

Dyslexia and the Phono-Graphix reading programme

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The study reported here set out to investigate the effectiveness of the Phono-Graphix™ reading programme with ten learners, aged 9-11 years, assessed as having specific learning difficulties/dyslexia. Testing was carried out via initial and final analysis of the students' phonological processing skills and reading/spelling ability over an 8-month intervention period. The students were instructed on a one-to-one basis and each received an average of 24.3 hours of instruction. Findings suggest that the Phono-Graphix programme did appear to help improve students' phonological processing skills. They further show that a majority of the students recorded an average gain in reading age of 21 months and an average gain in spelling age of 12 months at the end of the training period. Qualitative findings from the study also show overall positive perceptions of the Phono-Graphix intervention among the parents and class teachers involved. The study reported here adds to the sum of knowledge on UK trials of the Phono-Graphix approach and makes a useful contribution to the literature on remediation strategies for dyslexic students.

Key words: dyslexia, literacy, Phono-Graphix, phonological processing, synthetic phonics, remediation strategies in reading.

Introduction

The case for the systematic teaching of phonics in reading training has been strongly made (Brooks, 2003). The Phono-Graphix™ programme may be said to represent a shift in phonics training, in the shape of what its authors would claim to be an altogether speedier and more effective approach (McGuinness and McGuinness, 1998). Based on clinical trials carried out in Florida between 1993 and 1995 (McGuinness et al., 1996), the authors of the programme claim that Phono-Graphix can teach reading 'in one tenth

the time of phonics and with a hundred percent success' (McGuinness and McGuinness, 1998, p. 13). As far as trials in the UK are concerned, at least two studies involving use of Phono-Graphix have been documented (Dias and Juniper, 2002; Lore, 2001). The Dias and Juniper (2002) study, carried out in Bristol, involved reception classes in both experimental (using Phono-Graphix only) and control (using National Literacy Strategy plus teachers' preferred resources) groups. Findings are positive for Phono-Graphix in that, while all groups made considerable progress, the children taught Phono-Graphix made more progress than the other children and none of the children on the Phono-Graphix programme required additional literacy support in the following year. Lore's (2001) study also reported favourably on the use of Phono-Graphix with dyslexic learners in one school in Surrey. Apart from these two studies, little seems to be documented on use of the approach in the UK, either as a general teaching programme or as an intervention for children with reading difficulties. It was the purpose of the research reported in the present paper, therefore, to add to the sum of knowledge on the approach by testing its efficacy with children assessed as having specific learning difficulties/dyslexia. In addition, the research reported here aimed to move beyond the quantitative approach and to add a qualitative dimension not covered in previous UK studies, by seeking the opinions of teachers and parents on the intervention.

Ongoing debates in teaching reading and the case for Phono-Graphix

One of the key debates in this area concerns *synthetic* versus *analytic* approaches to the teaching of letter-sound correspondence. In the former, children are taught to pronounce sounds in isolation and then blend them to produce a word. Analytic phonics, on the other hand, begins with the whole word and identifies spelling patterns, which are then divided into smaller parts such as *onset* and *rime*. The onset is the initial consonant and the rime is the vowel plus final consonant or consonants (e.g. in the word *beak*, 'b' is the onset and 'eak' is the rime). McGuinness et al. (1996) point out that drilling in onset/rime teaches the child to memorise part of the word as if it were a unit, when

in fact it is a number of distinct sounds. They argue that there is no formal structure to this analytic approach as no one has worked out how many syllables and rhymes need to be taught. However, McGuinness (1998) points out that vowels and consonants can combine in 15 different syllabic patterns. If one puts these letter families together, there are over 1000 possible rhyming endings. It is clearly an impossible task for teachers to teach and for children to learn all these as arbitrary chunks. The Phono-Graphix programme sees this as unnecessary. Students are taught to decode by learning phonemes and letter blending, essentially *synthesising* sounds into words. In Phono-Graphix, the number of items that children need to learn is vastly reduced. It is important to note that Phono-Graphix views itself as differing from both analytic and synthetic phonics in that it does not teach phonic rules or letter names. It teaches that letters do not *make*, but rather, *represent* sounds (McGuinness and McGuinness, 1998). Nonetheless, inasmuch as Phono-Graphix may be seen as using strategies similar to those of synthetic phonics, the findings from a longitudinal study carried out in Scotland by Johnston and Watson (2005) are interesting and important in the continuing debate. The Johnston and Watson seven-year study reports the synthetic approach to be more effective than the analytic phonics approach in teaching reading and spelling.

A further key debate in this area concerns the teaching of letter names along with letter sounds. This is the approach recommended in the National Literacy Strategy (DfEE, 1998). While there is some justification to be found in the research literature for such an approach (Hohn and Ehri, 1983), other studies present conflicting evidence, suggesting that teaching the letter name as well as the sound can lead to children confusing the two (Harrison et al, 1996). McGuinness and McGuinness (1998) are, equally, of the opinion that having to learn the letter name as well as the sound causes both difficulty and confusion for children in distinguishing between the two. Therefore, on the premise that the written English language is a sound-based code, with letters being pictures of sounds, Phono-Graphix teaches sounds only.

A third area of debate in teaching reading concerns the use of single versus mixed strategy approaches. The National Literacy Strategy (DfEE, 1998) appears to recommend a mixed strategy approach and, in the Reading Recovery programme (Clay, 1991), children with reading difficulties are encouraged to predict words using pictures and context. McGuinness's forthright claim is that 'there is only one right way' to teach an alphabetic writing system, namely, by decoding one sound at a time (McGuinness, 1998, p. 221). While Goswami (1999) points out that there is no scientific basis for such a claim, there is, nonetheless, evidence to suggest that encouraging children to use pictures and context as a decoding strategy may be less than useful. Regarding use of context, Harrison et al. (1996) argue that children with a poor visual attention span have a tendency to base word predictions on initial, or initial and final, letters, leading to inaccuracies.

In light of a consensus that phonological processing is a core cognitive difficulty in dyslexia (Frith, 1997) the case for Phono-Graphix, on the basis of the above evidence, seemed to the researchers to merit further investigation.

The Phono-Graphix programme

Skills training on the Phono-Graphix programme comprises three levels of instruction, namely, the basic code, the advanced code and multi-syllable management. At basic code level, students are taught the correspondence of one sound to one letter. The skills of segmenting, blending and phoneme manipulation are introduced through simple three-sound words (*cat, mop*) as well as words containing adjacent consonants (*hand*). In the advanced code, students are taught one-to-two mapping, i. e. that a sound picture can be made up of two letters standing for one sound (*oa* in *boat*) and that most sounds can be represented in more than one way (*play, train*). Students also begin to recognise that there is 'overlap' in the code, that some components of the code can be represented by more than one sound (*cow, know*). The multi-syllable management level introduces systematic work on multi-syllable words of from two to five syllables. Students are taught to blend sounds into syllables and then syllables into words.

The study

Objectives

The overall aim of the study, which informs this paper, was to analyse the effectiveness of the Phono-Graphix programme as a remediation strategy for students identified as being dyslexic. In pursuance of this aim, the researchers' objectives were:

- to determine whether there would be any improvement in students' phonological processing skills, as shown by test scores, through use of the Phono-Graphix teaching methods
- to explore whether there would be any indication of any improved phonological processing skills impacting on reading ability/spelling ability
- to evaluate the perceived effectiveness of the programme by seeking the views of other adults working with the students.

Study design

The period of intervention was from the beginning of September to the end of April. Each student received 24.3 hours of instruction on average, using the Phono-Graphix programme. Ten students were taught one-to-one in 30-minute sessions, taken twice a week by the teacher-researcher. The lessons were conducted in the students' schools and the students were withdrawn from the class situation. By final testing, all students had worked through the advanced code.

At testing, phonemic awareness was determined using four tests, which are part of the Phono-Graphix programme: segmentation, blending, phoneme manipulation and code knowledge. The test results of each student were analysed, in accordance with McGuinness et al.'s (1996) three performance band groupings, to identify whether the initial/final scores fell in the good, low-moderate or poor performance bands. This enabled the researchers to determine whether there had been any improvement in the students' underlying phonological processing skills over the intervention period.

Reading and spelling levels were assessed using standardised reading and spelling tests, namely, the Neale Analysis of Reading Ability (Neale, 1997) and the Vernon Spelling Test (Vernon, 1976) respectively. The tests were initially administered at the start of the intervention programme. At the end of the Phono-Graphix programme, the tests were completed again in order to determine whether changes had occurred in the students' levels of reading and spelling ability. In relation to both the reading and spelling tests, the students' initial and final raw scores were converted into reading ages and standardised scores. The confidence bands for the Neale test scores were also calculated. In order to ascertain the extent of any improvement in the students' reading and spelling performance over the intervention period, 'gain scores' were calculated. All tests were administered by the teacher-researcher.

In an attempt to gain another perspective on the intervention, the latter was supported by a schedule of meetings and semi-structured interviews between the teacher-researcher and the students' parents and class teachers. Three meetings were held, one per term. The first meeting was held to discuss content of the programme. The second and third were used to discuss student progress. The parents were also invited to watch a lesson in progress and after the lesson the teacher-researcher discussed with them how they could best support their child with homework. The parents and class teachers were subsequently interviewed separately, at the end of the programme. The interviewees were not told of the students' final performance on the standardised tests until after the interview, in order to avoid the possibility of such knowledge influencing respondents' attitude towards the intervention.

Instruments of data collection

Phonological processing tests (McGuinness et al., 1996)

The *phoneme manipulation* test used eight real and two nonsense words. The students were presented with the words orally and asked to take away a sound and say the word (e.g. say *stop* without the 's'). Scoring on deletion of a phoneme is either correct/incorrect, with a maximum score of ten. The *segmentation* test also comprised real and nonsense words. Items ranged from consonant-vowel-consonant (CVC) words such as *dog/pim* to CVCC/CCVC words such as *hand, flob and frog*. The teacher-researcher said each word and the student was invited to repeat each phoneme in sequence. Each phoneme in sequence scored a point. A

perfect score was 63 points. The test of *blending* skills comprised 15 real words ranging in structure from CVC to CVCC to CCVC to CCVCC to CCVCCC words (*pig, bird, frog, shell, crunch*). The teacher-researcher said isolated sounds and the students were then asked to join the sounds to make a word. Scoring was correct/incorrect with a maximum score of 15. The *code knowledge* test included 50 items consisting of 20 consonant sounds, five vowel letters, six consonant digraphs (e.g. *sh, ck*) and 19 vowel digraphs / phonograms (e.g. *ie, ue, ou, ea, igh, igh,*). Students were invited to say what letters sound like when appearing in a word. Any probable decoding was scored as correct (*ea* can sound / ee / as in *team*, / e / as in *head* or / ei / as in *great*). A percentage was calculated based on the number correct out of 50.

Neale Analysis of Reading Ability (Neale, 1997)

The Neale Analysis of Reading Ability (Neale, 1997) test material comprised a book with short, graded narratives, each one constructed with a limited number of words and having a central theme, action and resolution. Accuracy in reading was assessed by recording the child's errors. The test also included a categorisation of different types of errors. There were two parallel standardised forms of the test, each comprising six graded passages of prose, and these were used to obtain pre/post test scores. Normative scores were provided as standardised scores, percentile ranks and reading ages for accuracy and comprehension. Comprehension was assessed in terms of questions that tested understanding of the main idea of the narrative, the sequence of the events and some limited inference. The teacher-researcher was allowed to correct the students' errors up to a certain limit as they read. These prompts, or corrections, helped to facilitate the flow of oral reading and enabled the student to maintain understanding.

Confidence bands

Neale (1997) pointed out that, however carefully educational tests were constructed, an element of error was likely to appear in the results they produced. This does not imply that a mistake has been made in the scoring of the tests, but rather that the score a student achieves can vary within a few points around the 'true score', i.e. the hypothetical perfect measurement of the student's ability if he or she had taken the test with no outside influences such as fatigue. The Neale Analysis of Reading Ability reports a 'confidence band' along with the standardised score and reading age. The confidence band indicates the range of scores within which the true score is likely to fall.

Error analysis or miscue analysis

Neale (1997) classifies six categories of error which, for the purposes of this paper, are illustrated in tabular form (table 1).

Error type	Description
Mispronunciations	Words that are only partially decoded and so are wrongly pronounced or distorted without meaning. They provide information on the way a student attempts to decode the main features of a word.
Substitutions	Real words that are used instead of a word in the narrative.
Refusals	The student is unable to make any attempt at a word.
Additions	Words, or parts of words, inserted in the text.
Omissions	Words omitted from the text.
Reversals	Reversals are substitutions but they are recorded separately because of their diagnostic value (<i>on for no</i>).

Table 1. Types and descriptions of errors on reading test

Vernon Spelling Test (Vernon, 1976)

The Vernon Spelling Test was used to assess spelling ability. In addition to saying the word, the teacher-researcher read a sentence that included the word. This ensured that the students were sure of what word they were being asked to spell. The student then attempted to write the target word in the test booklet, using block or other separated letters. The teacher-researcher continued with the test until the pupil had spelt ten words. The number of words the student had spelt correctly was then totalled and the raw score was entered into the summary table. The raw score could then be converted into both a standardised score and spelling age.

Interview schedules

Interview schedules were designed for the parents and class teachers of the students. The schedules comprised five open-ended questions. This question format was considered most appropriate because the researchers wished to obtain as true an assessment as possible of what the class teacher/parent really thought of the intervention programme. Respondents were free to answer the question as fully as they wished and no constraints were imposed. The questions were of a direct nature and moved from general enquiries about the respondents' experience of the support offered to more specific questions about the Phono-Graphix programme, how they perceived students as having responded to it and whether they had noted any changes in students' reading/spelling since the start of the programme. In devising the questions an effort was made to avoid the academic terminology featured in the Phono-Graphix programme. Questions were constructed which could be easily understood and which formed part of the interviewees' frame of reference.

The samples

The student sample comprised ten students identified by the education authority's educational psychologists as having specific learning difficulties/dyslexia. Twelve students

were referred to the teacher-researcher at the start of the school year for peripatetic teaching support, but only ten were included in the sample. Two students had very poor attendance records and were therefore withdrawn from the sample. Six of the students were aged 9–10 years and four were aged 10–11 years. All had different class teachers and nine different schools were involved. Three of the students were female (Chris, Nuala and Bernie) and seven were male. *In order to protect the identities of the students involved in the study, all have been assigned pseudonyms.*

The parent and teacher sample was to have included the parents and class teachers of all ten students participating in the programme. School staff time constraints and the inability of some parents to attend an interview because of work commitments led to a decision to focus on three of the ten students. Initial reading test scores were used to select the students. The selection process involved choosing the parents and teachers of three children – Rob, Simon and Dave – who had bottom, middle and top test scores respectively on the *Neale Analysis of Reading Ability*.

Findings

Part 1. Results of standardised tests

Student	Blending (out of possible 15)		Segmentation (out of possible 63)		Manipulation (out of possible 10)		Code knowledge (in % accuracy)	
	Intake	Final	Intake	Final	Intake	Final	Intake	Final
Kevin	10	14	17	63	4	8	48	82
Colin	12	15	37	63	3	9	38	96
Simon	14	15	21	63	2	8	50	96
Chris	9	14	12	58	1	5	24	60
Nuala	7	14	33	63	3	10	40	88
Charlie	13	14	38	60	5	8	46	88
Eoin	13	15	28	60	5	8	48	80
Bernie	11	14	17	60	6	8	32	80
Rob	9	14	20	60	1	9	32	66
Dave	12	13	15	60	3	8	22	78

Table 2a. Phonological processing tests results

Task	Performance Band		
	good	low moderate	poor
Blending /15	14+	11-13	-11
Phoneme segmentation /63	60+	50-60	-50
Phoneme manipulation /10	8+	5-7	-7
Code knowledge /100%	80-100	70-80	-70

Table 2b: Interpretation of phonological processing test scores

Student	Reading age [years/months]					Standardised score				
	Intake		Final		Gains	Intake		Final		Gains
Kevin Intake age 9.2	6.09	CB 6.04-7.04	8.05	CB 7.07-9.01	1.08	82	CB 77-87	91	CB 86-96	9
Colin Intake age 10.1	8.03	CB 7.06-9.0	11.01	CB 9.11-12.0	2.10	88	CB 83-93	101	CB 96-106	13
Simon Intake age 9.5	6.09	CB 6.04-7.04	8.05	CB 7.07-9.01	1.08	80	CB 75-85	90	CB 85-95	10
Chris Intake age 10.9	No score	CB –	6.07	CB 6.03-7.02		No score	CB –	No score	CB –	
Nuala Intake age 9.5	7.0	CB 6.07-7.06	8.10	CB 7.11-9.07	1.10	82	CB 77-87	92	CB 87-97	10
Charlie Intake age 10.4	6.09	CB 6.04-7.04	8.02	CB 7.04-8.10	1.05	74	CB 69-79	82	CB 77-87	8
Eoin Intake age 10.6	6.03	CB 5.10-6.10	7.02	CB 6.08-7.09	0.11	No score	CB –	73	CB 68-78	
Bernie Intake age 10.11	7.0	CB 6.07-7.06	8.02	CB 7.04-8.10	1.02	75	CB 76-88	80	CB 77-89	5
Rob Intake age 9.11	No score	CB –	6.08	CB 6.05-7.08		No score	CB –	70	CB 65-75	
Dave Intake age 10.1	7.04	CB 6.09-8.01	9.02	CB 8.02-9.11	1.10	82	CB 77-87	91	CB 86-96	9

Table 3. Scores, gains and confidence bands (CB) on Neale analysis of reading ability

Student	Spelling age [years/months]			Standardised score		
	Intake	Final	Gains	Intake	Final	Gains
Kevin	7.01	8.08	1.07	84	93	9
Colin	8.0	8.10	0.10	84	85	1
Simon	7.07	8.06	0.11	85	87	2
Chris	5.11	6.08	0.09	No score	No score	
Nuala	7.10	8.10	1.0	87	90	3
Charlie	7.05	8.04	0.11	78	81	3
Eoin	6.05	7.03	0.10	No score	74	
Bernie	7.03	8.02	0.11	75	78	3
Rob	5.11	7.01	1.02	No score	75	
Dave	7.03	8.02	0.11	79	81	2

Table 4. Scores on Vernon Spelling Test

Student	Mispronunciations		Substitutions		Refusals		Additions		Omissions		Reversals	
	Intake	Final	Intake	Final	Intake	Final	Intake	Final	Intake	Final	Intake	Final
Kevin	10	70	74	30	17	0	0	0	0	0	0	0
Colin	30	58	62	42	8	0	0	0	0	0	0	0
Simon	2	75	55.5	15	31	10	0	0	0	0	0	0
Chris	No score	36.4	86	36.4	14	27.2	0	0	0	0	0	0
Nuala	4.5	68.8	86	25	9.5	6.2	0	0	0	0	0	0
Charlie	8.7	77.6	61	13.2	21.7	0	4.3	0	0	0	4.3	9.2
Eoin	3.8	47.6	53.8	33.4	42.4	19	0	0	0	0	0	0
Bernie	13.7	43.4	41	47.8	27.3	8.8	0	0	9	0	9	0
Rob	No score	24	57	52	35.7	24	0	0	0	0	7.3	0
Dave	12.5	61	75	33.4	12.5	5.6	0	0	0	0	0	0

Table 5. Error patterns on reading test (in percentages)

Part 2. Findings from semi-structured interviews

Data from the interviews with class teachers and parents are both revealing of the complexity of the issues involved and very supportive of the efficacy of the Phono-Graphix intervention. All parents interviewed noted, throughout the period of the intervention, both improvements in their child's reading and a more positive attitude towards reading. Spelling remained more problematic in that students' attempts were more meaningful but all continued to have problems with longer writing activities. Parents and class teachers reported improvements in students' motivation and confidence, as well as in their degree of independence (though Dave remained dependent in the classroom situation). Rob's mother reported her son as saying:

I didn't know about sounds last year and that's why I couldn't read.

Parents reported their children as being more willing to complete Phono-Graphix (if not always class) homework and parents valued the meetings linked to the programme as having provided them with more knowledge and skill in providing assistance with homework. Teachers as well as parents found the meetings and observation lessons helpful in ensuring that, as Simon's teacher put it:

... all adults working with the students were focusing on the same goals

and that

... skills taught were being reinforced in both the class and home environments.

One mother wished she could attend more lessons as this would help with her own literacy difficulties. All could see

the value of training in Phono-Graphix being extended, though one of the teachers was resistant to the idea of training for himself, believing this to be the preserve of the special needs teacher. The other teachers, including one who had initially been sceptical, were keen themselves to learn more about Phono-Graphix methods, believing that this would better equip them to teach other special needs children in their classes. There was evidence of concern among both parents and teachers that gains might not be maintained when the students transferred to secondary school.

Discussion

Analysis of table 2a and table 2b reveals that, with the exception of Simon on the blending test, the students involved in the study scored either in the 'poor' or 'low-moderate' ranges on the initial tests of phonological processing. The Phono-Graphix programme did appear to help improve the students' underlying phonological processing skills, thus lending some support to Frith's (1999) contention that the environment can effect change at the cognitive level through the use of appropriate teaching strategies. With the exception of Chris on three of the four tests and Rob and Dave on one (code knowledge), students' scores on the final tests of phonological processing fell into the 'good' range. Students were much more adept at analysing and synthesising phonemes in simple words. Final performance on the phoneme manipulation task indicated that the students had a much better understanding of the nature of sounds in words and a fuller appreciation that a word could be substantially changed by the deletion, substitution or addition of a single phoneme in any position within the word.

An initial concern on the part of the researchers had been the teaching of spelling alternatives and code overlap at advanced code level, on the grounds that these concepts might be too difficult for the students to grasp. However, the majority of the students proved not to have any difficulty grasping the concept of spelling alternatives for the same sound. Neither did they have difficulty with the concept of code overlap, where one symbol can represent multiple sounds. At final testing, retention of sound pictures was good, as evident in final performances on the code knowledge task. It was noted that five of the ten students were able to identify vowel digraphs on the final test that had not been explicitly taught during the withdrawal sessions. This may suggest that the students were actively building their own knowledge of spelling alternatives as they met words in other situations.

It seems clear that the Phono-Graphix approach would appear to have equipped the majority of the students involved with a secure knowledge of letter-sound correspondences and improved skills of phoneme segmentation, blending and manipulation. It may be – and this would be supported by the findings of Dias and Juniper (2002) – that its concentration on the structured teaching of these skills proves less confusing to students than the information overload that can occur with other approaches, such as the

National Literacy Strategy. None of the students in the study reported here was involved in any other phonics-based programmes and it seems therefore reasonable to surmise that changes in phonological processing skills may be linked to the Phono-Graphix teaching input.

As far as progress in reading and spelling was concerned, three of the ten students (Chris, Eoin and Rob) were problematic in that intake reading/spelling age or standardised score were not available and it was, therefore, difficult to measure gains accurately for these students. Analysis of tables 3 and 4 reveals that the remaining seven students showed an average gain in reading age of 21 months over the eight-month intervention period and an average gain in standardised score of 9.1 points. This equates to an average gain of 0.37 points per hour of instruction. In relation to spelling, the seven students showed an average gain in spelling age of 12 months and an average gain in standardised score of 3.3 points over the duration of the Phono-Graphix programme. It can be concluded that the students in the study reported here showed substantial improvement in both reading and spelling performance. However, the study was unable to replicate the considerably greater gains (for fewer hours of instruction) that were claimed in the original research carried out by McGuinness et al. (1996).

Both reading and spelling are thought to have fairly independent sequences of development with reciprocal influences occurring at different stages. The developmental stages in reading and spelling were modelled by Frith (1985). The *logographic* stage is one in which pupils recognise words holistically. In the study reported here, Chris and Rob began the programme in the logographic stage. They could recognise a number of simple, high frequency words but had little understanding of the sound system based on alphabetic notation. The limited capacity of working memory meant that it was extremely difficult for both students to remember the nature and sequence of letters in a word. Miscue replacements on the initial reading test indicated that the other students had made some progress into the *alphabetic* stage of reading. This stage describes the development of letter-sound knowledge thus allowing reading by grapheme-phoneme correspondence to take place. It has already been noted that the Phono-Graphix programme appears to have helped to develop the students' phonological processing skills and it is possible that this may have enabled them to work more effectively in the alphabetic reading and spelling stage. At final testing, all of the students were utilising a phonetic spelling strategy and were able to provide an almost perfect match between letters and sound. However, whilst spelling attempts were more meaningful, the students chose letters on the basis of sound with little regard for conventional spelling patterns. In addition, it is important to state that all of the students involved in the intervention were following separate literacy programmes in the classroom situation. It was therefore impossible to determine the potential influence of these programmes on the students' final performance on the standardised reading and spelling tests.

A general trend emerged on the final reading tests of all the students. There was a dramatic increase in the number of errors categorised as mispronunciations (Table 5). It seemed that the students became so attentive to the decoding process that they frequently gave insufficient attention to the meaning contained in the text and tended to substitute nonsense words. A more balanced approach to reading instruction may have been needed. Students need to be encouraged to apply their analytic/phonetic skills but teachers must ensure that they are also attentive to holistic/meaning cues.

Colin progressed to the *orthographic* reading stage and was reading by a more direct route based on an automatic knowledge of the associations between grapho-phonetic elements, syntax and semantics. Units larger than single letters were instantly recognised without the need for individual letter-by-letter analysis. Some of the other students also appeared to be making a steady transition to the orthographic reading stage and were observed scanning words for familiar syllables, letter strings and patterns. They were beginning to recognise the vast majority of words in print directly and would decode novel words phonetically. The students were unable to make the transition to the orthographic spelling stage that involves moving away from a heavy reliance on a phonetic spelling strategy towards the use of more visual or meaning based strategies. Frith (1985) observed that this was a critical phase in the development of spelling, that it often took students a long time to move through it and that progress needed to be carefully monitored, with students requiring much support and explicit teaching.

Chris appeared to have more severe phonological processing difficulties than the other students in the sample and made much slower progress with the Phono-Graphix programme. She became more proficient at decoding words by sound blending and this enabled her slowly to improve her reading performance. However, word segmentation skills continued to be weak and Chris was unable to make the transition to the alphabetic spelling stage. In view of the limited progress, the cost/benefit ratio of continuing to provide Chris with this level of intense support is a difficult, moral question for the education authority involved.

Conclusions and recommendations

Responses to specific learning difficulties/dyslexia are strongly influenced by opinions concerning the nature of the condition itself. Those who support the contention that children with reading difficulties do not differ qualitatively from each other would argue that all children with reading difficulties should receive remedial teaching and no one group can benefit more, or is in greater need (Fredman 1989). Others support the view that the kinds of teaching approaches used for slow learners and generally backward readers are not particularly appropriate for the dyslexic child (Thomson 1984). They suggest that dyslexic children need special help with phonological processing, whereas the general population of poor readers requires help with all aspects of the school curriculum.

McGuinness et al. (1996) found that most poor readers in their study could be remediated to reading age norms with the Phono-Graphix programme. They argued that these results challenged the notion of a special reading disability such as 'dyslexia' and proposed that all children, barring the mentally retarded, could be taught to read if the reading programme and method of delivery were effective. Although the study reported in this paper cannot claim to have replicated the impressive results reported by McGuinness et al. (1996), the progress made by the students involved would nonetheless support the suggestion that the education authority might give consideration to whether the use of the Phono-Graphix programme should be restricted to pupils with specific learning difficulties/dyslexia or whether all pupils with reading difficulties should have access to it. There would be considerable cost implications given the number of staff who would require training in Phono-Graphix teaching methods both in moderate learning difficulties (MLD) units and mainstream schools.

Pumfrey and Reason (1991) stressed the importance of rigorous research into the short, medium and long-term efficacy of various methods of teaching the skills of literacy to pupils with specific learning difficulties/dyslexia. Parents and teachers in the study reported here had concerns as to how far student progress would be sustained. It would therefore be useful in future research to design more longitudinal studies, which might follow the progress of students over several years, to establish whether gains in reading are maintained and progress remains consistent. Equally, the problematic links between improvements in reading and progress in spelling that have emerged from the study reported here would suggest the need for further research in this area. The study might also be usefully replicated on a larger scale to involve more students, parents and teachers, with the aim of looking further at certain key issues, which have emerged from the interview data, such as the impact of the programme on student self-esteem and motivation. Finally, further comparative studies such as that of Dias and Juniper (2002) are needed, in order to provide more information on how the Phono-Graphix programme directly compares to other intervention strategies.

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