

The Early Development of a Self-Extending System in Writing

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Abstract

The purpose of this study was to explore how children's writing development changes over time when interpreted from a cognitive processing position. As few methods were available for capturing such a complex behaviour as writing, it was necessary to design a suitable tool to record and then to analyse some of the features of children's behaviour when they were asked to write in the classroom. Target children (N = 120) in the first four years of school were observed while writing and their behaviour was recorded and categorised using the generated procedure. Analysis of observations indicated the development of a system of writing strategies through effective monitoring and searching that allows children to take their own learning further. The major change occurred in children's word writing ability between the second and third years at school. Changes were also noted in the use of rereading, editing, resources, and of oral language while writing. Thus, this study demonstrated there is some validity to the notion of a self-extending system in writing and explored some of the behaviours and strategies that may be involved in the operation of such a system.

Integral to her theory of how children become literate, Clay (1991) describes what she terms a "self-extending system" which incorporates the processes of strategic action, knowledge of the goals, functions and expressions of the skill, and self regulation. The interactive set of strategies which readers develop in this system are said to enable them to detect that an error has been made and to search for ways to correct it, or to use existing knowledge to solve novel problems. This sys-

tem of strategies ensures that the more readers read, the more skilled they become and the less they need teacher intervention. Over time the system becomes more effective in controlling components of performance that become more fluid and automatic.

However, reading research does not provide a direct model of how such a strategic processing system might operate in writing and little systematic attention has been paid to such development empirically. It is likely that begin-

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ning *readers* may achieve a reasonable level of accuracy as they rely on strategies focused on meaning. But beginning *writers* must have additional strategies available from various sources to deliver their message in written form, as writing demands that the writer pay attention to all the levels of language at once. One example of potential differences in the operating characteristics of reading and writing systems is illustrated in the process of self-correction. While reading continuous text, the reader can confirm attempts through searching and monitoring processes that use a variety of sources of information including meaning, structure, phonology, and orthography. When the reader's monitoring efforts indicate an error has occurred and revision processes are mobilised, the internal strategy of self-correction becomes a visible behaviour. Clay (1991) has suggested that such strategic processing is closely related to progress. In writing, however, the strategies of self-checking and self-correcting might operate differently because the early writer is not able to confirm attempts as conclusively as in reading or because the writer is using his or her own output as input (Bereiter & Scardamalia, 1987).

Applying the concept of a self-extending system to writing suggests that it could, in part, operate through increased competency over some of the components of writing, such as motor skills and letter and word knowledge. As these require less conscious attention allocated to them, cognitive resources would become available for more difficult aspects of the task such as spelling multisyllabic words, attending to stylistic features, or linking ideas.

Clay (1987) suggests that, for example, "invented spelling can lead to a control over writing that frees the child to write the messages he wants to write" (p. 59). As in reading, if the child solves these more complex aspects using strategies that strengthen each time, slightly more difficult novel problems are able to be solved and new learning occurs. Clearly, the acquisition of this knowledge depends upon the child's developing a system of generative strategies available for use on novel or more complex problems.

If one considers that the developmental functions of a self-extending system include the principle of reciprocal causation described by Stanovich (1986), the overall process may involve what he refers to as the "bootstrapping effect." For example, knowing how to articulate words slowly in writing in order to hear and record the sounds not only provides children with a strategy for dealing with new words, but also affords them the opportunity to confirm and extend the strategy as each new word is successfully solved. Another example would include the existence of a known writing vocabulary, which would allow for the possibility of extending general knowledge about the orthographic regularities of the English language, the chunks of words that can be used, and the morphemic units that occur across words. A self-extending system in writing would generate the power to go beyond itself when tackling problems as it would be constantly attending to things that had not been noticed before, then incorporating them into the existing strategies of the system.

In a discussion of the self-regulatory processes in writing, Zimmerman

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and Risemberg (1997) describe the behavioural processes of self-monitoring and self-verbalisation. Evidence of an effective processing system at work in writing could be provided by behavioural indicators that suggest the child may be operating a range of searching and checking strategies. For example, slow articulation of words to guide the writing of an unknown word, or using knowledge of one word to write another by analogy are indicators of *searching* processes, as is that of accessing external resources available in the ambient environment to assist with problems. Although the source of this latter assistance is external, using it indicates the child knows that this help is available and how to access it. Indications of *checking* or self-monitoring would be visible when children reread text and/or revise their writing. With increasing expertise, there should be a shift towards personal control over instructional resources (Clay, 1991; McNaughton, 1995).

The way in which the instructional setting is organised may promote or constrain development of a self-extending system in writing. For beginning readers, developmental sequences reflect the organisational procedures and curriculum goals operating in programmes such that different developmental features are associated with different programmes (Clay, 1991). Similarly, in writing, instructional practices and opportunities may operate to affect development. For example, the teacher-child interaction that occurs in conferencing can provide differential opportunities for independence and control (Glasswell, Parr, & McNaughton, 1996).

Research suggests children develop strategic behaviour in writing both outside school (e.g., Chomsky, 1970, 1971; Ferreiro & Teberosky, 1982; Read, 1971, 1975) and in the school classroom (Calkins, 1980; Dyson, 1985; Y. Goodman & Wilde, 1985; Graves, 1973, 1983, 1984;). For example, Graves (1983) talks of the production of drafts by eight- and nine-year-olds as evidence of "control of the writing process" (p.4) and, using anecdotal evidence, describes a developmental sequence in the types of changes made. Similarly, for spelling, Gentry (1982) identified changes children go through on their way to becoming competent spellers and Radebaugh (1985) examined the spelling strategies that third- and fourth-graders used to write a word. Indeed, the notion of strategic control is central to literacy learning (Cambourne, 1988, 1995; Clay, 1991). An assumption is made, certainly in New Zealand curriculum materials (e.g., *Dancing with the Pen*, 1992), that, as in early reading, learners develop strategic control over their writing. But, compelling as this concept is, there has been limited detailed examination of changes in writing behaviour across age or class levels and over time. Assumptions about the developmental shift towards greater strategic control over performance have not been examined systematically and empirically.

This study was designed to examine likely indicators of a self-extending system for writing. To reiterate, such indicators may include observable strategies for: (a) *word solving*, such as using vocalisation to break the word into parts or to make the phoneme-grapheme link; (b) *monitoring* and *editing*, such as rereading to check what

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has been written, to confirm the intended message, or to provide a cue for what may come next; and (c) *searching*, such as using analogies or classroom resources. The study further aimed to examine developmental shifts with respect to these indicators over the first four years of instruction. The focus of the study centered on answering descriptive questions, namely: What changes can be observed in written language produced by children? What changes occur in the way children check and alter their writing? What changes occur in the way children transcribe their writing, using searching strategies to problem solve?

Method

Participants

A total of 120 children, 62 boys and 58 girls, were chosen randomly from the class rolls in three schools. The children were in the first four years of school and there were 30 children at each level. The mean age in each group was: Year 1, five years nine months; Year 2, six years nine months; Year 3, seven years nine months; and Year 4, eight years eight months.

The three schools were selected on the recommendation of a school language consultant as having assistant principals, in charge of the first three years, who were knowledgeable about the teaching of writing. The 13 teachers had teaching experience ranging from less than one year to 28 years. All schools taught children from beginning instruction to Year 6 (ages 5-11). Two of the schools were in the urban area of South Auckland and one was in what might be described as the "inner city."

The enrollments were 533, 305, and 263, respectively, with two schools having single classrooms and one an open plan design. The schools consisted of Anglo/European populations from 49% to 80%, and of Maori children from 5% to 29%, with other Pacific Island and Asian groups represented. One of the schools qualified for additional funding from the Ministry of Education to assist them in coping with pressures resulting from the diverse ethnic composition of the school and the proportion of unskilled and unemployed parents in the school community.

Procedure

A cross-sectional descriptive design was employed. The behaviours of individual children, as they attempted to write meaningful text during classroom writing sessions, were observed and recorded. Informal observations were made of organisational variables operating in the classrooms. Classroom writing programmes were usually of half-an-hour's duration with the younger children using only a part of that time to compose their story. The researcher observed the class from the beginning of the writing period and, when the children had begun to work, observed each of the target children individually for a period of five minutes. All writing behaviour, oral language behaviour, and other behaviours were recorded on a grid using a predetermined coding system (explained below). The concentration was on the transcription aspects of the process, particularly at the word level as this is critical to a developing process. Copies of the total piece of text being written were analysed and ratings of these included considerations of text level

features and whether the writing carried a message.

Coding and Classification of Data

The observational categories initially encompassed six areas which, in pilot observations, were determined to be behaviours occurring whilst the children were writing. These six included: oral behaviours, word writing, rereading, editing, resource use, and interruptions. Subsequently these six were grouped under four categories: (a) oral behaviour, (b) words written, (c) monitoring (rereading and editing), and (d) resource use. In addition, a holistic analysis of the overall quality of the written piece was conducted. Each will be discussed.

Oral responses. To determine changes in the quantity of oral responses before or during writing, each child received a rating based on the amount of this activity as follows:

- *Zero points* were given when the child made no oral utterances or lip movements.
- *One point* was given when there were some oral utterances or lip movements (i.e., less than 50% of the words written had some indication of this behaviour associated with their production).
- *Two points* were given when many oral utterances or lip movements were observed (i.e., more than 50% of the words had some indication of this behaviour associated with their production).

Word writing. Two sub-categories of written words were used. The first was the number of total words written. All spaced letter groups were counted as words except for place names or children's names. Compound words were counted as one word however they were written. For example, *Faua*

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bale, to represent *fireball*, was counted as one word. Capitalisation was ignored. The category of *total words written* was used to indicate the competency of children in writing words, regardless of accuracy or assistance. The other sub-category was *total words written correctly for spelling without assistance*. To be counted in this category, no assistance from any source had been observed, including all the categories included in resource use. A word was counted if correctly written for spelling but not necessarily syntactically correct, for example, *of* for *off*. A word was counted as incorrect if a letter, written incorrectly, could be confused with another. For example, *doat* for *boat* was not counted. Apostrophes to denote possession did not have to be present for a word to be counted as correct. Colloquial words were counted as correct if written regularly (e.g., *oh*), as were common abbreviations, (e.g., *M.P.*).

Monitoring. This category includes the sub-categories of rereading and editing. Rereading of already composed text was recorded when there was a clear indication through pointing and/or oral reading, or eye or head movement, to identify the starting point of the rereading.

Changes over time in the type and quantity of editing made to text were computed from analysis of observation records. Editing was said to have occurred when the child, without assistance, changed the text already written in a way that altered the form of the text. Sometimes this change was at the letter level, for example changing *i* to *I* or *an tree* to *a tree*. Other changes were at a phrase level and included rejecting the opening to a sentence and beginning

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with a different form of words. These changes resulted in both correct and incorrect text.

Resource use. Resources were classified as human (teacher and peer assistance) and material resources. Information on assistance given to children, whether child- or teacher-initiated, was drawn from the records. A count was made of the frequency with which children received help per word written, regardless of the number of consultations at the letter level, if there were no breaks in the consultation.

Material resources were categorised as one of four types, namely: (a) the child's own text whether a current or previous story; (b) a dictionary—this included alphabet and teacher-produced word lists, notebook dictionaries, or published dictionaries; (c) general resources—any resource such as a list, display or book that was in the classroom but had not been generated for the writing session; and (d) a specific resource—any resource that had been generated for that specific task, for example, the story written on the board prior to the writing time or the brainstormed list of useful words.

To be included in the analysis, the sequence of behaviour had to have been completed. In a few cases the child had just begun to consult the resource when the observation period finished. If it was unclear to the researcher the reason the child was searching a resource, she asked the child after the observation period to confirm the reason for the search. This most often occurred when the children turned back and searched through their own text.

Holistic analysis of written pieces. To obtain an independent measure of the overall quality of the writ-

ing, four experienced raters were used. The instructions directed the raters to assess the overall quality of the writing and to assign a rating on a five-point scale. The scale, which is included in the appendix, attempted to capture the overall quality of the child's writing while taking into consideration component aspects of the process (Boocock, 1991). Similar scales were used by Kroll (1983) and by Juel, Griffith, and Gough (1986). The description of the criteria to be assessed on the scale included word writing ability, phonemic analysis, structural considerations, and the extent to which the writing carried a message. As an example, writing samples were rated in category one if "The child's writing does not carry the message" and in category four if the child's writing consisted of "two or more paragraphs organised around a theme." Raters were also given five rated stories taken from the samples to illustrate the steps of the scale.

Inter-Observer Reliability

To establish reliability in the coding of data, care was taken to determine inter-observer perceptions. For the on-site observations, an independent observer watched 30 children (25% of the sample, from six of the classrooms) concurrently with the researcher. Inter-observer reliability was calculated overall and for specific categories. Agreement level was calculated on the sequential behavioural record and expressed as a percentage. Agreement was judged to have been achieved when the two observers recorded behaviour as occurring in a particular sequence and in a particular category. Oral responses were not included in this reliability calculation because of the diffi-

culty experienced in arranging for two persons to be in a position to capture oral responses as they occurred. Non-agreement was indicated if only one observer had recorded behaviour as occurring. If a word writing sequence was interrupted by behaviour that only one observer recorded, non-agreement was judged to have been reached for this behaviour, but not necessarily for the word as a whole. Calculated in this way, there was 89.15% agreement overall.

To check agreement on specific categories of observation, Pearson product-moment correlations for monitoring behaviours were calculated. The resulting coefficients were 0.94 for *editing* and 0.87 for *rereading of written text*. These results indicate that the behaviour could be captured reliably using these procedures.

With respect to ratings of the quality of writing, four educators independently rated the samples of writing collected at the various observation points. Inter-rater agreement was high (>85%) and the scores assigned were mean ratings.

Results

To answer questions in the present study concerning change across class level groups, raw scores were computed and group means, percentages or ratios, were calculated for data in the four main category groups. The effect of class level was investigated using two one-way analyses of variance (ANOVA) for the categories of *total words written* and *total words written correctly and unassisted*. Post-hoc tests (Tukey) were used to determine if there

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were significant differences between class levels.

Qualitative Ratings of Writing Samples

The mean ratings for overall quality of writing produced were: Year 1, 2.00; Year 2, 2.54; Year 3, 3.17; and Year 4, 3.39. These ratings indicate an increase in writing quality for each class level. To illustrate this qualitative comparison, a category two rating was a "simple sentence, clearly delineated, with a clear message" (e.g., "When I went to my nanas hoes/ house to stae/stay the night I fale/fell out of bed."). Although 2.0 was the mean score for Y1 writing, the range was considerable, from samples such as "IFeHPYAyHeCWTJSeEtOVrW" to writing which was rated in category three, involving more extended writing using several sentences. In Y2, the best writing samples received a rating of category four. Apart from being two or more paragraphs, each consisting of several connected sentences around a theme, such category pieces illustrated mastery of conventions such as spelling and dialogue. The total mean increase between Y3 and Y4 was lower than between other class levels, suggesting an increase in quality was slowing between these levels. Also, the requisite competencies for the quality of writing at the top of the rating scale had not been achieved by most children in the class range of this study.

Oral Language Behaviour Before and During Writing

The difficulties of capturing oral language behaviours necessitated the use of broad categories. Oral behaviour

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declined in total across class levels. The percentages of records that contained no oral behaviour were: Y1, 17%; Y2, 23%; Y3, 43%; and Y4, 50%. Those records with oral behaviour were divided into two groups according to the proportion of oral behaviour per words written. Those texts with greater than or equal to half the words written involving oral behaviour were: Y1, 60%; Y2, 40%; Y3, 17%; and Y4, 10%.

Change across class levels was evident in the type of oral articulation that occurred. It should be noted that some children at Y1 level did not say anything as they wrote whilst some Y4 children responded orally while writing half or more of the words. The three children in Y4 who fell into this category, however, were producing indistinct lip movements or murmurings compared to more overt articulation in the younger children. More of the latter rated in the category of greater than or equal to half the words written involving oral behaviour.

Table 1 Mean Number and Range of Total Words and Total Unassisted Correct Words Written in Five Minutes for Class Years

Words Written	Class Years ^a			
	Y1	Y2	Y3	Y4
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Words Total	9.73 (0.37)	13.47 (2.49)	28.43 (1.69)	32.10 (4.73)
Total Unassisted Correct Words	6.87 (0.31)	10.13 (1.30)	24.77 (0.66)	28.87 (2.66)

^an = 30 for each class level

Words Written

Table 1 presents data on the mean number and range of words written in the five-minute period at each class level. The words written information is expressed in two categories: (a) total words written and (b) total words written correctly and unassisted. Children increased their writing in both categories as they got older. Whilst there were increases in means between Y1 and Y2, and between Y3 and Y4, a major increase occurred on both types of words written between Y2 and Y3. Consideration of the written products suggests that for some children, the increase in the total words written was partly accounted for by the use of approximations or invented spellings (e.g., "my tay gun that shats plsdc sdc that are savin ainchs laing" <my toy gun that shoots plastic sticks that are seven inches long>). These data are presented in Figure 1.

It is important to note that the range in both categories of words writ-

ten was considerable at all class levels, with the less expert writers in each class producing very little. The top of the range continued to increase with age. The percentage of total words written correctly without assistance was: Y1, 70.2%; Y2, 75.5%; Y3, 87.2%; and Y4, 90%. The mean percentage of correct unassisted different words written of three letters or more was: Y1, 26.5%; Y2, 28.14%; Y3, 41.8%; and Y4, 46.6%.

To examine these differences, one-way analyses of variance (ANOVA) were conducted on the two categories, that is, total words written and total words written without assistance. The main effect of class level was significant on both variables: total words written, $F(3, 116) = 16.70, p < .01$, and total unassisted correct words written, $F(3, 116) = 19.09, p < .01$. Post hoc

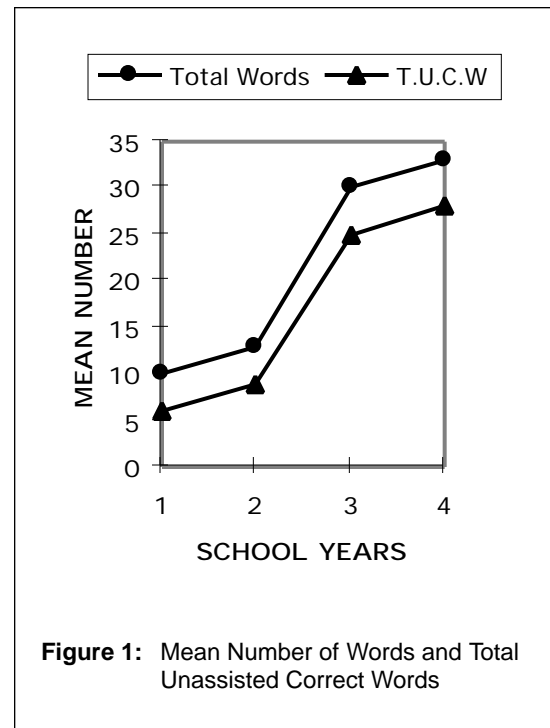


Figure 1: Mean Number of Words and Total Unassisted Correct Words

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comparisons were made using Tukey (HSD) tests to establish significant differences between means. For total words written, these differences were between Y1 and both Y3 and Y4, and between Y2 and both Y3 and Y4, $q(116) = 11.30, p < .01$. For the category of total unassisted correct words these differences were similarly between Y1 and Y3 and Y4, and between Y2 and Y3 and Y4, $q(116) = 10.37, p < .01$.

Monitoring

Rereading. Two types of behaviour were used to illustrate children's monitoring as they wrote. One source of data was the rereading of text that had been previously written and the other was changes made to the text as it was being written.

The proportion of writing samples containing rereading behaviour was Y1, 63%; Y2, 77%; Y3, 70%; and Y4, 50%. The percentage of children who reread fluctuated across the class levels with the lowest level occurring in Y4. The mean amount of children's rereading behaviour was adjusted for ten words written. These data are presented in Figure 2. It can be seen that the children in Y1 and Y2 reread a greater proportion of what they had written than those in Y3 and Y4.

Editing. The percentage of writing samples containing edits was: Y1, 27%; Y2, 67%; Y3, 73%; and Y4, 83%. The edits included changes to punctuation, whole words, and letters within words. The mean

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number of edits adjusted for ten words written per child was calculated and the results are presented in Figure 3. The graph indicates the direction of change from low levels of editing in Y1 to an increase in Y2 and a levelling off at Y3 and Y4.

Resources Used

The nature of teacher and peer interaction occurring during writing and the physical resources provided in the classroom were recorded. Constraints on the use of human and material sources of assistance were also noted. These constraints mainly involved the apparent emphasis placed on children's getting down their own messages by attempting problem words, which were to be checked later for spelling and meaning. As a result, in most Y3 and Y4 classes, children were discouraged from seeking out dictionary resources while they were writing.

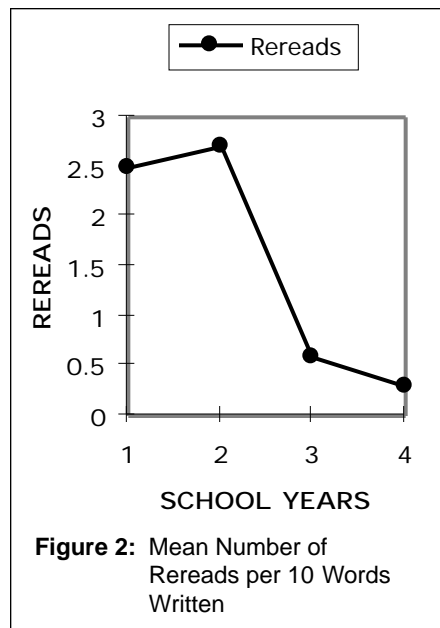


Figure 2: Mean Number of Rereads per 10 Words Written

Some comments can be made about patterns of assistance and availability that occurred. All teachers were available to children in some manner. They roved around the classroom, sat at their table, or sat at children's writing tables. All children sat in groups, often with individual desks for the older children or at larger tables that could seat four to six children. Peer interaction was encouraged to some degree although teachers often requested quieter noise levels while the children were working. In only one Y4 class did the teacher insist on absolute quiet when children were writing. Data from observations of teacher assistance, peer assistance, as well as that of materials as resource assistance are discussed below.

Teacher assistance. Instances of this type of interaction were obtained from observations of teacher-initiated behaviour with respect to the target children. Quantitative analysis of this

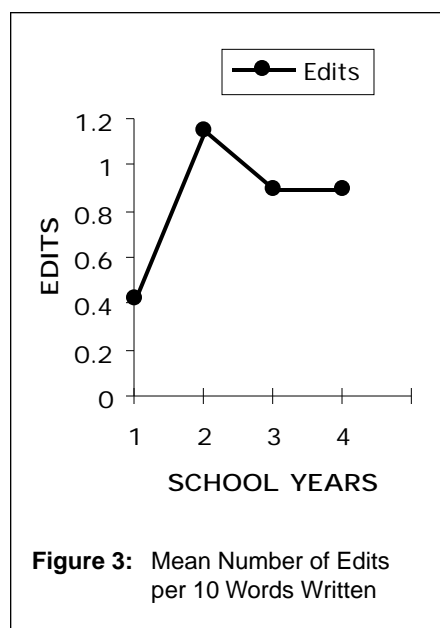


Figure 3: Mean Number of Edits per 10 Words Written

category was restricted to a count of the number of words that included some consultation with a teacher and whether that assistance was utilised in the text subsequently written. Teacher help given to target children while they were being observed was restricted to the Y1, Y2, and Y4 levels because all Y3 target children wrote without teacher assistance during the observation time. It had been anticipated that more intensive teacher interaction might occur at the early levels, particularly whenever the child did not fully control the task and this proved to be the case. Eight of the target children received teacher assistance while being observed at the Y1 level, one child received assistance at Y2, and two at Y4. Even with the small number of teacher-child interactions observed, it is possible to comment on a pattern of interaction that emerged. Most of the teacher interactions occurred in one Y1 classroom, although teacher interactions occurred in three other classrooms. The teachers drew the children's attention to many aspects of language in brief exchanges as the children wrote; these included: (a) the meaning of their message, (b) the structure of their sentences, (c) the relationship between letters and sounds, and (d) the correct spelling of a word. The teachers also drew children's attention to external resources that were available. In only one instance did a teacher tell the child a spelling without prior or subsequent discussion. A pattern emerged from the data where the teacher was working with children who did not control many aspects of writing. The teacher worked with the child and did what she deemed to be necessary for the task to be completed successful-

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ly, whilst also trying to take the child's learning further.

Peer assistance. Children's interactions with peers were obtained and analysed in the same manner as those of teacher-child ones. All interaction with peers around particular problems resulted in the sample child simply being told letters or words, except for one child in Y1 who prompted the target child to articulate slowly the word requested. Of the two class levels where peer help was recorded, the information used by the target child was correct three times in Y1 and incorrect twice, and in Y4, correct eight times and incorrect once. The support of peers was given high priority in most classrooms. In some classes more competent children were observed to give considerable help to less competent writers, sometimes limiting their own writing efforts.

Assistance from material resources. The writing problems for which the children sought external help, other than from teachers and peers, predominantly involved the writing of words and letters. The categories of resources that children sought for help were their own text, a published dictionary, any teacher-written list, a general classroom resource, or specific teacher-written resources. Children across the class levels used their own text to refer to the spellings of words most frequently (Y1, 8 times; Y2, 1 time; Y3, 10 times; and Y4, 7 times). Use of other resources occurred infrequently.

Discussion

Change Over Time in Writing: Text Quality and Word Use

Across-group differences. The two measures used to detect change over time in children's writing yielded quite different results. The global rating of texts indicated the children, on average, did improve the quality of their writing. This was particularly marked at the early levels and there was some variability across schools. On the word writing measure, in contrast, some startling shifts in behaviour occurred between the Y2 and Y3 class levels. A possible explanation for this sudden increase in the number of words written correctly without assistance relates to our initial discussion of the development of skilled behaviour and the possible existence of a self-extending system in writing. Such an increase would appear to confirm the existence of processing mechanisms that enable children, who previously may have established control of only a small number of words, to develop ways of expanding their vocabularies. This would account for the sharp increase between the Y2 and Y3 level.

During the task of writing continuous text, the children's attention was focused on words they wanted to write and it seems that, through continued correct use of the most common ones, learning was taking place. These high frequency words became progressively easier to write fluently resulting in a threefold increase in the mean number of words written per five-minute period from Y1 to Y4. At the same time, the number of total words written correctly without assistance increased fourfold.

These findings are consistent with the position that in learning how to write a few words accurately, they have also developed important generative strategies. They have learnt how to learn words independently in order to write novel ones. As this happens, other processing capacity becomes available for strategies to be extended and for attention to be given to other words and to other aspects of the process.

The data from this study support the movement towards control over longer, less frequently used words. The development of these generative strategies would enable this element of the processing system to become self-extending. The levelling off of mean number of total words that were written correctly without assistance that occurred between Y3 and Y4 may indicate that once children are able to write a core of frequently used words, their attention turns to other aspects of the writing process. However, this may reflect a programme effect. If children are choosing topics to write about, as they were in many classrooms, they themselves may be limiting their exposure to less frequently used unknown words by writing about familiar subjects. Therefore, the opportunities to extend the set of strategies available to them would be restricted.

Individual differences. By Y4 the gap had increased between the most competent and the least competent writers in both word writing categories. At this level the difference between the highest and lowest number words written for both categories had doubled in comparison to the first year of school. Croft (1987) reported increases in the variability of achievement in accurate spelling and the quantity of writing

from Y3 to Y8. This research supports the finding of variability increasing with age in these two areas and also shows such variability occurring at an earlier age.

Evidence suggests that whilst the competent children are improving in writing, the children at the bottom end of the achievement range are not. These lower-achieving children may perceive the task as too frustrating, resulting in a sense of failure, less engagement in the task, and lower achievement. Stanovich (1986) has described this phenomenon in relation to progress in reading, in which the rich get richer and the poor poorer, as the "Matthew Effect." Essentially, the more children read, the better they become at it. Those who do not read well, and consequently do not have the opportunity to practice competent reading, do not improve. This study confirms the potential for this effect to be operating in writing. Such an outcome would be consistent with current theories of development (Vygotsky, 1978; Wood, Bruner, & Ross, 1976) which suggest that intensive individual instruction from experienced teachers who scaffold the task based on the elements of the writing process the child could control, would be beneficial in attempting to close the gap in achievement. Observations of teachers revealed that in most Y1 and Y2 classes, more individual teaching time was given to all children while writing than was the case in Y3 and Y4 classes.

This study also provides support for the notion that the lowest-achieving readers and writers would benefit from individual instruction at the point when most children are getting underway in reading and writing in order to prevent the cycle of non-achievement. Many

children in New Zealand have that opportunity in a Reading Recovery programme (Clay, 1993). This programme includes a writing component in which the child writes a simple sentence with the aid of the teacher. In this study, the researchers noted that the least competent writers at Y3 and Y4 were children who had not had the opportunity to participate in the Reading Recovery programme, or who were new settlers from non-English speaking countries.

Change Over Time in Writing: Monitoring and Searching Behaviour

According to Clay's theory of children becoming literate (1991), monitoring strategies that are observable, such as rereading and editing text, and internal and external searching strategies would be important to the creation and increasing power of a self-extending system as they would generate, in a cumulative way, new knowledge and understandings about language. With respect to the areas investigated in this study, some comments can be made regarding strategy use.

The rereading behaviour that was evident suggested shifts in the amount of text children had to monitor overtly to keep control of the task. At Y3 and Y4 the children were able to write more words in the same amount of time and to maintain control over what they were producing before rereading their text. It is plausible to assume they were monitoring more internally as they wrote their stories, since their edits increased over time, while their overt rereading did not. This would suggest there was more processing capacity available for attending to other aspects of the process

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so they have the potential to notice more and learn more by themselves.

In the present study, another indicator of strategy use in writing was the child's use of resources to aid problem solving. We found there was limited use of other people and external material resources provided by the environment. Children were relying primarily on their own resources when writing, either through knowing how to write the word or attempting a spelling, often through an analysis of sounds. Factors in the environment appeared to contribute to this emphasis. For example, in some classes the children were encouraged to attempt to write the word themselves and check their spelling after the end of the writing period or when they finished the story. If the aim is developing active problem solving through a flexible system of strategies, the learner needs the opportunity to engage with the whole process in order to learn how to orchestrate the many components. Those classrooms that do not provide the children with knowledge of how to access a variety of resources to solve their problems are limiting learning opportunities.

If there were a self-extending system operating, what would be the role of the teacher? It would seem that the influence of the teacher, as well as the programme, would be most critical at the time when the children are developing a processing system, leading eventually to the children's being able to extend their learning further on their own. The nature of the teacher's assistance should be consistent with the notion of scaffolding within the children's zone of proximal development (Vygotsky, 1978; Wood, Bruner, & Ross, 1976) and be focused on develop-

ing a flexible system of strategies for operating effectively using both internal and external assistance.

Teacher observations in this study yielded examples of graduated responses of teachers to children at lower achievement levels that fitted the scaffolding model. In time, the role of the teacher might shift to extending the range of opportunities to use this processing system to solve novel problems in text writing. Therefore, exposure to the special properties of different types of writing may be appropriate. In the present study, most writing was of a personal narrative type, however, some teachers said they interspersed this type of writing with other genres during the year. Indeed there was evidence on the walls of the classrooms that children were engaged in a variety of writing opportunities. This writing conformed to the qualities of transactional writing and indicated children were being exposed to other genres.

An important part of building the use of material resources into a child's repertoire of strategies would be providing a range of resources and showing how to access them to search for new information or how to check with attempts already made. Such instruction could begin in the initial classes with resources appropriate to the children's progress in writing.

It seems a balance would need to be struck, on the one hand, between children having access to and knowing how to use all the resources available to them in a way that enabled practising what they knew and, on the other hand, pushing their own learning further by encountering new problems to solve. An imbalance in the use of a range of strategies, such as occurred when chil-

dren copied whole texts from the teacher's writing, provided fewer opportunities for learning.

Some comments can be made regarding possible ways of increasing access to resources. For example, in a large class where access to a teacher is difficult, it may be possible to increase the number of adults in the room, particularly when children are forming their processing system. In this study only two classes had some assistance from other teachers and parents. Special considerations are needed when incorporating peer assistance into the classroom environment. In terms of Vygotsky's theory (1978), the peer must be a more competent one to affect the course of development. In the few examples available in this study, peer assistance was not always helpful at the Y1 level, as the children were of similar expertise. At the Y4 level, peers offering help were invariably more competent and could assist children to solve their problems. To be an effective resource, children of diverse ability levels need to be available in the instructional setting.

Changes to Oral Language Use

This study confirmed a trend towards the development of direct processing from thought to written language without the intermediary of sound. It demonstrated the relative importance of oral behaviour, both phoneme analysis and the oral composition of text, when children first begin to write, but supported the notion that this behaviour is internalised over time. The analysis of data showed that silent writing occurred at all class levels. From a processing position, the children may not have acquired phonemic knowl-

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edge. Alternatively, they may have possessed other more efficient strategies to access words. Also, those children who did not orally compose text in advance may not have developed the strategy or may have moved beyond needing to use it.

Conclusion and Limitations of the Study

Three limitations should be kept in mind when considering the findings of this study. The first is that the small-scale nature of this study meant the cross-section of children sampled at each class level was only 30. This number limits the generalisability of the data in describing inter-individual change. Second, the research view changes across class levels, but to investigate this question further, we would need a longitudinal study of specific children to capture intra-individual change over time. The study pointed to environmental features that may constrain or increase the behaviour, but could not confirm their effect. Finally, it may be that five minutes per child for observation was insufficient to capture the use of material resources by the children. From the high percentages of words written without assistance, it would seem that occasions when external help was needed were not themselves high in number and, therefore, a study of these would require longer observation periods.

The purpose of this study was to explore how children's writing development changes over time when interpreted from a cognitive processing position. As few methods were available for capturing such a complex behaviour as writing, it was necessary to design a

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suitable tool to record and then to analyse some of the features of children's behaviour when they were asked to write in the classroom. It has been possible to suggest tentatively how children become more skilled at writing to the point where they are able to assume responsibility for their own learning. Further, this study demonstrated that there is some validity to the notion of a self-extending system in writing and explored some of the behaviours and strategies that may be involved in the operation of such a system. Additional research is needed to investigate the mechanisms of its operation. Another question to be explored is the nature of the reciprocity between the processing systems of reading and writing.

References

- Bereiter, C., & Scardamalia, M. (1987). *The psychology of written composition*. Hillsdale, NJ: Lawrence Erlbaum.
- Boocock, C. *Observing children write in the first four years of school*. Unpublished masters thesis, University of Auckland.
- Calkins, L. (1983). *Lessons from a child*. Portsmouth, NJ: Heinemann.
- Cambourne, B. (1988). *The whole story: Natural learning and the acquisition of literacy in the classroom*. Gosford, New South Wales: Ashton Scholastic.
- Cambourne, B. (1995). Toward an educationally relevant theory of literacy learning: Twenty years of enquiry. *The Reading Teacher*, 49, 182-190.
- Chomsky, C. (1970). Reading, writing, and phonology. *Harvard Educational Review*, 40, 287-309.
- Chomsky, C. (1971). Write first: Read later. *Childhood Education*, 47, 396-399.
- Clay, M. M. (1966). *Emergent reading behaviour*. Unpublished doctoral thesis, University of Auckland.

- Clay, M. M. (1969). Reading errors and self-correction behaviour. *British Journal of Educational Psychology*, 39, 47-56.
- Clay, M. M. (1987). *Writing begins at home*. Auckland, NZ: Heinemann.
- Clay, M. M. (1991). *Becoming literate: The construction of inner control*. Auckland, NZ: Heinemann.
- Clay, M. M. (1993). *Reading Recovery: A guidebook for teachers in training*. Auckland, NZ: Heinemann.
- Croft, C. (1983). Teacher's manual for Spell-Write. Wellington, NZ: New Zealand Council for Educational Research.
- Croft, C. (1987). Word use and spelling mistakes in a national sample of primary writing. *New Zealand Journal of Educational Studies*, 22, 215-220.
- Dyson, A. H. (1985). Three emergent writers and the school curriculum: Copying and other myths. *The Elementary School Journal*, 4, 497-511.
- Ferreiro, E., & Teberosky, A. (1982). *Literacy before schooling*. Exeter, NH: Heinemann.
- Gentry, R. (1982). Spelling genius at work. *The Reading Teacher*, 36, 192-199.
- Glasswell, K., Parr, J., & McNaughton, S. (1996). *Developmental pathways in the construction of writing expertise*. Paper presented to the New Zealand Association for Research in Education, Nelson, NZ.
- Goodman, K. S. (1970). Using children's reading miscues for new teaching strategies. *The Reading Teacher*, 23, 455-459.
- Goodman, Y., & Wilde, S. J. (1985). *Writing development: Third and fourth grade O'Odham (Papago) students* (Research Report No.14). The University of Arizona.
- Graves, D. (1973). *Children's writing: Research directions and hypotheses based upon an examination of the writing processes of seven-year-old children*. Unpublished doctoral thesis, University of Buffalo.

A Self-Extending System In Writing

- Graves, D. (1983). *Teachers and children at work*. Exeter, NH: Heinemann.
- Graves, D. (1984). *A researcher learns to write*. Exeter, NH: Heinemann.
- Holdaway, D. (1979). *The foundations of literacy*. Sydney, NZ: Ashton Scholastic.
- Juel, C., Griffith, P. L., & Gough, P. G. (1986). Acquisition of literacy: A longitudinal study of children in first and second grade. *Journal of Educational Psychology*, 78, 234-255.
- Kroll, B. (1983). Antecedents of individual differences in children's writing attainment. In B. Kroll & G. Wells (Eds.). *Explorations in the development of writing*. Chichester, NY: John Wiley & Sons.
- Luria, A. R. (1970, March). The functional organisation of the brain. *Scientific American*, 222, 66-78.
- McNaughton, S. (1987). *Being skilled: The socializations of learning to read*. London: Methuen.
- McNaughton, S. (1995). *Patterns of emergent literacy*. Auckland, NZ: Oxford University Press.
- Ministry of Education. (1992). *Dancing with the pen: The learner as a writer*. Wellington, NZ: Learning Media.
- Radebaugh, M. (1985). Children's perceptions of their spelling strategies. *The Reading Teacher*, 38, 532-536.
- Read, C. (1971). Pre-school children's knowledge of English phonology. *Harvard Educational Review*, 41, 1-34.
- Read, C. (1975). *Children's categorisation of speech sounds in English*. Urbana, IL: National Council of Teachers of English.
- Scardamalia, M. (1981). How children cope with the cognitive demands of writing. In C. Frederiksen & J. Dominic (Vol. Eds.). *Writing: The nature, development and teaching of written communication*. Writing: Process development and communication (Vol. 2, pp. 81-103). Hillsdale, NJ: Lawrence Erlbaum.

- Stanovich, K. E. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly*, 21, 360-406.
- Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.
- Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem-solving. *Journal of Child Psychology and Psychiatry*, 17, 89-100.
- Zimmerman, B., & Risemberg, R. (1997). Becoming a self-regulated writer: A social cognitive perspective. *Contemporary Educational Psychology*, 22, 73-101.

Appendix

Holistic Analysis of Writing

Instructors to Raters

Please read these copies of draft writing. Where it is part of an ongoing story, this is included with the last date shown giving an indication of the amount of writing completed in one day. Allocate for the writing a rating according to the accompanying rating sheet. These categories are aimed at capturing the quality of the message the children are able to compose with the assistance available in their classroom. If assigning a rating of 3 or 4 according to the categories on the rating sheet, please indicate whether the writing fits A or B.

Rating Categories

CATEGORY 1

The child's writing doesn't carry the message

- Letters used predominately

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- May include a few high frequency words
CATEGORY 2
One simple sentence with words clearly delineated and a clear message
- A few high frequency words written correctly.
- Dominant sounds recorded in other words
CATEGORY 3
One paragraph using 2-6 sentences.
- Many small high frequency words written correctly
- Either A) Many sounds correct in other words
Or B) Gaps left for proofreading
CATEGORY 4
Two or more paragraphs using 6+ sentences around a theme
- Most high frequency words written correctly
- Either A) Few words written incorrectly
Or B) Gaps left for proofreading
CATEGORY 5
More than two paragraphs possibly written over many days
- Most words written correctly
- More sophisticated sentence structures vocabulary and/or more literacy composition

Biographies

Christine Boocock is a Reading Recovery trainer coordinator at the National Reading Recovery Centre in Auckland, New Zealand. She has been involved in Reading Recovery since 1983 as a teacher, tutor, and trainer. Prior to this, she worked as a primary school teacher. While completing her Master of Arts degree at the University of Auckland, she undertook the research described in this paper. She is interested in all aspects of children's literacy learning.

Stuart McNaughton is an associate professor and head of the School of Education at the University of Auckland. His research and teaching interests are in developmental and educational psychology and focus on the development of language and literacy, and processes of education, socialization and culture. Dr. McNaughton's publications include books on reading and instruction (*Being Skilled: The Socialisations of Learning to Read*, 1987) and emergent literacy (*Patterns of Emergent Literacy: Processes of Development and Transition*, 1985). Recent work has been on a language activity developed for the New Zealand Ministry of Education for national school entry assessment. He is a member of the International Research Institute for Maori and Indigenous Education at the University of Auckland and his current research involves educational programs for optimizing the transition to school for diverse school populations.

Judy Parr teaches and conducts research in the School of Education at the University of Auckland. A cognitive-developmental psychologist, her major teaching responsibilities are in the area of developmental psychology, particularly relating to language development and research methods. Her major research focus is the development of expertise in written language and, as part of this focus, she has researched and published on the use of technology in written communication and, more broadly, in the teaching and learning process.