means of proof-reading. His scores on the TOWL-2 pre-test highlighted the characteristics of his writing. His development of a theme, use of appropriate and varied vocabulary and sentence structure were all average for his age. He is a very poor speller and makes inconsistent use of even the most basic punctuation, often writing with no punctuation or capital letters at all. In the post-test Ron wrote a much longer composition and resulted in improved scores in all aspects of his original writing. His consistent use of correct punctuation and his spelling did not show an improvement in the standardised tests. His reading level and PASS (academic self-concept) scores both increased.

Stephanie

Stephanie's readiness to write was very much determined by the topic. She appeared to be quite capable of writing with reasonable speed and accuracy, but tended to do so only if the subject was one that appealed. When this was not the case she would spend considerable amounts of time on borders for the text, on sharpening pencils, talking to friends, requesting clarification from the teacher and other similar non-writing, but legitimate classroom behaviours. Her work was often incomplete. She published work "if the teachers wanted it done" and occasionally because she "liked the story." The tidiness of her draft work decreased during the year.

Although initially quite keen to write using the computer, she only used it at a consistently low level. At times she was resistant to using it. Texts produced using the computer became shorter while draft book writing and work for activities on pad paper continued to be produced. Stephanie was a frequent Soundproof user when writing on the computer, although when the words per error ratios of her draftbook work and her word-processed stories are compared there is little difference. Her answers in her writing interview prior to intervention showed she already possessed a good knowledge of both the writing/planning

process and the editing process. She reported finding publishing

time-consuming and that writing was easier "if you were able to make your own choice."

The comparison of the pre and post-test results showed no consistent improvement in the transcriptional aspects of writing. However, she also, wrote more fluently in the post-test, using a more varied, relevant vocabulary. Her word attack showed an improvement in the Burt Test but her PASS (academic self-perception) score declined, particularly in the area of mathematics.

Jon

With one exception during the year, Jon always had difficulty starting writing and continuing to write whether writing on computer or off. The one exception occurred when he filled a page and a half of his draft book writing about London in the time of Dick Whittington. On this occasion he said that he was able to write lots "...because I know heaps about it...". His knowledge was derived from two stories that had been read to the class. The next day Jon had rubbed out all but one paragraph of six lines, saying that the story hadn't made sense.

Jon's draft work was difficult to understand. A major difficulty was the real lack of even phonetic sense to a large number of the words he wrote, and this was compounded by problems in making sense of the story structure even when words could be interpreted. Jon did not feel that spelling was a problem for him in his writing. In the first term, Jon sat in a very inaccessible corner of the classroom. He rarely sought attention from the teacher.

Jon used the computer only infrequently after the first term. Although he would listen to Soundproof he often did not change any of his text. When asked if his story sounded O.K., he would shake his head and would suggest words to be fixed. With encouragement he would attempt to do this. However he rarely persevered without support. The highest proportion of errors that Jon corrected using Soundproof was 0.5 and the word per error ratio was similar in both his draftbook writing and his word processed stories.

All aspects of Jon's writing were weak in the standardised pre-tests. In the post-test he too was more fluent and this increased his scores on three of the sub-scales. This result confirmed our classroom observations that his difficulties with the secretarial aspects of writing seriously interfered with his ability to express ideas and demonstrate his authorship. When interviewed about his approach to writing, Jon found it difficult to articulate his understanding. He focussed on micro factors of revision and editing. He thought writing was easier "when you knew more and were more in the mood". He published stories which he liked. The large increase in his academic self-concept score in the post-test is inconsistent with his lack of progress. A closer examination of his profile showed he had given inconsistent replies to several items relating to reading and

spelling and the validity of his score is suspect. He does not appear to be able to openly acknowledge his difficulties. Over-compensation is also one of a range of responses made by students with learning difficulties.

Shayna

Shayna wrote quite willingly, but also liked to spend time working on the presentation details such as borders and headings during written language time. She liked to present neat work and obviously worked to obtain approval from the teacher. Compared to others in her class she was not a fluent writer. Although she was initially very enthusiastic about using the word-processor and Soundproof, she gradually used both less and less. She did however use the COPS strategy when proof-reading her own work and after working with the speech feedback she was observed reading her own stories aloud to herself when proofreading. The error

analysis of her writing showed fluctuating word/error ratios in all her writing. The proportion of corrections made with Soundproof varied from 0 - 0.67. In her interview she spoke on planning and developing a story and making it interesting. She found stories hard to write when she couldn't get many ideas. 'Checking spelling' and 'that sentences made sense' were her responses to editing and revision.

Her standardised writing test scores showed little overall change. In the post-test she wrote less fluently than in the pre-test, but she was the only student to proof-read her composition. Her increased achievement in the contrived TOWL-2 tests reflect her greater attention to the transcriptional aspects of writing. Her academic self-perception scores are both low. She scored very low in confidence and the decrease was largely due to a lower score on the mathematics sub-scale. She did not respond positively to some reading items even though she is actually a good reader.

Jarred

Jarred participated well in all facets of class work. He usually set to a task quickly and followed instructions accurately. He demonstrated more initiative in solving problems for himself. He was a consistent user of the word processor and Soundproof using this mainly as a means to correct spelling, though he also corrected noun/verb disagreement after listening. Of the seven compositions he 'filed' several times, the final forms of five showed a higher words/error than his draftbook work. He investigated other functions of the computer as he was dissatisfied with the basic style of print out. He also coached Ron on the use of the spell-checker. Generally he was a more confident and fluent writer. When asked about planning writing he mentioned both content and presentation and thought it was easier if the teacher started you off with ideas. He had published stories because the teacher wanted it done and he chose

the ones he thought were best for others to read. He saw editing as checking for spelling errors. He was generally unconcerned about punctuation and although the COPS strategy could have been very useful to him he was not seen using it unprompted.

His pre and post-test responses to the TOWL-2 test and the other standardised tests were similar. His academic self-concept score improved slightly and was consistent with his achievement levels. The context of the writing

As noted earlier, the social and instructional context of word processor use are major determinants of any benefit that may arise from such use. While one layer of instruction and support was provided early in this study by the researchers, another, more pervasive and entrenched, arose because the writing that the students in this study carried out was done as part of their class language programme.

For both classes the language programme centred around a series of themes, lasting two to four weeks, from which a number of class activities were generated. A new theme would start with the class gathered together on the floor during which organisation for the theme would be explained and an initial activity pursued.

Setting out activities on the blackboard was the dominant method of making them available to students. Activities emphasised the production of written work although other curriculum areas occasionally featured. The senior area of the school had recently adopted the "Central Editing System" devised by a senior member of staff. After initial writing students were encouraged to read their work out aloud to themselves or a partner as a check for readability and accuracy, and to adjust their work from the evaluation of their reading aloud. Specifically mentioned at this stage were punctuation, spelling and enrichment of sentences - the use of "better" words and adjectives. A variety of types of conference could follow. Peer editing, a teacher, parent or

college teacher conference were the alternatives and could all lead to "level 1" publishing, publishing a piece of writing in which errors may still be present. Only a conference with the teacher could lead to "level 2" publishing, with the ideal being a typed, glossy, illustrated, error-free piece of work.

In both classes students wrote drafts in a draft book and a second and final copy was usually completed on pad paper although on occasions it was published using a word processor. This copy was either placed in a clearfile folder or became part of the class display.

The writing that the students carried out was very much framed by the theme study of the class and the activities that students were required to carry out. Directions with regard to topic were nearly always present even to the extent that sentence beginnings were often specified, and instructions about length (either

maximum or minimum lengths) were frequently part of the class teaching that occurred prior to written work.

Restrictions imposed on topic choice and length have direct implications for the children's writing. The appearance of writing as a routine task often performed by students without a great deal of commitment may result from the removal of student ownership and control of the topic. The students' writing becomes reactive, not creative. An endorsement of this view is found in a comment by one of the students who was asked why she had written such a long story:

"... 'cos I didn't get told what to write. I was able to do my own choice, it made it easier..."

We did however observe that all students on some occasions pursued the writing task with self-generated enthusiasm and direction. The pieces created in this mode were usually longer, content was heavily influenced by the students' interests and often revealed touches of humour. Students were writing with their own voice.

In the face of what appeared to be arbitrary decisions by the students to write with vigour and voice we felt almost impotent to influence their writing towards this state on a more permanent basis in their classroom context. We can only suggest that the key is real choice of topic for the students and support for them in the topic choice and initial planning stages. Our study did not address the issue of topic choice, but was concerned with planning, and we address this point later.

In line with the emphasis of the adopted editing system, teachers' conferences with students focussed on punctuation and spelling. Errors which affected meaning or logic were less frequently discussed. Students referred to teacher conferences as "...getting your work checked..." and would often have to queue to have such a conference. With another of the emphases in the writing programme being the students own proof-reading, it was quite common for students to queue for a teacher conference, only to be told to return to their desk to proof-read their own work first.

Buddy conferences were more likely to result in writers being asked to explain what particular passages in their text meant. From our observations it appeared that students were an interested and critical audience of texts their peers wrote. However, buddy conferences usually only occurred when the teacher specifically requested that students have work checked by a buddy, and this request was not common.

Analysis of student writing to date has concentrated on surface features, the concerns of convention rather than information (Calkins, 1983). These concerns include the mechanical or transcriptional aspects of the writing task such as capitals, punctuation, spelling, and the review functions of proofreading at a word and sentence level. The most noteworthy global feature of this analysis to date is the lack of errors of meaning in both

absolute and relative terms in the writing of all students.

Meaning errors that did occur arose mainly through omitted words, with tense and incorrect use of a linking word being other occasional causes of error. Meaning errors were least likely of the three types to be changed in the students' writing, even with a teacher conference. Most corrections that did occur were the insertion of omitted words. We discuss this point further when we review the use of Soundproof.

Word processor use

Students used the word processor to compose and to copy previously written work in approximately equal amounts. Students made frequent use of the surface editing features of the word processor (delete, insert, cursor movement) both while composing and when checking a finished product (sentence, paragraph or completed text). Although the block move features of the word processor were taught and practised, students were never seen using them. Students were interested in varying the style of print-out and with help were eventually able to do this. The 'neat' but small copy provided was not an incentive for computer use for these students as it was not always appropriate for the theme presentation.

Motivation

The word processor introduced for the study was not just another writing tool, even though two were already present. It was a new toy for the students. There is no doubt that having a talking laptop computer in the class created an initial stir, and that the students wanted to be seen working on it. In this regard our observations support the conclusions of other researchers that students were motivated to work on their writing as a result of the availability of the word processor. For two students this motivation to write immediately translated into increased production (more stories). Overall though, for all students, motivation was simply evident as a greater willingness to engage in the writing process. In itself we considered this to be a real advantage in assisting the students with writing difficulties who were participating in this study.

We have two questions to ask of this aspect. How long term is the motivational effect? Is it possible to capitalise further on the motivational attributes of a talking wordprocessor, and if so, in what ways? With the students for whom production increased, word processor use tailed off after an initial four or five week burst of activity. However the number of stories written in this initial period was uncharacteristically high, and use after this period did not fall below an average number of stories. Our conclusion is that there are two factors creating the motivational effect. One is obviously related to the appearance of a new toy, the other to changes in the writing process. Of these the former created a stir that disappeared

after around four weeks. It was possibly the latter kept all students using the word processor over a much longer period of time, but even so it was eventually outweighed by other factors. For example, the positioning of the word processor in the class may have had some effect on the extent of use. To use the word processor it was necessary to leave the class group and in some ways become isolated from the social nature of the class writing. It became apparent during the study that two of the students preferred to write amongst the companionship of their friends, and both these students used the computer relatively less often in the later stages of Phase 3. Generally, privacy to write did not seem to be a particularly important factor for these students and did not act as an incentive to use the computer.

Soundproof

Speech synthesiser use as a vehicle for the exploration of written language and the development of a critical ear was possibility to be examined in two ways. The first is whether or not students were able to realise that meaning errors were part of their work, second is whether students could pick up that even

meaningful writing might need amendment.

On only a few occasions did listening to their own stories cause students to add to or amend stories to correct meaning errors. The corrections were most frequently the insertion of omitted words. Students did occasionally make alterations to story endings, but there was no evidence to indicate that they were using speech feedback to rephrase or re-sequence their stories. To imply they should assumes that students were aware of the relationship between story structure and rhetorical purpose and of ways to improve story structure. From an instructional perspective, we noted class teaching about these areas occurred very infrequently and teacher conferences did not focus on them at all. Unless such instruction forms part of a writing programme, use of the speech synthesiser is unlikely to help students attend to the requirements of audience and the development of meaning.

Soundproof was extensively and successfully used by the students at the level of convention. On numerous occasions students changed spelling and often attended to capital letters as a result of listening to their stories. The spelling changes were often improvements in errors, rather than corrections. However, one day two students started using the spell checker immediately after using Soundproof and found that they were much more often presented with a list of alternatives rather than the unhelpful "Word is incorrectly spelt" message. From this list correct words were frequently chosen. The combination of speech synthesiser and spell checker was a valuable tool at the transcriptional level for these two. A third student's phonetic skills were insufficiently developed for him to be able to use

the feedback provided effectively to improve spelling.

Strategy Use

Mulcahy et al. (1986) describe in detail the means of establishing and maintaining strategy use in class groups. In the study reported here, working with individuals, it was extremely difficult to establish and maintain the use of strategies by students. Compositions that were written in several stages on the computer showed use of the sequence of POWER writing strategy. However, only towards the end of Phase 3 were the Bare Bones (for planning and revising) and COPS (mainly for editing) strategies being used frequently. We did not anticipate immediate strategy acquisition, bearing in mind Mulcahy's (et al.) (1986) admonition that "...it takes a systematically designed program of instruction spread over a long period of time to gradually nurture and give expression to strategic learning and behaviour..." (p.11). However we consider a February to July acquisition period is quite lengthy for students working in a normal classroom environment. Possibly the lack of strategy use in the general classroom acted against the acquisition of strategies taught in our programme. Undoubtedly, the effort and commitment involved for the achievement of a long term benefit for an individual child in a class of over thirty where no additional resources are available would place considerable demands on the teacher. The reinforcement required to establish and maintain strategy use (and Soundproof) would possibly be easier to deliver to students with special needs in a resource room setting and the strategies when in place could give the student more control over their own writing in the regular classroom.

Planning, as a student activity prior to class written work did not appear to be developed or encouraged within the classroom. Students were often asked to generate ideas as the basis for later written work, in a manner similar to the knowledge telling strategy described by Bereiter & Scardamalia (1987), and teachers would often discuss topics as a kind of advance organiser for a written task. In two terms we observed two lessons purposefully designed to help students become aware of elements of story

structure, and how to plan to put them together. Again, this lack of class emphasis on planning may be part of the reason that the strategies we introduced required such a long period of time to gain currency with the students.

The COPS and POWER strategies were chosen because it seemed computer use could enhance their value for the students. However, these strategies only ran alongside the use of the talking word processor, rather than creating the anticipated positive interaction. We feel that the reason for the lack of interaction lies in the lack of reinforcement in the use of strategies in the computer writing environment that arose through

the variable use of the computer for writing.

Conclusion

In reviewing our work with the students over two terms we are first led to endorse, strongly, the importance of the class instructional and social climate as a major determinant of the pattern of the writing process. We also acknowledge that in the right circumstances students enjoy the writing process as much as they enjoy seeing a finished piece of written work. Bereiter and Scardamalia (1987) write that students "...find the process to be an important one and are eager to master it, given some method for doing so..." (p.91). The students we worked with all showed enjoyment in writing, on occasions. At least part of that enjoyment seemed to be derived from the use of the talking word processor.

The value of strategy instruction for students with difficulties has again been demonstrated within this study. This study also appears to indicate that the use of the speech synthesiser may hold benefits for students having problems with the transcriptional side of writing. Certainly, speech synthesiser use initiated editing for transcription errors with those two students for whom writing with the computer became an accepted part of class life. Again the study showed that the most successful strategy users were those students who personalised the strategies for their own use.

Finally, although it is not evident to date, we still feel there is potential for the use of a talking word processor to enhance the use of strategies by students. Further research in a more strategy oriented classroom is required to determine the extent of this potential.

References

- Bereiter C. & Scardamalia, M. (1987). *The psychology of written composition*. Hillsdale, NJ.: Lawrence Erlbaum Associates.
- Borgh, K. & Dickson, W.P. (1992). The effects on children's writing of adding speech synthesis to a word processor. *Journal of Research on Educational Computing*, 24, 533-544.
- Calkins, L. (1983). *Lessons from a child*. Exeter, NH.: Heinemann.
- Christenson, S., Thurlow, M., Ysseldyke, J. & McVicar, R. (1989). Written language instruction for students with mild handicaps: Is there enough quantity to ensure quality? *Learning Disability Quarterly*, 12, 219-229.
- Cochran-Smith, M. (1991). Word processing and writing in elementary classrooms: A critical review of the related literature. *Review of Educational Research*, 61(1), 107-155.
- Dalton, D.W. & Hannafin, M.J. (1987). The effects of word processing on written composition. *Journal of Educational Research*, 80(6), 338-342.

- Graham, S., Harris, K.R., MacArthur, C.A. & Schwaltz, S. (1991). Writing and writing instruction for students with learning disabilities: Review of a research program. *Learning Disability Quarterly*, 14, 89-114.
- Graham, S. & MacArthur, C.A. (1987). [Improving learning disabled students' skills at revising essays produced on a word processor: Self-instructional strategy training.] Unpublished raw data. Cited in MacArthur, C.A. (1988). The impact of computers on the writing process. *Exceptional Children*, 54(6), 536-542.
- Houck, C.K. & Billingsley, B.S. (1989). Written expression of students with and without learning disabilities: Differences across the grades. *Journal of Learning Disabilities*, 22, 561-569.
- Lynch, E.M. & Jones, S.D. (1989). Process and product: A review of the research on LD children's writing skills. *Learning Disability Quarterly*, 12, 74-86.
- MacArthur, C.A., & Graham, S. (1987). Learning disabled students' composing under three methods of text production: handwriting, word-processing and dictation. *The Journal of Special Education*, 21, 22 - 42.
- Morocco, C.C. & Neumann, S.B. (1986). Word processors and the acquisition of writing strategies. *Journal of Learning Disabilities*, 19, 243-247.
- Mulcahy, R., Marfo, K., Peat, D. & Andrews, J. (1986). SPELT: A strategies program for effective learning and thinking. Calgary: University of Alberta.
- Newcomer, P.L. & Barrenbaum, E.M. (1991). The written composing ability of children with learning disabilities: A review of the literature from 1980-1990. *Journal of Learning Disabilities*, 24, 578-593.
- Nodine, B.F., Barrenbaum, E.M. & Newcomer, P.L. (1985). Story composition by learning disabled, reading disabled and normal children. *Learning Disability Quarterly*, 8, 167-179.
- Outhred, L. (1989). Word processing: Its impact on children's writing. *Journal of Learning Disabilities*, 22, 262-264.
- Reid, D. K. (1988) Teaching the learning disabled, a cognitive developmental approach. Boston MA: Allyn & Bacon.
- Rosegrant, T.J. (1986). It doesn't sound right: The role of speech output as a primary form of feedback for beginning text revision. Paper presented at the annual meeting of the American Educational Research Association, San Francisco. Cited in MacArthur, C.A. (1988). The impact of computers on the writing process. *Exceptional Children*, 54(6), 536-542.
- Wallace, G.W. & Bolt, D.A. (1989). Statement-Pie: A strategy to improve the paragraph writing skills of adolescents with learning disabilities. *Journal of Learning Disabilities*, 22, 541-543, 553.
- Wong, B.L., Wong, R. & Blenkinsop, J. (1989). Cognitive and

metacognitive aspects of learning disabled adolescents' composing problems. *Learning Disability Quarterly*, 12, 300-322.

Talking Back and Writing

Talking Back and Writing

Interaction lies in the lack of adolescents' composing problems. *Learning Disability Quarterly*, 12, 300-322.

Talking Back and Writing

Talking Back and Writing

Talking Back and Writing

Talking Back and Writing

AD. (1988) *Teaching the learning disabled, a cognitive developmental approach*. Boston MA: Allyn & Bacon.
adding speech synthesis to a word processor. J