Preventing Negative Matthew Effects in At-Risk Readers:
A Retrospective Study

FINAL REPORT - Phase IV
June 2002

Report to the Ministry of Education
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The opinions expressed in this report are those of the authors and do not necessarily reflect those of the Ministry of Education.
Preface

This publication presents research commissioned by the Ministry of Education and undertaken by William E. Tunmer, James W. Chapman and Jane E. Prochnow of Massey University. Data were collected from students during 1996 and 1997, and compared with the performances of students from the same schools involved in an earlier longitudinal study that ran from 1993 to 1995.

Since then, the Ministry has released the Report of the Literacy Taskforce (1998), which presented a range of recommendations to improve literacy achievement in New Zealand. To date, most of the recommendations made by the Taskforce have been incorporated into policy and now shape literacy initiatives to lift the achievement of all students, particularly those who are under-achieving.

Ministry of Education
Preventing Negative Matthew Effects in At-Risk Readers: A Retrospective Study

Final Report

Phase IV

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Massey University

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AUTHORS’ NOTES

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EXECUTIVE SUMMARY

We began this report by drawing attention to some puzzling findings. Despite having a very homogenous education system with a uniform approach to reading instruction and intervention, New Zealand has for several years now consistently shown comparatively high levels of variability in the test scores from international surveys of literacy achievement. Three strategies have been proposed for reducing the unacceptably large amount of disparity between New Zealand readers and preventing reading failure: (I) “doing more of the same” (but better); (2) accommodating cultural differences; and (3) changing the method of teaching reading. On the basis of an analysis of the arguments and evidence in support of each of these positions, we concluded that the third strategy is most supportable. We hypothesized that New Zealand’s relatively large spread of scores in international studies of literacy achievement is largely the result of Matthew effects triggered by a mainstream constructivist (i.e., whole language) orientation to teaching reading that fails to respond adequately to differences in essential reading-related (especially phonologically-based) skills and knowledge at school entry that stem primarily from social class differences in home literacy environment.

Two predictions were derived from this hypothesis. First, incorporating into beginning literacy programs supplementary materials and procedures designed to help children develop awareness of the sound components of spoken words and make greater use of letter-sound patterns in reading unfamiliar words should produce significantly greater gains in reading achievement than the standard whole language approach to literacy instruction. Second, the use of these materials and teaching strategies should reduce the gap in beginning reading achievement between Maori and Pakeha (i.e., European) children. To test these predictions a retrospective study was carried out in which a representative sample of seven schools was selected from 22 schools that three years earlier had participated in a longitudinal study of beginning literacy development. The target children in the program modification schools were tested at four of the same testing points (beginning, middle and end of Year 1 and end of Year 2) as the children in the original longitudinal study with tests that assessed phonological processing skills and literacy achievement.

Components of three commercially available literacy instruction packages were used by the Year 1 teachers in the seven target schools over the course of a four-term school year. Sound Foundations (Byrne & Fielding-Barnsley, 1991) was used during the first term, Rhyme and Analogy (Goswami, 1996) during the second term, and Jolly Phonics (Lloyd, 1992) during the third and fourth terms. The selection of the three packages was based on the assumption that the degree of explicitness and detail with which phonologically-related knowledge, skills, and strategies are taught is particularly important. Although a naturalistic, informal, whole language approach to beginning literacy instruction (in which word analysis activities arise incidentally from the child’s responses during text reading) may be suitable for many children (mainly those with an abundance of literate cultural capital at school entry), other children (especially those at risk) appear to require a more highly structured, systematic approach with particular attention focussed on the development of phonologically-based skills and strategies.
Two major findings from the study supported these suggestions. First, incorporating into existing classroom literacy programs materials and procedures designed to increase beginning readers’ phonological awareness and alphabetic coding skills resulted in an average difference in reading age of 14 months over standard literacy programs by the end of Year 2. Second, the use of the supplementary materials and teaching strategies eliminated the gap in beginning reading achievement between Maori and Pakeha children by the end of the second year of schooling. These findings suggest that relatively small changes to the predominant approach to teaching literacy in New Zealand will greatly increase the overall effectiveness of beginning reading instruction and substantially reduce the number of reading failures, especially among Maori children.
Preventing Negative Matthew Effects in At-Risk Readers: A Retrospective Study

INTRODUCTION

We begin this paper by presenting some puzzling findings. Although New Zealand generally ranks well in international surveys of literacy achievement, the variability in test scores is consistently very high in comparison to other countries. For example, in the recently released study of literacy achievement among 15-year-olds carried out by the Organization for Economic Cooperation and Development (2001), New Zealand’s mean reading scores (within the margin of error) were in the top 2 to 8 countries of the OECD. However, of the top eight countries (five of which were English speaking countries) New Zealand had the highest percentages of students performing at the highest and lowest levels. Similarly, in the last international study of literacy achievement conducted by the International Association for the Evaluation of Educational Achievement (IEA), New Zealand had the largest variation in achievement of any of the 32 participating countries (Elley, 1992). The majority of poor readers were from low-income backgrounds with an over-representation of Maori students (Wagemaker, 1993).

Recent research in New Zealand has revealed disparities between children of different backgrounds in important literacy-related skills at school entry, such as phonological sensitivity, letter-name knowledge, and understanding of concepts about printed language (Gilmore, 1998; Nicholson, 2000b). Group differences in literacy achievement steadily increase over the first years of schooling (Crooks & Caygill, 1999; Nicholson, 2000b), throughout high school (Nicholson, 1995; Nicholson & Gallienne, 1995), and into adulthood (Ministry of Education, 1997). Crooks and Caygill (1999) reported that of the 15 curriculum areas assessed in the National Education Monitoring Project (NEMP), the difference in performance between 8-year-old Maori and non-Maori students was greatest for reading, with a mean effect size of .52. The pattern of results remained the same when socio-economic factors were controlled, although the mean effect size was reduced to -.34. Relatedly, results from the international survey of adult literacy (Ministry of Education, 1997) indicated that proportionately almost twice as many Maori adults scored in the bottom two achievement levels of the study as did non-Maori adults. Home language is not a contributing factor to these performance differences as very few Maori learn to speak Maori as a first language, and only a small proportion learn Maori as a second language (Crooks & Caygill, 1999).

The relatively wide gap in literacy achievement in New Zealand is puzzling for two reasons. First, New Zealand is a very small country with a unified national education system. There are no separate states, provinces, or school districts in New Zealand. Although there is some degree of management at the local school level, almost everything else relating to literacy education is controlled centrally by the Ministry of Education, including the setting and monitoring of the national curriculum and the production of beginning reading materials and instructional guides for beginning reading teachers. As well, the two major intervention
programs for struggling readers, Reading Recovery and Resource Teachers: Literacy, are funded and monitored on a national basis (Greaney, 2002). Consequently, compared with other countries like the United States or Canada, there is considerably less variation in the reading methods and instructional strategies used in regular classroom reading programs and in nationally implemented intervention programs. Second, it is well established that reading difficulties are associated with various socio-economic factors, such as residing in low-income families, living in poor neighbourhoods, having parents with limited education and low levels of literacy, and attending schools in which literacy achievement is chronically low (Snow, Bums & Griffin, 1998). However, while poverty certainly exists in New Zealand, the degree of poverty and the difference in material wealth between low- and middle-income families are not nearly as great as in other countries, such as the United States.
STRATEGIES FOR REDUCING THE GAP

Three strategies have been proposed for preventing reading failure and reducing the unacceptably large gap in literacy achievement between Maori and Pakeha (i.e., non-Maori) children (Wilkinson, Freebody, & Elkins, 2000). These are (1) doing “more of the same” (but better), (2) focusing greater attention on accommodating cultural differences, and (3) changing the method of teaching literacy.

Doing More of the Same

Those who argue for doing more of the same are strongly opposed to making any substantial changes to current literacy practices in New Zealand (Elley, 1996, 1997; Ministry of Education, 1999; Smith, 1997, 2000; Smith & Elley, 1994). Instead, they recommend placing greater emphasis on addressing the needs of struggling readers, largely by providing professional development to teachers on what is regarded as “best practice” (vaguely specified) in working with children most at risk for underachievement (Ministry of Education, 1999). As part of this strategy, each school would be provided with an expert literacy adviser to ensure ongoing access to quality professional development opportunities, to provide literacy leadership within the school, and to evaluate the effectiveness of school literacy programs, including those for children needing additional support. Reading Recovery, however, would remain as the nationally implemented intervention program for children failing to respond adequately to formal reading instruction after 12 months of schooling (see Nicholson, 2002, for a more detailed discussion of the development of the National Literacy Strategy in New Zealand).

Ironically, the development and rapid expansion of whole language and Reading Recovery in New Zealand during the 1980s and 1990s provides the strongest argument against the “more of the same” strategy for reducing the gap in literacy achievement (see Opensifaw, 2002, for a historical analysis of the development of Reading Recovery). Survey data indicate that every year since 1991 a staggering 20 to 25 percent of all six-year-old children received expensive, intensive, one-to-one Reading Recovery tutoring after only their first year in school (Kerslake, 2000). Most of these children had made little or no progress toward gaining independence in reading despite having been immersed in a print-rich environment for an entire year.

Reading Recovery was designed to complement regular classroom literacy instruction in New Zealand, which is predominantly whole language in orientation with theoretical underpinnings compatible with the reading theories of Ken Goodman (1967, 1986) and Frank Smith (1978). In the book experience approach used in New Zealand classrooms, children are taught what they need to know to learn to read incidentally through frequent encounters with absorbing reading materials. According to Smith and Elley (1994), two leading proponents of the whole language approach in New Zealand, “children learn to read themselves; direct teaching plays only a minor role” (p. 87). The focus of this approach, then, is on learning to read by reading, with minimal attention being given to the development of
essential wordlevel skills and strategies. Instead, beginning readers are urged to use preceding passage content, sentence context cues, and picture cues as the primary strategies for identifying unfamiliar words in text. Connelly, Johnston and Thompson (2001) noted that the shift from emphasis on words in teaching reading to an emphasis on the story and book “has become more prevalent in the last twenty years and there has been increasing concern that children are able to predict reading responses from story and sentence contexts” (p. 433).

If, as we argue below, the whole language approach is particularly disadvantageous to at risk readers, then it is perhaps no accident that the rapid expansion of Reading Recovery and whole language in New Zealand almost exactly coincided with the increasing disparity between New Zealand readers. Given that Reading Recovery is essentially a more intensive version of what occurs in regular New Zealand classrooms (Thompson, 1993), it would not seem to be an effective strategy to place children who are failing to learn to read into a remedial reading program that uses the same methods that most likely contributed to their failure in the first place. In support of these claims are the results of a longitudinal study of Reading Recovery that we carried out in New Zealand (Chapman, Tunmer, & Prochnow, 2001). We found that Reading Recovery failed to significantly improve the literacy development of children considered to have succeeded in the program. These children showed no signs of accelerated reading performance, and one year after completion of the program, they were performing at around one year below age-appropriate levels (see Tunmer & Chapman, in press a, for a more detailed critique of Reading Recovery).

**Accommodating Cultural Differences**

Accommodating cultural differences is another strategy that has been proposed for reducing the literacy achievement gap (Au 1998, 2000; McNaughton, 1995). There seems to be little disagreement that teachers should adjust their teaching to accommodate student differences in cultural background (Ministry of Education, 1999). However, this may be easier said than done. As Snow, Burns and Griffin (1998) pointed out, “Cultural differences are entrenched in history and social institutions and are not easily amenable to educators’ manipulations” (p.243).

Despite these difficulties, several researchers have attempted to examine the effects of modifying teaching approaches to build upon the diverse range of knowledge and literacy practices found in the homes of children from minority cultures. This research is based on the assumption that early school literacy problems can be reduced by adjusting teaching practices so that they better match the cultural patterns and styles of learning of children of diverse backgrounds. McNaughton (1995), for example, claimed that more effective forms of instruction are those that provide bridges between home and school by allowing children from minority cultures to engage in literacy learning activities in the classroom that draw on familiar family literacy practices. Other examples of “culturally responsive instruction” include making learning experiences more personally meaningful to students of diverse backgrounds by engaging them in activities that relate to their interests and experiences outside of school; using instructional materials that present minority cultures in an authentic manner, including presenting culturally relevant content in culturally familiar social contexts;
and improving community involvement in literacy learning by promoting stronger connections among schools, parents, and the community (Au, 1998, 2000). These links should go in both directions with schools learning more about family literacy practices and how to build upon them, and families learning more about what they can do to support their children’s literacy learning in school.

Perhaps most importantly, teachers should hold high expectations for students from minority cultures. Au (2000) argued that, “There should not be a different set of standards for students of diverse backgrounds, but there should be a recognition that these students may require more powerful instruction and additional time to meet the standards” (p. 844). Some teachers from the dominant culture have low expectations of success for children of diverse backgrounds that stem from racist attitudes and deficit views of minority children’s intelligence, linguistic competence, and home environment (Nicholson, 2000a).

Another important issue relating to culturally responsive instruction concerns the disadvantages of using the whole language approach with students of diverse backgrounds, or what Au (1998) called the “mainstream constructivist orientation” (p. 306). Au (1998) argued that,

\[
\text{In a mainstream constructivist orientation, the tendency is to propose general principles applicable to all students, although individual differences may be considered. This point of view fails to acknowledge that a given set of learning opportunities may benefit mainstream students while working to the detriment of students of diverse backgrounds within the same classroom.} \text{ (p. 307)}
\]

Au (1998) further stated that,

\[
\text{Because the emphasis in constructivist approaches tends to be on process rather than product, educators with a mainstream constructivist orientation may see it as their role to act as facilitators of students’ learning, responding to students’ work but not transmitting knowledge .... Educators with this orientation may be reluctant to provide students with instruction on specific skills.} \text{ (p. 313)}
\]

The concerns expressed by Au (1998) regarding the use of the whole language approach are particularly applicable to New Zealand. Wilkinson, Freebody, and Elkins (2000) concluded that New Zealand faces a dilemma in meeting the challenge of equity in literacy education because of its child-centred pedagogy:

\[
\text{New Zealand’s literacy practices have a history of association with a developmental constructivist bias in teaching and learning. There is a general commitment to the centrality of the child in teaching and to a view of learning as proceeding from the child along developmentally appropriate pathways under guidance or support of the teacher; direct instruction of specific knowledge and skills according to prespecified routines finds little favour.} \text{ (p. 12)}
\]

The clear implication of these observations is that the “learn to read by reading” approach to teaching literacy that is predominant in New Zealand schools is not a culturally responsive
form of instruction and may even be a major contributing factor to cultural reproduction within New Zealand society (Tunmer, Prochnow & Chapman, 1999).

There are three general criticisms of the hypothesis that the poor literacy achievement of students from minority cultures is largely the result of a mismatch between their home culture and the culture of the school. First, cultural/ethnicity differences are often confounded with socio-economic variables that are themselves associated with reading difficulties in young children. For example, in New Zealand the majority of Maori students come from low-income families, live in low-income neighborhoods, and attend schools with relatively high proportions of students with similar disadvantages (Crooks & Caygill, 1999). Although both socioeconomic and cultural factors appear to be important, it is difficult to determine the relative contributions of each to reading achievement differences.

Second, although research indicates that culturally accommodated instruction may result in greater student participation and school satisfaction, there is no conclusive evidence that such instruction positively influences reading achievement (Snow, Burns & Griffin, 1998). Projects reporting positive effects typically include many components, some of which are not culture specific, such as general principles of effective teaching and classroom organization. In such circumstances it is impossible to determine whether culturally based factors or more general factors are responsible for the positive effects on student achievement (see Snow et al., 1998, for further discussion).

Finally, as we argue below, the problem of how to reduce the gap in early literacy achievement may have less to do with modifying classroom instruction to match home literacy practices and more to do with addressing the specific needs of children struggling to learn to read in an alphabetic orthography regardless of the cultural group or social class to which they belong. There is no evidence to suggest that direct instruction in essential reading skills cannot be done in a culturally sensitive manner.

**Changing the Method of Teaching Literacy**

In claiming that changing the method of teaching literacy is the best strategy for reducing the relatively high level of disparity between New Zealand readers, we are not suggesting that such a strategy alone will act as a “silver bullet” for bringing about equity in New Zealand literacy education. Although many children from low-income backgrounds do not struggle to learn to read, and a significant number from middle-class backgrounds do, the odds are generally stacked against low-income children because they live in families that are under varying degrees of financial and social stresses; for example, unemployment, single parent households, large families, poor living conditions (Crooks & Caygill, 1999; Nicholson, 1997, 1999, 2002). As a consequence, fewer resources are available for books, study materials, learning aids, and private study areas, and less adult time is available for engaging children in important literacy-related activities prior to school entry. In addition, low-income children are more likely to attend schools with fewer resources; with a lower ability composition; with lower levels of academic self-concept, achievement motivation, and school satisfaction; with higher levels of learning, emotional and behavioural problems; with a higher proportion of
disrupted class time; and with less qualified, experienced, and motivated staff (Crooks & Caygill, 1999; Nicholson & Gallienne, 1995; Snow, Burns, & Griffin, 1998).

Although changing the methodology of literacy instruction would not be expected to overcome all of the disadvantages associated with living in low-income families and neighbourhoods, our contention is that the whole language approach to teaching literacy makes the situation considerably worse than it otherwise would be by failing to provide at risk children with explicit instruction in alphabetic coding and related skills (see Foorman, Fletcher, Francis, & Schatschneider, 2000, for a similar view). Instead, whole language is predicated on the assumption that “reading and writing are best acquired ‘naturally’ in the same way that we learn to speak and listen” (Smith & Elley, 1994, p. 81). If children are immersed in a print-rich environment in which the focus is on the meaning of print, they will readily acquire reading skills, according to this view.

An alternative conceptualisation is that the acquisition of a complex skill like reading is a developmental process that occurs over time and involves qualitatively different (but perhaps overlapping) stages or phases (Ehri, 1997; Juel, 1991; Spear-Swerling & Sternberg, 1996). In this view consideration must be given to cognitive entry behaviours, which are the existing knowledge, skills, and strategies that students have at the outset of learning something new. With regard to reading, the literacy-related skills and experiences of children at school entry vary enormously. These skills include familiarity with “book” or “decontextualised” language (promoted by adult storybook reading); knowledge of letter names and sounds; sensitivity to the subcomponents of spoken words (referred to as phonological awareness; see Blachman, 2000); understanding of concepts and conventions of printed language; and ability to produce invented spellings (e.g., writing colour as KLR). Vellutino et al. (1996) have drawn attention to the importance of differences in these entry-level skills, arguing that:

… any given level of reading achievement is a by-product of a complex interaction between one’s endowment and the quality of one’s literacy experience and instruction, such that the child who is endowed with an adequate mix of the cognitive abilities underlying reading ability is better equipped to profit from experience and instruction in learning to read than is the child who is endowed with a less than adequate mix of these abilities. Indeed, the optimally endowed child may be able to profit from less than optimal experience and instruction, whereas the inadequately endowed child may have difficulty profiting from even optimal experience and instruction. (p. 602)

There is considerable evidence that children from low-income backgrounds begin school with significantly lower levels of literacy-related skills and experiences than children from more advantaged backgrounds (Nicholson, 1997; Snow, Burns & Griffin, 1998). The differences are especially large for phonological awareness, which is the best single predictor of future reading achievement at school entry (Share, Jorm, MacLean & Matthews, 1984; Tunmer, Chapman, Ryan & Prochnow, 1998). Bowey (1995), for example, found a strong relationship between socio-economic status and preschool phonological awareness even after controlling for the effects of IQ and general verbal ability (vocabulary knowledge and grammatical understanding). Recent research in New Zealand has revealed disparities between children of
different backgrounds in entry-level phonological sensitivity, letter-name knowledge, invented spelling ability and understanding of concepts about printed language (Gilmore, 1998; Nicholson, 2000b).

Home literacy environment has been suggested as the major contributing factor to these differences in entry-level pre-reading skills (Nicholson, 1999; Snow, Burns & Griffin, 1998). Because economic disadvantage is associated with lower levels of formal education and adult literacy, the parents of children from low-income families are less likely than middle-income parents to demonstrate a high positive regard for literacy and may feel less confident about engaging in strategic communication with schools and teachers about how to support their children’s early literacy development (especially if there are cultural and ethnicity differences as well). Moreover, as a consequence of financial and social stresses, low-income parents may have less time available to engage their children in the amount of verbal interaction necessary for the development of higher levels of vocabulary knowledge and oral language proficiency (which, in turn, are related to subsequent reading growth; Hoover & Tunmer, 1993; Tunmer & Hoover, 1992, 1993) and in the kinds of activities that promote the development of preliterate phonological awareness. The latter include looking at books and playing games that increase knowledge of letter names and their relation to sounds in words (e.g., “s” is for snake; see Murray, Stahl & Ivey, 1996), playing rhyming and sound analysis games and being read books that increase phonological sensitivity (e.g., pig Latin, I spy, nursery rhymes, Dr Seuss books; see Bryant, Bradley, Maclean & Crossland, 1989), and manipulating movable letters to form preconventional spellings of words (e.g., FRE for fairy). Exposure to such activities may be particularly important to children who enter whole language programs, which are based on the mistaken assumption that phonologically-based skills and knowledge of the alphabetic principle are of limited value in learning to read, and possibly even a hindrance (see, for example, Smith & Elley, 1994, p. 143).

When literacy-related activities in the home environment are passed from one generation to the next, as they often are, they become what sociologists call literate cultural capital. As the prominent New Zealand sociologist Nash (1997) argued, families located within the existing economic class structure “are engaged in long term actions with the strategic purpose (broadly known to them) of enabling their offspring to maintain their economic, cultural, and social position [and] schools are involved in this process by affording recognition to the skills acquired through a literacy-focused socialisation . . .“ (p. 13). In their empirical work, Nash and Harker (1992) reported that literate cultural capital was significantly associated with reading achievement. With respect to differential performance in the Maori population, they concluded that, “A considerable proportion of working class Maori pupils come to have relatively poor reading scores because schools as they are constituted are unable to transcend the effects of [Maori pupils’] somewhat less than literacy-dominated home environments (this is, of course, the result of the mono-cultural nature of the schools) ... [and] this relatively poor level of reading then begins to shape and confirm class and ethnically specific expectations pupils form about their eventual social and labour market destination” (p. 10).

The suggestion that differences in home literacy environment are a major cause of social class differences in school literacy achievement is highly controversial (see, for example, Taylor, Anderson, Au & Raphael, 2000). As Nash (2002) noted:
Many people regard the argument as a “deficit” theory and set their minds against it for that reason alone. This response is akin to burying one’s head in the sand. (p. 243)

We agree with Nash (2002) and maintain that the argument we (and others) are putting forward is not another example of deficit theory, where educational failure is explained largely in terms of relatively fixed characteristics that reside within the child or the child’s home, such as the intelligence the child possesses, the language the child speaks, or the culture from which the child comes. Stubbs (1980) distinguishes “deficit” from “disadvantage” and argues that the latter term is preferable because it implies that “there is nothing wrong with —the [children], but that [their] social experience puts [them] at a disadvantage because it is different from what is expected by schools ...” (p. 148).

Stubbs’ (1980) use of the term “disadvantage” is particularly relevant to the mainstream constructivist (i.e., whole language) orientation to literacy teaching, where it is assumed that children mostly “learn to read themselves” when immersed in a print-rich environment (Smith & Elley, 1994, p. 87). The emphasis in whole language and Reading Recovery on the use of text-based strategies over word-based strategies stems from the incorrect assumption that skilled reading is a process in which minimal word-level information is used to confirm language predictions (Clay, 1991; Goodman, 1967; Smith, 1978). On the basis of this assumption, whole language proponents concluded that the development of reading ability is largely a matter of learning to rely increasingly on the syntactic and semantic redundancies of language to generate hypotheses about the text yet to be encountered. As Smith and Elley (1994) argued, children “learn to read with minimal input from the text, predicting and confirming and making sense as they go” (p. 142). The teaching approach of urging beginning readers to use sentence context as the primary strategy for identifying unfamiliar words in text, and the theoretical assumptions about reading that underlie this approach, have been strongly promoted by the Ministry of Education in New Zealand through its various publications (Reading in junior classes, 1991; The learner as reader, 1996; Reading and beyond, 1997).

This view of reading, however, has been rejected by the scientific community. Pressley (1998), for example, stated that “the scientific evidence is simply overwhelming that letter-sound cues are more important in recognising words than either semantic or syntactic cues” (p. 16), and that heavy reliance on the latter is a “disastrous strategy” for beginning readers (p. 32). Several studies have shown that children with reading problems are much more likely to rely on sentence context to identify words than normally developing readers (for further arguments and evidence, see Tunmer & Chapman, 1998; in press b, c, d). Liberman and Liberman (1992) claimed that most children (perhaps up to 75%) will independently discover the enormous value of taking advantage of the alphabetic code in identifying words, which they must do to achieve progress in reading, regardless of the method of instruction to which they are exposed. The use of letter-sound relationships is the basic mechanism for acquiring word-specific knowledge, including knowledge of irregularly spelled words (Ehri, 1992, 1997; Gough & Walsh, 1991; Tunmer & Chapman, 1998).

To discover mappings between spelling patterns and sound patterns, children must be able to segment spoken words into subcomponents. For beginning readers who have difficulty
detecting phonological sequences in words, progress in reading will be impeded. Stanovich (1996) succinctly described the chain of events that leads to reading failure: “Impaired language segmentation skills lead to difficulties in phonological coding which in turn impede the word recognition process which underpins reading comprehension” (p. 155).

Children from low-income backgrounds are particularly susceptible to early reading difficulties because they often lack the necessary preschool exposure to the kinds of language play activities and early literacy experiences that promote the development of preliterate phonological awareness (Blachman, 2000). This in turn may trigger negative Matthew (poor-get-poorer) effects in reading (Stanovich, 1986). At risk children who do not possess a sufficient level of phonological sensitivity at the outset of formal reading instruction (and who are not provided with supplementary teaching to overcome their weakness in the phonological domain) most likely will not await phonological development but instead will be forced to rely increasingly on ineffective word identification strategies, such as using picture cues, partial word-level cues, and contextual guessing. Reliance on such counterproductive strategies would almost certainly be exacerbated by an instructional approach like whole language in which beginning readers are specifically encouraged to use text-based strategies over more effective word-based strategies.

Many at risk children will rely on ineffective strategies to such an extent and for such a long time (years in some cases) that the strategies become consolidated and difficult to “unlearn.” Because of their deficient word identification skills, these children not only receive less practice in reading but soon begin to confront materials that are too difficult for them, which (not surprisingly) results in avoidance of reading. As a consequence, they are prevented from taking advantage of positive Matthew (rich-get-richer) effects in reading. As children become better readers, both the amount and difficulty of the material they read increases, which leads to increased knowledge of letter-sound patterns (which improves word identification skills) and to further development of vocabulary knowledge, syntactic knowledge, and general knowledge (all of which improve reading comprehension skills).

As a result of repeated learning failures, many struggling readers also develop negative self-perceptions of ability and therefore do not try as hard as other children because of their low expectations of success (Chapman & Tunmer, 1997, in press; Chapman, Tunmer & Prochnow, 2000). For some of these children, especially boys, the sense of failure and feelings of frustration, coupled with the need to disguise their inability to perform reading tasks, become so great that they begin to exhibit classroom behaviour problems (Prochnow, Tunmer, Chapman, & Greaney, in press). What began as a relatively small difference in reading-related skills and knowledge at the beginning of school, then, soon develops into what Stanovich (1986) described as a downward spiral of achievement deficits and negative motivational and behavioural spin-offs (i.e., negative Matthew effects).

In summary, a clear (and testable) explanation for why New Zealand continues to have such a large spread of scores in international studies of literacy achievement is that these differences are largely the result of Matthew effects triggered by a mainstream constructivist orientation to teaching reading that fails to respond adequately to differences (not deficits!) in essential reading-related (especially phonologically-based) skills and knowledge at school entry that
stem primarily from social class differences in home literacy environment. Evidence in support of this claim comes from a five-year longitudinal study in New Zealand by Nicholson (2000b), who found that differences in phonological awareness skills, letter-name knowledge, and invented spelling ability between low- and middle-income children at school entry were associated with a steadily increasing gap between the two groups in reading accuracy, reading comprehension, and spelling over the next five years. Relatedly, we (Chapman, Tunmer & Prochnow, 2001) found in a longitudinal study of beginning literacy development in New Zealand that children selected by their schools for Reading Recovery were, without exception, experiencing severe difficulties in detecting sound sequences in words (i.e., phonological awareness) and in relating letters to sounds (i.e., alphabetic coding) during the year preceding entry into the program. Participation in Reading Recovery did not appreciably reduce these deficiencies, and the failure to remedy these problems severely limited the immediate and long-term effectiveness of the program. The few children who received some benefit from Reading Recovery were more advanced in phonological processing skills at the beginning of the program than children who derived little or no benefit from the program, and progress in learning to read following participation in Reading Recovery was strongly related to phonological processing skills at discontinuation from the program.

Further evidence in support of our claim is provided by a recent meta-analysis of studies examining the effects of whole language instruction on the literacy achievement of children from low-income backgrounds (Jeynes & Littell, 2000). Overall, the results indicated that less advantaged children benefited less from whole language instruction than from basal instruction, leading the authors to conclude that “using a whole language approach with low-SES children could widen the gap between advantaged and disadvantaged students” (p. 31). In support of this conclusion are results from a study by Foorman et al. (1998) of the effects of different methods of beginning reading instruction on the reading growth of at risk beginning readers. They found that degree of explicitness of instruction in the alphabetic code and related skills was positively associated with amount of improvement in reading, and that more explicit instruction in alphabetic coding was more effective than less explicit approaches with children who had lower levels of phonological processing skills at the beginning of the year. Of particular importance was the finding that direct instruction in alphabetic coding resulted in less disparity between students in reading achievement at the end of the year than less explicit approaches to teaching spelling-sound patterns.

To examine further these issues in the New Zealand educational context, we designed a study to answer two questions. First, if beginning reading teachers incorporated into their literacy programs supplementary materials and procedures designed to help children develop awareness of sound sequences in spoken words and make greater use of letter-sound patterns in reading unfamiliar words, would this produce significantly greater gains in reading achievement than the standard whole language approach to literacy instruction? Second, would the incorporation of these materials and teaching strategies reduce the gap in beginning reading achievement between Maori and Pakeha (i.e., European) children?
METHOD

Sample and Design

A retrospective study was carried out in which a representative sample of seven schools was selected from 22 schools that three years earlier had participated in a longitudinal study in which the literacy development of 152 children was closely followed from school entry to the middle of Year 3. Children in New Zealand commence school on or around their fifth birthday, and formal reading instruction begins at that time. To control for amount of prior schooling, the children selected for participation in the original study had almost reached their fifth birthday or had turned 5 years of age during the preceding summer break, and therefore had entered school for the first time at the beginning of a new school year.

The seven schools selected for program modification were located in a range of socio-economic areas. In New Zealand, schools are rated from a decile of 1 (low) to 10 (high) according to the socio-economic community the school serves. The decile ratings of the selected schools ranged from ito 10, with one school at each of levels 1, 3, 4, 5,7, 9 and 10. A total of 80 children from 13 classrooms in the seven target schools satisfied the same criteria for selection as the children in the original study. The mean age of the children at school entry was 5 years, 1 month (range = 4 years, 11 months to 5 years, 3 months).

A comparison group of 63 children was formed by selecting children from the original sample who had attended the target schools three years earlier. The mean age of the comparison group children at school entry was 5 years, 1 month (range = 5 years, 0 months to 5 years, 3 months). The classroom reading programs of these children strongly adhered to the whole language philosophy of teaching reading (for detailed descriptions of the New Zealand version of whole language, see Connelly, Johnston & Thompson, 2001; Smith & Elley, 1994; Thompson, 1993; Tunmer & Chapman, 1999).

Instruments

The children in the program modification schools were tested at four of the same testing points as the children in the original longitudinal study (beginning, middle and end of Year 1 and end of Year 2) with a selection of tests from the original test battery, especially those that assessed phonological processing skills. The tests, which were given at developmentally appropriate testing times, included measures of letter identification, phonological sensitivity (as measured by onset-rime segmentation, sound matching, and phoneme segmentation), knowledge of letter-sound patterns (as measured by pseudoword decoding), ability to use orthographic analogies, invented spelling ability, conventional spelling ability, context free word identification ability (two tests), reading book level, and children’s reported word identification strategies.

Letter identification was assessed at school entry by means of the Letter Identification task in
the Diagnostic Survey (Clay, 1985). Children were required to give the name or sound of 26 uppercase and 28 lowercase letters, two of which appeared in varying fonts. Scoring was based on the number of letters correctly identified by name or sound. The reliability estimate for this scale was .97.

The onset-rime segmentation task was developed by Caifee (1977) and was administered at the beginning and middle of Year 1. The task was to delete the initial consonant onset from a presented word and to say aloud the vowel-consonant rime that remained, where an onset is the initial consonant or consonant cluster of a syllable, and rime is the vowel and any following consonants. For instance, to the word *mice*, the correct response was “ice”; to the word *rope*, the correct answer was “ope.” The task comprised four training lists and six transfer lists. The difficulty level increased through the lists. For the last two transfer lists, half of the words were real and half synthetic (e.g., *kend*, *mox*, *j~*). Scoring was based on the number of correct responses to items presented in the six transfer trials, with a maximum possible score of 53. The internal reliability coefficient for this scale was .96.

The sound matching task was an adaptation of a task developed by Bryant, Bradley, Maclean, and Crossland (1989). This task, which was administered at the middle of Year 1, comprised two parts; an onset matching task and a rime matching task. In the onset matching task, the child was asked to indicate which two of three orally presented words sounded the same “at the beginning” (e.g., *hair*, *pin*, *pig*). In the rime matching task, the child was asked to indicate which two of three orally presented words sounded the same “at the end” (e.g., *snail*, *nail*, *boot*). For both tasks a series of practice items was included, and picture support was provided for each test item in order to reduce memory load. Scores for the sound matching task comprised the total number correct for the onset matching task (maximum = 9) plus the total number correct for the rime matching task (maximum = 9), giving a maximum possible score of 18. The internal reliability estimate for this scale was .78.

Phoneme segmentation ability was assessed at the end of Year 1 by means of a modified version of a phoneme counting task developed by Tunmer, Herriman, and Nesdale (1988). The children were required to use counters to represent the sounds in orally presented pseudowords of varying length. The task was presented in the form of a game in which the children were asked to identify the sounds in “funny sounding names of children who live in far away lands.” One demonstration item was given, followed by four practice items with corrective feedback. Scoring was based on the number of items correctly segmented, giving a total possible score of 24. The internal reliability coefficient for this scale was .83.

An adapted version of a pseudoword decoding task developed by Richardson and DiBenedetto (1985) was used to measure knowledge of letter-sound patterns at the middle and end of Year 1 and end of Year 2. Thirty monosyllabic pseudowords from Section 3 of their Decoding Skills Test were presented in the form of a game in which the children were asked to try to read the “funny sounding names of children who live in far away lands.” The pseudowords were presented in order of increasing difficulty, ranging from simple consonant-vowel-consonant patterns (e.g., *jit*, *med*, *dut*) to blends, digraphs, and vowel variations (e.g., *prev*, *thrain*, *fruice*). Two practice items with corrective feedback were given followed by the 30 test items with no corrective feedback. When the child incorrectly
pronounced an item, the mispronunciation was recorded using the pronunciation key provided by Richardson and DiBenedetto. The items were scored according to the total number of sounds pronounced correctly in each item, provided the sounds in the item were blended into a single syllable. The total number of possible points was 101, and the internal reliability estimate for this scale was .99.

**Invented spelling** was assessed at the middle and end of Year 1. The children were asked to write 18 words that were read aloud by the experimenter, first in isolation, then in a sentence. The 26 letters of the alphabet were displayed across the top of the children’s response page. Each word that children wrote down received a score from 1 to 4. Maximum points were awarded for correct conventional spellings. Three points were awarded if all the sounds in the word were represented with letters, although unconventionally (e.g., *kik* for *kick*, *fil* for *fill*, *sid* for *side*). Two points were awarded if more than one phoneme (but not all) was represented with phonetically related or conventional letters (e.g., *sd* for *side*, *lup* for *lump*). One point was awarded where the initial phoneme was represented with the correct letter (e.g., *f* for *fat*). The total number of possible points was 72, and the internal reliability estimate for this measure was .94.

An **analogical transfer task** devised by Greaney, Tunmer and Chapman (1997) was used to measure the children’s ability to take advantage of orthographic analogies when reading words containing common rime spelling units. The children were asked to read 72 monosyllabic words that were presented in 18 rows of four words each. The 72 words comprised 18 groups of words, each of which contained a common rime spelling unit (e.g., *at* in *cat*, *hat*, *bat*, *fat*). Half the words were presented contiguously (e.g., *tail*, *mail*, *sail*, *jail*), and half were presented noncontiguously such that no two words containing a common rime spelling unit appeared in any one row (e.g., *bank*, *side*, *may*, *meat*). The words presented contiguously and noncontiguously were counterbalanced across participants. The first word of each of the rows containing contiguously presented words was a frequently occurring word that children could easily recognise. The remaining three words in each row were chosen to vary widely in frequency of occurrence to increase the likelihood that some of the words would not be immediately recognised by the children. Scoring was based on the number of words read correctly in the two presentation conditions. The internal reliability for this task was .98.

Context free **word identification** ability was assessed by means of a combination of Forms A, B, and C of the Ready to Read Word Test (Clay, 1985) at the beginning, middle, and end of Year 1, and the Burt Word Reading Test, New Zealand Revision (Gilmore, Croft, & Read, 1981) at the middle and end of Year 1 and end of Year 2. The Ready to Read Word Test comprised 45 words selected from the most frequently occurring words in the 12 “little” books of the New Zealand Ready to Read Series. Scoring was based on the number of words read correctly by each child. The internal reliability coefficient for this test was .90.

The Burt Word Reading Test is a standardised test in which children are presented with a list of 110 words of increasing difficulty and asked to look at each word carefully and read it aloud. Testing continued until 10 successive words were read incorrectly or not attempted. Scoring was based on the number of words read correctly. The Burt Test has a reliability
coefficient of .97. Of particular relevance to the present study, which did not include a standardised measure of reading comprehension ability, Blaiklock (1997) reported that the Burt Test correlated highly with word recognition accuracy in connected text ($r = .94$) and reading comprehension ability ($r = .85$), as assessed by means of the Neale Analysis of Reading Ability - Revised (Neale, 1988).

**Reading book level**, as assessed by the children’s classroom teachers at the end of Years 1 and 2, was included as an estimate of reading progress. Children were assigned to the book level in which they were able to attain a word recognition accuracy rate of 90% to 94%. There are 26 book levels, the characteristics of which are more fully described in Iversen and Tunmer (1993). Reading book level has been criticised as an unreliable measure of reading achievement that yields inflated estimates of children’s progress (Chapman, Tunmer & Prochnow, 2001; Elbaum, Vaughn, Hughes & Moody, 2000; Tunmer & Chapman, in press a).

**Spelling of common words** was assessed at the end of Year 2 by means of 20 words from the *Spell-Write Manual* developed for use in New Zealand schools by Croft (1983). Five words from each of the four word lists in the manual were randomly selected for inclusion in this task. The words were clustered in groups of 5, and in increasing difficulty. The reliability estimate for this scale was .92.

Children’s **reported word identification strategies** were obtained by asking each child the following question toward the end of Year 1: “When you are reading on your own and come across a word that you don’t know, what do you do to try to figure out what the word is?” The children’s responses were coded according to whether reference was made to the use of word-based strategies, reference was made to the use of text-based strategies, or no response was given. Examples of word-based strategies were “sound it out,” “think of the sounds,” “hear all the letters,” “listen to what the letters are.” Examples of text-based strategies were “guess,” “think, guess what the word is,” “read it over again,” “read on,” “have a look at the picture,” “put my finger on the book and try other words and get a word that makes sense,” “miss it out and go to the end and go back and guess a word that makes sense.” Responses were independently rated by two research assistants. There were very few differences in categorisation of responses, and these were resolved by discussion.

**Modified Literacy Teaching Program**

In designing and evaluating intervention programs there are many factors to consider (Lyon & Moats, 1997; Tunmer, Chapman, Greaney & Prochnow, 2002). Lyon and Moats (1997) noted that all “real-world” interventions will have strengths and weaknesses, no matter how elegantly designed:

> In conducting intervention research, there are clear trade-offs with respect to experimental control and ecological validity For example, the more control that is exerted over teacher and school effects, the more difficult it is to generalise the results of the study to typical classroom settings. (p. 585)
Because our ultimate goal was to affect change in regular classroom literacy practices, a deliberate decision was made to have the supplementary instruction delivered by the classroom teachers themselves rather than specially trained researchers brought to the school. Accordingly, our approach was to work collaboratively with the beginning reading teachers in the 13 new entrant classrooms of participating schools to adapt, deliver and test supplementary teaching strategies and materials designed to help all children, but especially those at risk for failure, to derive greater benefit from regular classroom instruction.

An important feature of our program was the emphasis placed on professional development. Hiebert and Taylor (2000) concluded from a review of research on early reading interventions that opportunities for teachers to learn are an essential part of successful early intervention projects, especially in initiating changes in the profiles of struggling beginning readers (p. 478). Teachers need to know what they are doing and why they are doing it, and be able to respond to the individual differences and needs of their students rather than teaching in narrow, formulaic ways. With these considerations in mind, a full-time researcher was assigned to the project to provide ongoing support throughout the school year to all participating teachers in the use of the supplementary teaching materials and strategies. The researcher visited the 13 classrooms on a rotating basis, and assisted the teachers in implementing the program by explaining, demonstrating and modelling effective use of the materials and instructional strategies.

Towards the end of the year preceding the implementation of the program, we met with the teachers and principal of each participating school to explain the rationale for the next phase of our research project. We indicated that the data from the longitudinal study we had carried out in their school (and the other participating schools) showed that many beginning readers were having trouble detecting sound sequences in spoken words and in relating letter patterns to sound patterns, and that these problems were strongly related to subsequent delays or difficulties in learning to read (data from actual cases in each participating school were presented to illustrate the pattern of results we obtained). We then suggested to the teachers and principal that incorporating some additional materials (that we would provide free of charge) and instructional strategies into their beginning literacy program might help their children, especially those at risk, to derive greater benefit from the school’s literacy program, and thus make the program more effective. We presented material from three commercially available literacy instruction packages that were designed to help children develop awareness of sound sequences in spoken words and to make greater use of letter-sound patterns in reading unfamiliar words. Because the packages had been developed in Australia and England, the teacher’s role was to work collaboratively with the research team to determine whether the packages could be successfully adapted for use in New Zealand classrooms. The teachers agreed to use the resources with the support of the full-time researcher and to provide ongoing comments and written evaluations of their usefulness, including recommendations for adaptations. At different times during the project the teachers in each of the schools were invited to a lunch hosted by the research team to share their experiences in using the supplementary materials and instructional strategies with teachers at other participating schools. Throughout the project the authority and professionalism of the participating teachers were recognised and respected.
Components of the three selected packages were used by the teachers of Year 1 students over the course of a four-term school year (each term lasted approximately 10 weeks). *Sound Foundations* (Byrne & Feilding-Barnsley, 1991b) was used during the first term, *Rhyme and Analogy* (Goswami, 1996) during the second term, and *Jolly Phonics* (Lloyd, 1992) during the third and fourth terms. The selection of the three packages was based on the assumption that the degree of explicitness and detail with which phonologically-related knowledge, skills, and strategies are taught is particularly important. Although a naturalistic, informal, whole language approach to reading instruction (in which word analysis activities arise *incidentally* from the child’s responses during text reading) may be suitable for many children (mainly those with an abundance of literate cultural capital at school entry), other children (especially those at risk) appear to require a more highly structured, systematic approach with particular attention focussed on the development of phonologically-based skills and strategies.

*Sound Foundations* is a thoroughly researched program (Byrne & Feilding-Barnsley, 1991a, 1993, 1995; Byrne, Fielding-Bamsley, & Ashley, 2000) that aims to increase young children’s sensitivity to the phonological components of words (the beginning and end sounds) through activities that focus on sound-sharing among spoken words. Most attention is focused on nine phonemes; three continuant consonants (s, sh, l), four stop consonants (m, p, t, g) and two short vowels (a as in bat, e as in bet). For each of these sounds there are a variety of activities. The first involves the use of large, durable, brightly coloured posters depicting scenes with objects beginning with the same sound (sea, seal, sailor, etc.) and other posters with objects ending with the same sound (bus, horse, octopus, etc.). Accompanying each poster are three reproducible worksheets containing drawings of objects and characters. On each worksheet about half the items begin (or end) with the critical sound and the child’s task is to find and colour the target items.

Two card games are included in the package. In “Sound Dominoes” two pictured objects appear on each card and the child’s task is to join cards sharing beginning sounds (or ending sounds in a second version of the game). In “Snap” one pictured object appears on each card and children (as many as eight) take turns placing their next card face up on a pile and saying “snap” when the new card matches the top one in the pile for initial sound (or final sound in a second version of the game, or beginning or final sound in a third version). The teachers used the posters, worksheets, and card games to teach the nine key sounds (in beginning and ending positions), with a new sound being introduced each week in the order recommended in the *Sound Foundations* manual. The *Sound Foundations* materials and teaching activities were used by the teachers for at least 60 minutes each week during the first term.

*Rhyme and Analogy* (Goswami, 1996), which was used during the second term, is based on Goswami’s work on the role of orthographic analogies in learning to read (see Goswami, 2000, for a review of research). The ability to segment spoken words into phonemic units is preceded by the ability to divide words into onsets and rimes (Treiman, 1992). Because onsets and rimes are more accessible to beginning readers, especially to children as young as New Zealand beginning readers, an initial focus on teaching orthographic units corresponding to onsets and rimes was considered to be a useful first step in making children more aware of sublexical relationships between written and spoken words.
The *Rhyme and Analogy* package comprises three components. First, an alphabet frieze (and tabletop poster version of the same material) shows the letters of the alphabet and four common digraphs (*ch, sh, th, wh*), each presented with a colourful illustration of an object beginning with the sound represented by the letter or digraph (e.g., a picture of a shoe accompanies *sh*). The frieze and poster are used to help children recognise letter shapes and learn letter sounds. Second, 60 reproducible worksheets are used to develop children’s knowledge of the alphabet by having them practice letter formation, identify and categorise the initial sounds of illustrated objects, and make connections between initial sounds and letters.

The third and most important component of *Rhyme and Analogy* are four sets of cards that can be used to play more than 50 games designed to develop children’s awareness of onset and rime, and to help children recognise and use common rime spelling patterns in their reading and spelling. The first deck contains 120 initial sound (i.e., onset) picture cards (four picture cards for each letter of the alphabet and for each of the common digraphs) that are used to increase children’s sensitivity to the beginning sounds of spoken words. The second deck contains 120 letter cards (four cards for each letter and digraph, presented in lower case) that are used to develop knowledge of letter sounds and, when used in conjunction with initial sound picture cards, to encourage children to make connections between letters and initial sounds. The third deck contains 64 rhyme picture cards (16 families of pictured objects that rhyme) that are used to develop children’s sensitivity to rime units in spoken words. The fourth deck contains 64 rhyme word cards (each with a printed word that matches one of the rhyme picture cards in the third deck) that are used to encourage children to make connections between rimes in spoken words and rime spelling patterns in printed words (e.g., “ip” in “ship,” “zip,” “lip,” “chip” and *ip* in *ship, zip, lip, chip*). The teachers reported that the card games were easily integrated into their regular classroom literacy activities and were particularly helpful in developing beginning readers’ knowledge of basic letter-sound patterns (i.e., initial letter sounds and rime spelling units).

Two components of the *Jolly Phonics* package were used during the third and fourth terms. These were the *Phonics Handbook* and the seven *Finger Phonics* books. A distinctive feature of the program is that children are taught the main letter or letter pattern corresponding to each of the 42 sounds of English, not just the alphabet sounds (i.e., sounds represented by individual letters like *s, t, o*, as well as those represented by digraphs like *ai, oo, th, ng, and ch*). The program therefore provided a review and extension of the letter-sound patterns that were taught in the *Rhyme and Analogy* program.

*Jolly Phonics* uses a multi-sensory approach that incorporates visual, aural and tactile teaching techniques. The Phonics Handbook provides over 100 reproducible sheets for teaching the 42 letter-sound patterns and the structured blending of letter sounds. For each of the 42 letter sounds a “sound sheet” is provided with a suggested storyline (e.g., “Pack a hamper - children suggest food taken - they sit down and lay out the picnic - start eating - little child feels tickling on arm and says *a a a a a ants* - they jump and leave the angry ants”), an action (teacher shows the letter *a* and children wiggle their fingers above their elbow as if ants were crawling on them, and say *a, a, a!*), a picture to colour (e.g., two angry ants), and a line to practice writing the letter(s) on. Training in blending sounds begins by having the children
listen to the separate sounds of three-letter words (e.g., “duh-ah-guh”) and then calling out the appropriate word (e.g., “dog”). The *Phonics Handbook* also includes lists of words for the children to cut up and put into “sound boxes” to be taken home for additional blending practice.

The seven *Finger Phonics* books each contain six letter sounds presented in a textured format that allows the child to feel the letter shape. Also included in each book are illustrations of the actions the children learn to associate with each letter sound, and illustrations of objects (and their associated printed words) containing the sound in different positions in words. The back pages of each book give additional practice in matching sounds to letters and in word-building activities involving the manipulation of word segments.

The teachers reported that the *Jolly Phonics* materials and procedures were most easily and effectively used when working with groups of four to six children. They further indicated that the children responded very enthusiastically to the program, especially the storylines and associated actions. Each week the teachers spent about an hour working with each group, and normally introduced three new letter sounds in the order recommended in the *Phonics Handbook*.

The materials and procedures from the three packages that were incorporated into the Year 1 literacy programs of the seven participating schools did not represent a return to a rigid, skill-and-drill approach to literacy instruction in which word-level skills are largely taught in isolation as part of an overall lock-step approach to literacy instruction. Instead, the instructional approach that we encouraged the teachers of beginning readers to adopt was based on two assumptions. First, there needed to be a balance between activities that facilitated the acquisition of declarative, or factual, knowledge and those that facilitated the acquisition of procedural, or “how to,” knowledge (i.e., strategies). Skill-and-drill approaches tend to place too much emphasis on teaching factual knowledge, such as that a particular letter or letter sequence (e.g., *tion*) makes a particular sound (e.g., /shunl), without giving sufficient attention to developing within beginning readers an understanding of how and when to apply such knowledge. In contrast, strategy training fosters the development of procedural knowledge by encouraging beginning readers to become active problem solvers with regard to graphic information, which includes adopting a “set for diversity” (Gaskins et al., 1988) that enables them to make use of irregular and polyphonic spelling patterns (e.g., *ear* as in *bear* and *hear*, *own* as in *clown* and *flown*, where children generate alternative pronunciations of the word until one is produced that matches a word in their vocabulary and is appropriate to the sentence context). Emphasis was therefore placed on developing self-improving strategies for acquiring spelling-sound relationships (because there are too many to acquire by direct instruction; Gough & Hillinger, 1980) rather than on just teaching individual spelling patterns per se, as in the skill-and-drill approach. Juel (1991) argued that a little explicit phonics instruction may go “a long way” in facilitating the process by which children induce untaught spelling-sound relationships (p. 783). As the reading attempts of beginning readers became more successful, they would begin making greater independent use of letter-sound information (possibly supplemented with text-based cues) to identify unfamiliar words from which additional spelling-sound relationships can be induced without explicit instruction (Juel & Minden-Cupp, 2000; Share, 1995; Share & Stanovich, 1995;
Second, balance also needed to be achieved in the instructional components included in the modified beginning reading programs, especially between learning new skills and actually using them. Beginning readers must be given plenty of opportunities to use their newly acquired word-level skills and strategies to identify unfamiliar words while reading *connected text*. Although beginning readers should receive explicit and systematic instruction in letter-sound patterns and word identification strategies outside the context of reading connected text, they must also be taught how to use this information during text reading through demonstration, modelling, direct explanation and guided practice. It cannot be assumed that beginning readers who are successful in acquiring word analysis skills will automatically transfer them when attempting to read connected text (Lyon & Moats, 1997). Some children, especially struggling readers, must be made aware that successful attempts in identifying unfamiliar words in text are a direct consequence of the appropriate and effortful application of taught skills and strategies. For this reason we stressed to the teachers during the final term of the school year the importance of giving students consistent and accurate feedback to encourage them in their reading and writing efforts, to help them identify appropriate strategies, and to help them recognise the effort needed to achieve success in reading and writing tasks. The intention of the “feedback scripts” that we developed and modelled for the teachers was to make the children more aware of the cause-effect links between what they do on the reading or writing task and the outcome achieved, and to promote a positive sense of reading-related self-efficacy (Chapman & Tunmer, in press).
RESULTS AND DISCUSSION

Presented in Table 1 are the means and standard deviations for measures taken at the beginning, middle and end of Year 1 and at the end of Year 2 as a function of type of program. t-tests were carried out to determine whether there were any significant differences between the means of children in the original and modified beginning literacy programs. The results indicate that the two comparison groups performed at similar levels on letter identification, onset-rime segmentation, and word identification at school entry. The children in both groups performed at floor levels on the word identification measure, usually only recognising the word I (which is also an upper case letter) and possibly one other word.

At the middle of Year 1 the children in the modified program scored more highly than the children in the original program on all measures. However, only two reached significance, sound matching and invented spelling, both of which were phonological processing measures. By the end of the year the differences between the means for all measures except reading book level (which, as noted earlier, is a somewhat unreliable measure) had reached significance, including two standardised measures of reading achievement (i.e., the Clay and Burt tests). Of particular importance were the very robust differences favouring the modified program group on all phonological processing measures (i.e., phoneme segmentation, invented spelling, pseudoword decoding, and analogical transfer). The materials and procedures from the three packages that were incorporated into the reading programs of the 13 intervention classrooms were clearly having a cumulative positive effect on the development of children’s phonologically-related skills and strategies, which in turn were beginning to generalise to standardised measures of reading achievement.

An important aspect of intervention research is determining whether any positive effects obtained from the intervention are maintained after the intervention is completed. The data presented in Table 1 indicate that by the end of Year 2 the gains made by the children in the modified program (which was completed at the end of Year 1) over the children in the original program were not only maintained but had increased to an average difference in reading age of 14 months. Convergent evidence that these gains can be attributed to greater knowledge and use of letter-sound patterns comes from the children’s responses to the question concerning their preferred word identification strategy given at the end of Year 1.
Table 1: Tests of differences between means of original and modified beginning literacy programs for all measures

<table>
<thead>
<tr>
<th>Variable</th>
<th>Maximum score</th>
<th>Type of Program</th>
<th>Original</th>
<th>Modified</th>
<th>M</th>
<th>D</th>
<th>M</th>
<th>SD</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning of Year 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Letter identification</td>
<td>54</td>
<td></td>
<td>20.1</td>
<td>18.0</td>
<td>25.4</td>
<td>17.4</td>
<td>Ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Onset-rime segmentation</td>
<td>53</td>
<td></td>
<td>31.9</td>
<td>15.5</td>
<td>34.6</td>
<td>12.5</td>
<td>Ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word identification (Clay)</td>
<td>45</td>
<td></td>
<td>1.5</td>
<td>3.6</td>
<td>2.4</td>
<td>2.5</td>
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Presented in Table 2 are the frequency and percentage for each response category as a function of type of beginning literacy program. For the children in the modified program, there was a clear shift toward reporting the use of word-based strategies, from 54% to 76%, with a corresponding decline in text-based responses, such as those referring to sentence context or picture cues.

Table 2 Frequency and percentage for each response category of reported word identification strategies as a function of type of beginning literacy program

<table>
<thead>
<tr>
<th>Response Category</th>
<th>Original Program</th>
<th>Modified Program</th>
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<td>%</td>
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<tr>
<td>Text-based strategies</td>
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</tr>
<tr>
<td>Total</td>
<td>61</td>
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</table>
The second aim of the study was to determine whether supplementary materials and procedures designed to help children develop phonological awareness and alphabetic coding skills would reduce the gap in reading achievement between Maori and Pakeha (i.e., European) children. To answer this question we divided the children in the original and modified literacy programs into Pakeha and Maori subgroups (the few children who did not belong to either of these ethnic groups were not included in the analysis). Although there was at least one Maori student in the sample from each of the seven schools that implemented the modified beginning literacy program, the majority of Maori students attended low decile schools (65% in deciles 1 to 5, 35% in deciles 6 to 10) with the largest percentage (29%) attending a decile 1 school. In contrast, the majority of Pakeha children were in higher decile schools.

For the Pakeha and Maori children in the original longitudinal study, the means, standard deviations and tests of significant differences for all measures included in the retrospective study are presented in Table 3. The results show significant differences between the two groups on all measures at all testing points. Particularly noteworthy are the large group differences on all phonological processing measures from school entry to the end of Year 2 (i.e., onset-rime segmentation, sound matching, phoneme segmentation, pseudoword decoding, analogical transfer, invented spelling). These findings support our claim that the mainstream constructivist orientation to teaching reading in New Zealand fails to respond adequately to differences in essential phonologically-related skills and knowledge during the initial years of schooling. After two years of schooling the Maori children were performing on average 9 months below age-appropriate levels in reading (as measured by the Burt test) and 11 months below the Pakeha children in the sample.

Effect sizes were calculated to provide data for comparing the performance of Pakeha and Maori children. For each measure the mean score obtained by Pakeha students was subtracted from the mean score obtained by Maori students, and the difference was divided by the standard deviation of the scores obtained by the Pakeha students. In this procedure Pakeha mean effect sizes were set at 0 to form a benchmark against which to compare Maori mean effect sizes. When the mean effect sizes for the measures taken at each testing point were computed and plotted against time, the standard negative Matthew effect of increasing group differences was revealed, as illustrated in Figure 1 (see the line representing the performance of Maori children in standard beginning reading programs). Consistent with these findings are the results presented in Table 4 showing large differences in reported word identification strategies between Pakeha and Maori children at the end of Year 1. The Pakeha children were three times more likely than Maori children to report using word-based strategies to identify unfamiliar words in text.
### Table 3 Tests of differences between means of Pakeha and Maori children in original longitudinal study

<table>
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<tr>
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<th>Ethnicity</th>
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### Table 4 Frequency and percentage for each response category of reported word identification strategies as a function of ethnicity (original program)

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For the Pakeha and Maori children in the program modification study, the means, standard deviations and tests of significant differences for all measures are presented in Table 5. At school entry the differences between the two groups were very similar to those in the original longitudinal study. However, at all subsequent testing points there were no significant differences between any of the measures taken. The mean effect sizes shown in Figure 1 indicate that the initial gap between Maori and Pakeha children at school entry had closed by the end of Year 2 (see the line representing the performance of Maori children in modified beginning reading programs). Consistent with these findings are the results presented in Table 6 showing no major differences between Pakeha and Maori children in reported word identification strategies. By the end of Year 1 both groups reported a strong preference for using word-based strategies to identify unfamiliar words in text. These results suggest that the phonologically-related materials and procedures incorporated into the reading programs of the 13 intervention classrooms were effective in eliminating the gap in reading achievement between Maori and Pakeha students.
Table 5 Tests of differences between means of Pakeha and Maori children in retrospective program modification study

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<td>Burt reading age (yrs., mos.) &gt;12:0</td>
<td>6.2</td>
<td>-</td>
<td>-</td>
<td>6.1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Reading book level</td>
<td>26</td>
<td>12.1</td>
<td>4.9</td>
<td>10.7</td>
<td>5.5</td>
<td>ns</td>
</tr>
<tr>
<td><strong>End of Year 2</strong></td>
<td></td>
<td>(n=43)</td>
<td>(n=12)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pseudoword decoding</td>
<td>101</td>
<td>85.6</td>
<td>16.8</td>
<td>87.8</td>
<td>9.3</td>
<td>ns</td>
</tr>
<tr>
<td>Analogical transfer</td>
<td>72</td>
<td>66.2</td>
<td>7.8</td>
<td>65.8</td>
<td>6.5</td>
<td>ns</td>
</tr>
<tr>
<td>Spelling common words</td>
<td>20</td>
<td>14.4</td>
<td>4.7</td>
<td>15.6</td>
<td>3.9</td>
<td>ns</td>
</tr>
<tr>
<td>Word identification (Burt)</td>
<td>110</td>
<td>45.6</td>
<td>14.3</td>
<td>45.9</td>
<td>18.1</td>
<td>as</td>
</tr>
<tr>
<td>Burt reading age (yrs., mos.) &gt;12:0</td>
<td>8.3</td>
<td>-</td>
<td>-</td>
<td>8.3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Reading book level</td>
<td>26</td>
<td>21.9</td>
<td>4.7</td>
<td>20.0</td>
<td>3.6</td>
<td>ns</td>
</tr>
</tbody>
</table>

Table 6 Frequency and percentage for each response category of reported word identification strategies as a function of ethnicity (modified program)

<table>
<thead>
<tr>
<th>Response Category</th>
<th>Pakeha</th>
<th></th>
<th>Maori</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Word-based strategies</td>
<td>40</td>
<td>75.5</td>
<td>11</td>
<td>84.6</td>
</tr>
<tr>
<td>Text-based strategies</td>
<td>11</td>
<td>20.7</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>No response</td>
<td>2</td>
<td>3.8</td>
<td>2</td>
<td>15.4</td>
</tr>
<tr>
<td>Total</td>
<td>53</td>
<td>100.0</td>
<td>13</td>
<td>100.0</td>
</tr>
</tbody>
</table>
CONCLUSIONS

We began this paper by drawing attention to some puzzling findings. Despite having a very homogeneous education system with a uniform approach to reading instruction and intervention, New Zealand has for several years now consistently shown comparatively high levels of variability in the test scores from international surveys of literacy achievement. Three strategies have been proposed for preventing reading failure and reducing the unacceptably large amount of disparity between New Zealand readers: doing more of the same, accommodating cultural differences, and changing the method of teaching reading. On the basis of an analysis of the arguments and evidence in support of each of these positions, we concluded that the third strategy is most supportable. We hypothesised that New Zealand’s relatively large spread of scores in international studies of literacy achievement is largely the result of Matthew effects triggered by a mainstream constructivist orientation to teaching reading that fails to respond adequately to differences in essential reading-related skills and knowledge at school entry that stem primarily from social class differences in home literacy environment.

Two predictions were derived from this hypothesis. First, incorporating into beginning literacy programs supplementary materials and procedures designed to help children develop awareness of the sound components of spoken words and make greater use of letter-sound patterns in reading unfamiliar words should produce significantly greater gains in reading achievement than the standard whole language approach to literacy instruction. Second, the use of these materials and teaching strategies should reduce or eliminate the gap in beginning reading achievement between Maori and Pakeha children. To test these predictions a retrospective study was carried out in which a representative sample of seven schools was selected from 22 schools that three years earlier had participated in a longitudinal study of beginning literacy development. The target children in the program modification schools were tested at four of the same testing points as the children in the original longitudinal study with tests that assessed phonological processing skills and literacy achievement.

Two major findings emerged from the study. First, incorporating into existing classroom literacy programs materials and procedures designed to increase beginning readers’ phonological awareness and alphabetic coding skills resulted in an average difference in reading age of 14 months over standard literacy programs by the end of Year 2. Second, the use of the supplementary materials and teaching strategies eliminated the gap in beginning reading achievement between Maori and Pakeha children by the end of the second year of schooling. These findings are very encouraging because they suggest that relatively small changes to the predominant approach to teaching literacy in New Zealand will greatly increase the overall effectiveness of beginning reading instruction and substantially reduce the number of reading failures, especially among Maori children. Provided that our findings are a reasonably accurate depiction of reality (i.e., are replicable and generalisable), a disturbing implication of our findings is that the mainstream constructivist (learn-to-read-by-reading) orientation to beginning literacy instruction is functionally discriminatory.

There are, however, limitations of the study that need to be considered before any firm
conclusions can be drawn. First, the sample size was somewhat small, especially the number of Maori students who participated in the program modification study (initially 17 students but only 12 by the end of the study). A study involving a larger number of children needs to be carried out.

Second, this was not an experimental study. Perhaps the positive effects obtained for the modified program group over the untreated comparison group were largely the result of Hawthorne effects. However, there are two counterarguments to this possibility. First, the positive effects obtained in the study were very specific in nature and followed a particular sequence. As can be seen in Table 1, there were only two positive effects at the middle of Year 1, the most significant one being for a measure of phonological awareness, which, it could be argued, reflected the focus of the intervention up to that point. By the end of Year 1 there were very robust effects for all phonological processing measures but only modest effects for the standardised measures of reading achievement. However, by the end of Year 2 the robust effects obtained for the phonological processing measures had not only been maintained but had generalised to a robust effect for reading achievement. In short, the positive effects seem to emerge in the order predicted by theory (Stanovich, 1996): phonological awareness skills are essential for the development of alphabetic coding skills which in turn are essential for the development of word recognition skills. This pattern of results cannot be easily explained in terms of Hawthorne effects. The second counterargument is that the findings from the retrospective study are consistent with other intervention studies carried out in New Zealand that are more experimental in nature. Greaney, Tunmer and Chapman (1997), for example, found in a carefully designed study that even children with persistent reading problems, most of whom had been referred on from Reading Recovery, were able to derive long-term benefits from explicit instruction in phonological processing skills.

Another limitation of the study is that we do not know if the positive effects obtained at the end of Year 2 were maintained in subsequent years, especially the elimination of the gap in reading achievement between Pakeha and Maori children. We cannot conclude that the intervention program implemented in Year I resulted in a “vaccination effect” guaranteeing freedom from future reading problems. Research reviewed by Hiebert and Taylor (2000) indicates that the gains made from early reading interventions are necessary but not sufficient for success in the middle grades. As they put it, at risk children are “not out of the woods yet” as the initial positive effects of early interventions often decrease in subsequent grades (p. 477). Although early reading intervention programs like the one we initiated may help at risk children to acquire basic literacy skills, further support for these children may be required to help them develop the higher order comprehension strategies necessary for reading the kinds of informational texts that are introduced in the middle grades and beyond (Hiebert & Taylor, 2000; Pressley, 1998, 2000).

The findings from the retrospective study have important implications for educational practice in New Zealand. The children with lower levels of literacy-related skills at school entry clearly benefited the most from the intervention. The mean scores on the Burt test for the Pakeha children increased from 32.7 in the original longitudinal study to 45.6 in the program modification study, whereas the mean scores for the Maori children increased from
20.6 to 45.9. In general the amount of explicit instruction required to develop adequate levels of phonological awareness and alphabetic coding skills varies considerably across beginning readers.

Recent research by Juel and Minden-Cupp (2000) suggests that organising instruction to cater for the differing phonological processing skill needs of new entrants is essential for maximising the effectiveness of beginning literacy instruction. They studied in depth the widely varying instructional practices of teachers in four first-grade classrooms, each of which comprised a high proportion of at risk students. Juel and Minden-Cupp (2000) reported two major findings. First, differential instruction appears to be a particularly important feature of beginning literacy instruction:

One of the most provocative findings from this study is the indication that differential instruction may be helpful in first grade. All teachers used homogenous reading groups.

The more time incoming students with comparatively fewer early literacy skills spent in these groups - as opposed to whole-class instruction - the better they did. Further, the two classrooms that were most successful in getting them off to a good start in first grade had the most differentiated word recognition instruction .... In fact, the classroom … that had the very highest success both overall and with the low group had considerably different instruction across the groups. As compared with the other low groups, and with the other reading groups within this classroom, the focus of the low group was squarely on phonics. (pp. 482-483).

Second, training in phonological processing skills is critical for some children, but less so for others:

Certainly the finding from the current study that appeared the most clear-cut … was that children who entered first grade with few literacy skills benefited from a heavy dose of phonics. However, children who possessed middle-range literacy skills on entering first grade benefited from a classroom with more trade book reading and time for writing text … Children who entered first grade with some reading ability did exceptionally well in a classroom that included a less structured phonics curriculum and more reading of trade books and writing of text … (p. 484).

The important question to ask at this point is what kinds of home literacy environments and social class backgrounds did these children most likely come from that enabled them to benefit more from a book experience (i.e., whole language) approach, which is the approach that is predominantly used in New Zealand schools? As we see it, the critical issue facing the New Zealand Ministry of Education is whether they will continue to pursue a policy of actively promoting a largely unidimensional approach to literacy teaching that helps make schools contributing agents to cultural reproduction within New Zealand society. We hope not.
REFERENCES


