

# **The phonemic-orthographic nexus: The Phonemic-Orthographic Literacy Program**

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Any literacy education curriculum, to be optimally effective, needs to take account of the entry level knowledge of those intended to learn from using it. In this way it can target both the needs of those who are currently finding learning difficult and those who may be at risk of displaying learning disabilities in the future. One way of achieving this is to supplement the broad-based literacy education curricula such as Keys to Life, First Steps and CLaSS with programs that target particular aspects of early reading. This paper describes one approach to this issue : the use of the Phonemic-Orthographic Literacy Program (Munro, 1996). to teach the phonological, phonemic, letter cluster -sound and orthographic knowledge necessary for reading. This paper examines:

- the theoretical basis or rationale for the approach developed by the Phonemic-Orthographic Literacy Program ; the need for an explicit teaching of phonemic-orthographic knowledge.
- the key features of the methodology comprising the program .
- the means by which student progress is monitored.
- evidence for the success of the program.

## **The phonemic-orthographic nexus; critical for literacy development**

Phonological and phonemic awareness have been identified as key influences on literacy acquisition. Phonological knowledge is a knowledge of sound patterns, reflected in how well students pronounce words, rhyme them and generally manipulate multi-sound patterns. Phonemic knowledge is one aspect of this; a knowledge of individual speech sounds (Share, 1995; Stahl & Murray, 1994). This distinction has implications for diagnosis and teaching.

Those who have reading difficulty are less able to perform these processes. Some , for example, can segment a three- sound word but not longer words into sounds. Their reading suggests that when they look at a word they see individual letters rather than groups of letters at a time; they detect letters but not clusters. They read words either by sounding out letter by letter or pick out one or two letters and use these unsystematically to decide what the word is. They cannot use

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<sup>1</sup> Munro, J. (1998a). The Phonemic-Orthographic nexus: The Phonemic-Orthographic Literacy Program. *Australian Journal of Learning Disabilities*, 3, 2, 15-21.

what they know about some words to read others. They may know a great deal about the topic of the text but can't use this knowledge when they read, because they can't read enough of the words efficiently.

Two main types of studies have evidenced the phonemic-literacy nexus; correlative-predictive studies and phonemic training studies. Phonemic ability predicts later reading and spelling achievement, both for word recognition (for example, Munro, 1993; Munro & Munro, 1993; Wagner, Torgesen & Rashotte, 1994; Stanovich, 1986) and for comprehension (Tunmer & Nesdale, 1985). Word reading ability is predicted by earlier rhyming and alliteration abilities (MacLean, Bradley & Bryant, 1987), segmenting spoken words both completely into sounds and stripping off the first sound (Share, Jorm, Matthews & Maclean, 1988; Tunmer & Nesdale, 1985) and by blending sounds into words (Perfetti, Beck, Bell, & Hughes, 1987). Not only does phonemic knowledge predict reading acquisition, but the reciprocal relationship also exists; learning to read improves sound awareness (Stanovich, 1986).

Teaching phonemic awareness improves early reading and spelling (Ball & Blachman, 1988; Bradley & Bryant, 1985; Byrne & Fielding-Barnsley, 1993; Hurford, 1990; Lundberg, Frost & Petersen, 1988; Share, 1995; Vellutino & Scanlon, 1987). Teaching letter-sound correspondences with phonemic awareness is more useful than either phonemic awareness or phonics teaching only (Ball & Blachman, 1988). The extent of the positive influence depends on the entry phonemic and reading knowledge of students and when the influence is measured, either immediately after the teaching or later (Share, 1995).

Phonological knowledge is acquired developmentally, from the preschool years to the third-fourth grade levels (Lenchner, Gerber & Routh, 1990; Vandervelden & Siegel, 1995; Yopp, 1992). It is first displayed when children learn and remember how to say words such as the names of objects. Most children do this relatively easily. Those who find this hard may later have difficulty both saying words accurately and reading words, because the written words do not match their spoken forms. Many disabled readers juxtapose, omit or substitute sounds or syllables, for example, they may say "torrelant" for 'tolerant'.

From this children learn to recognise sound patterns in words, to segment words into onset and rime, to isolate a sound within a word, to segment one-syllable words into sounds and to blend a string of sounds into a word. They link sounds and letters, that is, learn phonological recoding. This equips them with three early word reading strategies; selecting and memorising distinctive visual features of words, recoding systematically each letter to a sound and then blending the sounds and using part of the letter-sound information, for example, recoding the first few letters of a word and synthesising this with contextual information. The distinctive visual features strategy is

least effective in the long term (Frith, 1985; Freebody & Byrne, 1988). They may use a combination of them.

Later they manipulate sound patterns in more complex ways; to match sounds in two or more words, delete sounds from a word, substitute sounds and categorize sounds, for example, the vowels into long versus short categories. The clusters learnt first are those for which children already have the sound patterns, for example, onset and rime units (Treiman, 1985).

Orthographic knowledge is learnt gradually. A child may recognise some written words and letter strings automatically and accurately (consistent with orthographic processing) and at the same time use word segmentation and recoding to read others. They develop a 'self-teaching mechanism' to learn orthographic information independently (Jorm & Share, 1983; Share, 1995). This mechanism uses phonological recoding and phonemic awareness. They learn to make analogies between known and unfamiliar words by noting letter group similarities and using the sounds that match the letter cluster in one word to read the others. A level of phonemic decoding is necessary for making these analogies (Ehri & Robbins, 1992; Goswami, 1991).

It is the movement through this developmental sequence that the Phonemic-Orthographic Literacy Program targets.

## **The Phonemic-Orthographic Literacy Program**

Students entering primary school differ in their ability to use the phonological and phonemic knowledge on a number of dimensions critical for literacy learning:

- their knowledge of the sound properties of language. This includes a variation in the accuracy with which words are pronounced accurately, an awareness of individual sounds in spoken words and the ability to manipulate spoken words in particular ways. Neglect of this variation in knowledge in the early stages of primary education could restrict subsequent learning throughout the education system.
- their ability to use functional on-task attention and problem-solving strategies. While some children enter primary school with a well-developed ability to focus on and to work through school-type learning tasks and use these to change what they know, others have greater difficulty learning by working through these types of tasks.
- the ability to transfer their literacy knowledge, and to use what they know about some words to read others. The notion of being a 'self-teacher' of word reading, being able to use what they know about some words to read others, is a critical component in

contemporary literacy research. Readers use what they know about 'light' to read words such as 'blight'. They need to be able to recognise the shared orthographic knowledge (that is, 'ight') and to derive the sound pattern that matches it, in order to transfer this to the unfamiliar word and integrate the phonological information.

- their pre-school knowledge of letters and letter clusters. While some children enter primary school familiar with some letter clusters and words, others have had little knowledge in this area.

***The framework of Phonemic-Orthographic Literacy Program*** Some early literacy programs that don't provide an explicit and sufficient opportunity to develop this knowledge need to be supplemented by a component that targeted these needs. The Phonemic-Orthographic Literacy Program is one attempt at such a supplement. It is a word reading and spelling instructional program based on teaching explicit phonemic awareness. It teaches students to read and spell word types in an explicit, systematic way, first for one-syllable words and later for two-, three- and four- syllable words.

- one-syllable words initially by teaching first the onset-rime units of the word type followed by their separate sounds. In other words,
- two-, three- and four- syllable words by teaching students how to deal with stress patterns in words, how to build words from prefixes, suffixes and morphographs.

The word types are defined as follows:

- one-syllable words are grouped into types based on their shared rime units, for example, the 'amp' unit (as in stamp, lamp), the 'ilk' unit (as in silk, milk) and the 'ove' unit (as in love, move). Rime units, usually containing vowels and at least one consonant, are pronounced more consistently than individual vowels and vowel digraphs (Adams, 1990; Ringler & Weber, 1984). Readers find it easier to learn to read words by using 'rhyming phonograms' (Adams, 1990, p. 321) such as 'ain' or 'ail' than by being taught spelling-sound correspondences and phonic generalisations such as 'ai'. Phonograms containing long vowels were learnt as easily as phonograms containing short vowels (Wylie & Durrell, 1970). The program teaches rime units such as 'ain' or 'ail' prior to the more abstract phonic units such as 'ai'.
- two- syllable words are grouped in terms of the prefixes or suffixes used and the syllable that is stressed, for example, concern, confuse, connect, consent, contract and confine are in the same group.

- three- and four- syllable words are grouped in terms of the main morphograph/s the words share, for example, telephone, microphone, homophone.

Students learn the phonological and phonemic properties for each type of word, its letter cluster-sound mappings and its orthographic properties.

The framework for the teaching program for grades three and four, indicating the order in which the types of knowledge are developed, is shown in Figure 1.

Insert Figure 1 about here

**Teaching one-syllable words** An example of the teaching sequence for one-syllable words is as follows. Students are shown a set of up to five examples of a rime (for example, *link*, *mink* and *sink* ) and

- **work on the phonological structure of the words**, for example
  - say accurately the words,
  - discuss the meaning of each word, use it in sentences,
  - segment spoken words into onset and rime,
  - suggest other words that rhyme or alliterate with the pattern,
  - discuss the shared sound pattern and
  - make up rhymes based on the pattern.

Evidence for the effectiveness of these teaching activities is provided by Ball and Blachman (1988), Bradley and Bryant, (1985) and Vellutino and Scanlon, (1987).

- **work on the phonemic structure of the spoken words**, for example, segment them into sounds, blend sounds, count the number of sounds, tap out the sounds, categorise words according to shared rhyming or alliteration patterns. Evidence for the effectiveness of these teaching activities is provided by Byrne and Fielding-Barnsley, (1993), Hurford, (1990) and Share, (1995).
- **work on the orthographic -phonemic links**; they
  - read each word both with the teacher and by themselves.
  - read the rime unit first.
  - discuss how the words are similar, both in their shared letter clusters and shared sounds.
  - visualise each word.
  - transfer the letter-sound rime unit to other words; use what they know about these words to read others, for example, use *link*, *mink* and *sink* to read *slink*,

*stink, clink*, see themselves as 'self teachers', using their knowledge of letter clusters in some words to read unfamiliar words.

- read the letter cluster in prose in a range of activities.
- spell the words.
- read two- and three- syllable words that have the letter cluster *linked* and *sinker*.
- say what they know now about the letter cluster pattern; they
  - describe how it is different from other patterns they know, for example, from *sick, lick*.
  - how they will remember it.
  - how they can recognise it in unfamiliar words.
  - how they segment words.
- ***work on automatizing their knowledge of the letter cluster pattern***; students
  - manipulate the letter cluster pattern in situations that require rapid processing.
  - discriminate the word type from similar rimes.
  - use the letter cluster in dictation for sentences.
  - reflect on the letter clusters, develop 'meta-orthographic' knowledge,
    - talk about their developing knowledge of letter patterns,
    - say how they will use them in the future,
    - how they can make bigger words from the smaller words and how they segment words.

An example of a week's teaching program for one-syllable words is shown in Figure 2. The approach described here fits well with the successful program developed by Hudson (1996).

Insert Figure 2 about here

***Teaching two- and three- syllable words*** A similar procedure is used for assisting readers to read two- and three- syllable words. The sequence for learning to read each type of two-syllable word is

- ***learning the prerequisite phonological knowledge***,
  - segmenting words into syllables.
  - combining two or more syllables to make a word.
  - stress patterns in these words and the concept of stressed and unstressed syllables.
  - identifying frequently occurring syllables.
- ***learning the phonemic structure of two-syllable words***,
  - learning to recognise the unstressed vowel (the schwa).

- learning how to unstress vowels.
- building the two-syllable word from an identifiable, familiar root word by adding a prefix or suffix.
- ***reading instances of each type of two-syllable word,***
  - exploring the prefix-stem structure of two-syllable words .
  - teaching the meaning of the prefix/ suffix.
  - using two-syllable reading strategies.
  - reading words by using analogy strategies.
  - transferring the letter patterns to prose.
  - linking the new letter clusters in long term memory .
  - developing metacognitive knowledge about the syllabic structure.
- ***orthographic processing of two-syllable words.***
  - manipulate poly-syllabic letter cluster patterns in situations that require rapid processing.
  - discriminate the word type from similar or shared syllables.
  - use the polysyllabic structure in dictation for sentences.
  - reflect on the letter clusters, develop 'meta-orthographic' knowledge,
    - talk about their developing knowledge of the syllabic patterns,
    - say how they will use them in the future.

An example of a two-week teaching program for two- syllable words is shown in Figure 3. The approach described here fits well with the successful program developed by Hudson (1996).

Insert Figure 3 about here

### **Monitoring student progress through the program**

A key aspect of any literacy program is the means by which student progress is monitored. Within the Phonemic-Orthographic Literacy Program there are two dimensions of this;

- training teachers to administer and monitor student progress and
- procedures used to monitor progress.

### **Training teachers to use the Phonemic-Orthographic Literacy Program**

The training program described here was implemented at a primary school in the inner Northern suburbs of metropolitan Melbourne.

**The action plan.** The leadership team of the school identified the need to supplement its Keys to Life literacy education curriculum with a component that targeted these needs. The supplement was to be delivered through an on-going professional development activity that involved a number of phases. It developed a two-year action plan that had at its base a supported implementation program. The action plan involved providing the opportunity for teaching staff to

- develop procedures for determining and describing the phonemic and orthographic knowledge of their students in terms of a developmental literacy spectrum.
- familiarise themselves with recent developments in the areas of phonemic and orthographic knowledge and to examine ways in which these may be incorporated in their teaching.
- work in teams to develop, trial and implement clusters of learning activities in these areas, to provide mutual support and to teach students from two or three grades in like-ability groups.
- review, evaluate and modify the sets of learning activities they were implementing.

**Implementing the action plan** The implementation proceeded as follows:

- **Describing literacy knowledge.** The teaching staff assessed students' word reading knowledge using the Orthographic Reading Test (Munro, 1995) and compiled a profile for each reader, showing the types of words read automatically, the types read with an investment of attention and the types not yet read. The profile for each reader was combined with earlier reading measures into a reading portfolio and used to develop a 'literacy map' that would be used to show each reader's 'journey through literacy' as she / he progressed through the school.
- **Why teach phonological and phonemic knowledge ?** This aspect of the action plan involved increasing the awareness of staff about the options and possibilities for increasing students' phonological, phonemic and orthographic knowledge. It was delivered in a six-session fortnightly professional development program. Between sessions teachers worked with their students on targeted activities. The topic of each session and the interpolated activities are shown in Table 1

Table 1 : The topic of each session and the interpolated activities for the professional development activity

Session	Focus of discussion	Follow-up teacher activity
1	Developmental trends in acquiring phonemic knowledge and its influence on reading development.	Teachers assess the phonological knowledge of students who are having reading difficulties in their class.
2	Implementing a phonemic-orthographic component would differ from their current literacy teaching.	Teachers work together at each level to <ul style="list-style-type: none"> <li>• identify outcomes in word reading and ways of assessing these.</li> <li>• identify the sound patterns they will target explicitly in their teaching.</li> </ul>
3	Teaching early level <ul style="list-style-type: none"> <li>• phonemic and word reading knowledge.</li> <li>• sound-spelling knowledge.</li> </ul> Integrating reading, writing and spelling at the early school.	Teachers <ul style="list-style-type: none"> <li>• sequence the sound patterns they will target at each level.</li> <li>• identify how poor sound-based knowledge affects students' literacy ability in their classes.</li> </ul>
4	Teaching <ul style="list-style-type: none"> <li>• middle level phonemic and orthographic knowledge .</li> <li>• more complex sound-spelling knowledge.</li> </ul> Integrating reading, writing and spelling at the middle school, automatising writing, analysing samples of writing.	Teachers develop phonological and orthographic activities at the early and middle and late levels.
5	Teaching late primary level <ul style="list-style-type: none"> <li>• phonemic and orthographic knowledge for more complex two- and three-syllable words, manipulating stress patterns.</li> <li>• later level spelling knowledge; more complex sound-spelling knowledge.</li> </ul>	Teachers develop phonological and orthographic activities at the late primary level.
6	Integrating phonemic and orthographic knowledge within a literacy education curriculum.	Teachers review their literacy education curricula in terms of the focus on teaching phonemic and orthographic knowledge.

- **Teaching phonological and phonemic knowledge** Teachers worked in teams to develop, trial and implement clusters of learning activities in the phonological, phonemic, letter-cluster sound and orthographic areas. A rich set of group activities was developed at each grade level. These included activities designed creatively by the teachers and the available literacy

resources in the school. A designated time was set aside each day for the explicit implementation of the program. Students from two or three grades at the same level were taught in like-ability groups.

- ***Review, evaluation and fine-tuning of the program*** Three terms after the daily implementation began, the implementation of the program was evaluated, with the purpose of modifying and fine-tuning the program where necessary. During the review, teachers reported
  - increased knowledge of letter cluster patterns in reading and spelling among students
  - increased on-task attention during literacy activities; students had learnt procedures for dealing with words they found difficult to read or spell; they were much less likely to simply dis-engage from the task. Instead, they had procedures to initiate to assist them to problem-solve.
  - increased self-confidence in literacy; students were more likely to take risks and displayed behaviours consistent with increased independence.

## **Monitoring student progress**

Monitoring student progress is a key aspect of the Phonemic-Orthographic Literacy Program. It is developed at two levels:

- during each teaching session students learn to read a set of words that share a pattern. They are encouraged to transfer the pattern to other isolated words and to read the words in prose. At the end of each teaching session they are asked
  - to say what they have learnt about the letter cluster and
  - to read words that have the pattern.
- every fifth week in the Phonemic-Orthographic Literacy Program program is an assessment week, when word patterns taught in the previous four weeks (and earlier weeks) are reviewed. Students' ability to read words both in isolation and in prose is assessed and individual student records retained.

An example of the assessment for a week's programme Grade 4 is shown in Figure 4.

Insert Figure 4 about here

## **Efficacy of the program**

During 1997 the Phonemic-Orthographic Literacy Program was trialed with 34 primary level children who displayed reading difficulties. These children met the commonly used criteria for reading difficulty; they had a reading discrepancy score in comprehension and accuracy on the

Neale Analysis of Reading (Neale, 1988) of at least 18 months, their general reasoning was rated by their teachers to be within the average span and the nature of their reading disability was not attributable to sensory, environmental, cultural, emotional or socio-economic causes. The children were from grades 3 to 6 and were taught in groups of five, organised on the basis of similar word reading profiles using the Orthographic Reading Test (Munro, 1995).

The children were exposed to eight Phonemic-Orthographic Literacy Program teaching sessions. In each session they learnt to read words that shared a rime. The set of words on which each group worked was determined by their reading profiles using the Orthographic Reading Test. During some sessions, all groups may have worked on different rime units. Five of the words that shared a rime were taught directly in each session and another five were not taught; these were used to investigate transferability of the rime. As well, transfer to five pseudo words and to five words that had the rime in prose were investigated. Reading ability for each set of words was assessed at the beginning and end of each teaching session. The mean gain scores for the groups across the eight sessions are shown with the matching gain scores for a control group of 26 matched age students who had similar reading profiles to each group and who received no training are shown in Table 2.

Table 2 : The mean gain scores for the taught and control groups for each condition of reading (maximum score = 5.0) .

Reading condition	Mean gain score	
	Taught group	Control group
reading the words taught	3.07	0.13
reading unfamiliar words words with the same rime	2.97	0.17
reading pseudo words words with the same rime	3.40	0.29
reading the taught words in prose	4.33	0.00
reading unfamiliar words with the same rime in prose	3.60	0.27

The gains in word reading score for the taught group, examined using the two-tailed t-test for repeated measures, were significant for all reading conditions ( $p < .01$ ) while the corresponding gains for the control group did not achieve significance for any condition. These data provide an indication of the capacity of the Phonemic-Orthographic Literacy Program to improve word reading knowledge for those who have reading difficulty.

### **Phonemic-orthographic programs in the future**

The literacy support program described in this article has not been submitted to the broad based scrutiny that more widely used literacy curricula have received. Nor is this necessarily appropriate,

as it is not intended to be a literacy education curriculum in its own right but rather a literacy curriculum supplement, to be used selectively by students who do not meet some of the entry level assumptions of the more widely used curricula. As noted above, it contains built-in measures for monitoring its effectiveness in improving students' knowledge of words.

It is likely that future teaching programs of this type will be delivered via computer. This medium more easily permits the charting of the progress of individual students, facilitates individual use and facilitates flexible use, with students being able to tap into parts of the content as the need arises. The capacity to ensure that learning gains are maintained and to monitor changes in students' word knowledge both for isolated words and prose are enhanced by this medium.

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