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Editor and General Manager,
Newell W. Tune,
5848 Alcove Ave,
No. Hollywood, Calif. 91607

Assistant Editor,
Harvie Barnard,
219 Tacoma Ave., N.
Tacoma. WA. 98403

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1. Announcements

United Kingdom Information Technology Year, 1982

As this issue goes to press, the United Kingdom is well into its promotion and publicity for Information Technology Year 1982 when the British Government is spending £1.2 million to publicise modern developments in electronic communication, microprocessors, and video equipment.

All these were non-existent in their present forms only a few decades ago. Two hundred years ago, the only major piece of Information Technology was the printed word. The basis for storing information was invented several thousand years ago – the writing system.

In 1982 there will be still more marvellous developments in modern communications. Not one modern marvel will remain unchanged, unimproved.

What will be the modern developments in the writing system? How much and in what way will they be influenced by computers, electronic typewriters, and typesetters, etc.? All these are alredy here. They will be used to the fullest extent of their capabilities!

In this continuation of the Proceedings of the Third International Conference on Spelling, Research and Reform, held in Edinburgh July, 1981, sponsored by the Simplified Spelling Society, the possibilities for development are made more clear and convincing.

Valerie Yule.

International Spelling Spotting Day, Sept. 30, 1981

was proclaimed in meny cities, among them were: Detroit, Michigan, Toronto, Saskatoon, Windsor, Canada, as well as meny cities in Australia and Great Britain.

Try to get the Mayor of your city to proclaim Sept. 30, 1982 as International Spelling Spotting Day. Get people interested in noticing spelling mistakes in public signs, advertisements, street names, as well as innovations in the products you will find in your local supermarket, such as: Lite beer, Gro-Mor, Krispy Kake Xones, Kum-Kleen labels, etc. Show the public officials that there is a trend toward spelling names in simplified spelling among the advertisers. Try to get newspapers to use SR-1, SR-2.

Just published – a new book, spiral bound

Spelling Reform – a comprehensive survey of the many aspects of the problem. A source book for students; teachers, researchers, and the public, on the subject. 304 pages, 8½ x 11, with 141 articles by 69 different authors, among whom are: George B. Shaw, Sir Cyril Burt, Sir David Eccles, Sir James Pitman, Emmett A. Betts, Bennett Cerf, Samuel L Clemens, Godfrey Dewey, John Downing, Frederick A, Fernald, Chas, H. Grandgent, Geo. J. Hecht, Gertrude Hildreth, A. Lloyd James, Albert J. Mazurkiewicz, Wm. J. Reed, Admiral Jas, D. Watkins, and many other well-known writers and educators.

The topics discussed are:
1. A short history of spelling reform.
2. Arguments for spelling reform.
3. Viewpoints on spelling reform by famous people.
4. Spelling reform in foreign languages, other countries.
5. Countering arguments against spelling reform.
6. Which way to go in reforming our spelling.
7. Ways of implementing a reformed spelling.
8. Specific designs for reform, with their critiques.
9. Spelling in relation to reading, writing, phonetics.
10. Teaching of spelling.
11. Spelling and oracy.
12. Criteria for spelling reform.
13. Spelling and literacy problems.
14. Spelling and commerce, marketing.
15. Spelling and electronics, photo-typesetting.
16. Historical changes in spelling.
17. Psychology applied to spelling.
18. Principles of English spelling in relation to language.
19. English as The World Language.
20. Why there has been failure to adopt spelling reform.
21. Illiteracy and crime – the connection.

Thirteen humorous articles, poems.

Price $32.00 (including shipping charges)
Newell W. Tune, Publisher, Hollywood, Ca, U.S.A.

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[Spelling Progress Bulletin Spring 1982 pp2–4 in the printed version]
See **all Third Conference papers**/

2. Proceedings of the Third International Conference of the Simplified Spelling Society in Edinburgh, July 31-Aug. 3, 1981, by Valerie Yule.*

*Old Aberdeen, Scotland.

Introduction.

The outcome of the conference has been three major developments in the direction for reform of English spelling: in theory, context, and implementation.

The emfasis has shifted from 'armchair argument' to multidisciplinary research that regards spelling as an aspect of communications technology, amenable to human engineering that considers the needs and abilities of its users.

The immediate consequence, from the research presented at the conference, is to query the almost universal assumption of earlier reform proposals, that one-to-one sound-symbol correspondence is the perfectly simple ideal solution. The i.t.a. (Initial Teaching Alfabet) and other experiments have proven that a consistent fonemic spelling is easier to learn than present spelling, but there are obvious disadvantages in problems of regional dialect, homofones, clumsy polysyllables and discontinuity with present spelling; and research presented by Seymour, Perin and Snowling showed the sort of disabilities it could still present for children with learning problems.

A different direction was pointed out by the congruent research and theory presented at the conference from the different stands of cognitive psychology, linguistics and electronic communication, and the almost unanimous resolution of those attending the final plenary session reads:

> *"In the long run we should aim at a perfectly consistent system of writing based on the general principle of foneme-grafeme correspondence; nevertheless due attention and research must be applied to the need to preserve uniform grafic representation of some morfemes and the written differentiation* of *some homofones, in the interests of semantic encoding strategies for learners, more. rapid visual reading by skilled users, more economical writing & greater access to the English language internationally."*

That is, the basic principle of alfabetic spelling is sound-symbol correspondence, but for better efficiency it needs to be modified in consistent ways to carry meaning concisely and clearly. It would be premature to give examples, but there is good hope that research-based solutions could be well advanced within three years, especially if funding can be found.

Such a spelling should look far more like present English spelling 'cleaned up' with a space-age appearance than the present image of reformed spelling looking like funny dialect in a novel.

Conference topics were: Cognitive processes in spelling (how we think when we learn and use spelling), teaching and learning spelling and the difficulties found, spelling internationally and international aspects o f English spelling, designing spelling for efficient human and electronic communication, theory and research in English and foreign spelling reforms, and implementing English spelling reform.

The pragmatic keynote of the conference was set from the beginning by the message sent by the patron of the Simplified Spelling Society, the Duke of Edinburgh. He had asked for a briefing about

his message, but in the event disregarded it and wrote his own, which was characteristically to the point, criticising lack of progress in simplifying spelling due to the disagreement among the different reformers and wishing the conference the best of luck in having some achievements to its credit.

Cognitive psychology.

Dr. Uta Frith presented recent cognitive research on the operations, strategies and processes in spelling function and how they can fail, and showed there are conflicting needs of readers and writers, learners and users, so that a spelling designed solely to be easy to learn may not be the most efficient to use. She thought a future solution for incompatible needs might be a computer-translater that translated 'spell as you like' into 'reading that's easiest,' but one might comment that it might be possible to produce a spelling system that was accomodated to the different purposes, rather than to one only.

Dr. Philip Seymour's paper amplified Dr. Frith's introduction. He described the three ways by which we can read words: direct visual word recognition, indirect recognition via semantic decoding, and through `sounding out: His studies with dyslexics showed their difficulties in using fonemic processing (`sounding out') which seen related to general difficulties in analysis and sequencing found in problems with mapping time and arrays also. He concluded that greater foneme-grafeme consistence would not help these dyslexics if it eliminated other sources of structure that they can use as well.

Teaching and learning English spelling, and its difficulties.

Miss Barbara Smith presented a practical study of children's spelling in six schools and work with teachers to improve spelling instruction. She showed the different spelling strategies used by pupils who spell well or are still at the dependent level or still fumbling, and showed how what appears as 'lack of fonic knowledge' may actually be a major linguistic problem of auditory perception, and discussed problems of long-term and short-term memory, and transfer of spelling learning to actual practice. Weak spellers also have problems of omissions and sequencing, and remediation was described.

Dr. Maggie Snowling discussed the research showing that poor readers have more trouble with fonetic spelling rules than do good readers, and have more problems in spelling with longer words and more complex consonant clusters. (Again, spelling reform must consider more than foneme-grafeme correspondence if it is to really help the learning disabled.)

Dr. Dolores Perin showed the strategies by which good readers are better able than poor readers to use fonemegrafeme correspondences, but poor readers can often spell nonsense words better than they can spell real words, since they do not have to worry about lexical access to non-fonemic variations (that is, consistency would help them).

Two contributors to this section of the conference were unable to come. Dr. Barbara Dodd was prevented by illness from presenting her research on spelling problems of children with phonological disorders who, unlike normal children, had no advantage in spelling when words had regular foneme-grafeme correspondence. Dr. David Moseley's car breakdown prevented him from bringing his video and microprocessing equipment to demonstrate the effective methods he is developing for children who have been failing to learn to teach themselves basic spelling. (These techniques would make learning with a consistent spelling extremely easy and interesting.)

Spelling in other languages and international aspects of English spelling

Mr. Stuart Campbell's discussion of the principles of Esperanto spelling is worth observing as an example of a 'planned' spelling with an approach emfasising IndoEuropean grafic agreement,

maximum simplicity and consistency, and designed so that the common people could use it without difficulty. Campbell drew moral lessons about English from what happens if one tries (as he did) to transliterate Hamlet's soliloquoy into as close to Esperanto spelling as possible. (It would be worth checking some of the claims of modern theorists about the advantages for readers of the redundancy in present English spelling, by using as subjects English-speaking, Esperanto enthusiasts who are skilled in both languages.)

Dr. Henry Niedzielski described experiments in Francofone Burundi in teaching English, including spelling, via French, or directly through the Kirundi language, with results favouring the latter. (At a reading conference earlier in the same week,

Dr. Niedzielski had presented a proposal for teaching one language (French) beginning with meaningful text using maximum common vocabulary and sentence structure and gradually introducing differences from a native language-English; illustrating one advantage of international morfemes that could be further exploited.)

Dr. Iraset Paez-Urdaneta gave a history of Spanish orthografic change, a description of the Bello reforms in Spanish America, and of an experiment in Venezuela showing social class differences in attitudes toward spelling reform. He drew from his survey conclusions about the requirements for successful spelling reform, particularly the social and political aspects.

Dr. Jesús Mosterín of the Univ. of Barcelona emfasised the international need for English spelling reform, and summarised its goals as improving international communication, making reading and writing easier to learn, increasing the linguistic awareness of speakers, making learning of foreign languages easier, diminishing the burden of polyglot communities, offering a uniform and consistent system of transcription from other writing systems, allowing unified representation of nouns in cartografy, and permitting the design of universal word-processing machines. It should be made, he considered, in accordance with principles valid for all languages, such as the International Phonetic Alphabet.

Spelling for electronic communication.

Mr. Colin Brooks of the Univ. of Southampton demonstrated how television etc. can be accompanied by simultaneous transcription of speech for the benefit of the def. A computer transcribes Palantype or Pitman Shorthand, using a hundred or so 'rules' that take fonetic context into account to improve performance, into a script ideally like English spelling. The pros and cons of `algorithmic' spelling were discussed. (Clearly this task would be relatively easy with a consistent English orthografy.)

Dr. Edward Rondthaler, of Photo-Lettering, Inc. New York, sent as a display a computerised dictionary demonstrating how modern techniques made simple the task of printers to transliterate to or from a reformed English spelling and present English spelling – abolishing a nightmare that objectors to spelling reform have profesied eny change would bring to the printed media. Change could be gradual or absolute.

Development of improvements in spelling.

Dr. Neville Brown, of the Foundation for the Education of the Under-achieving and Dyslexic, discussed the significance of semantic considerations in English spelling reform, and the importance of developing direct linguistic encoding strategies for efficient reading and writing.

Dr. Walter Gassner of Australia described possible approaches to reconcile conflicting principles for a spelling reform, with particular emfasis on questions of pronunciation, including location of stress.

Prof. V. A. Vassilyev of Moscow sent in absentia the monograf by himself and Prof. A. C. Gimson presenting a fully developed fonemic spelling.

Valerie Yule took up the implications of research and theory that were presented at the conference to present an illustration of what a 'morfo-fonemic' spelling could be like, and proposed the sort of research that would be required to develop and evaluate the most efficient modern English spelling.

Mr. Chris Jolly, marketing manager, extended the discussion of spelling to other orthografic considerations, and presented research on the commercial confusion that is caused by alfanumeric symbols that can be confused by visual or auditory similarity, as part of a discussion of commercial aspects of orthografic reform.

Mr. George O'Halloran, formerly of the Gambia, sent in absentia a paper containing an overview of orthografies of other languages, including new planned orthografies of this century for non-literate African tongues. From discussing approaches to spelling in English (fonetic, fonemic, diafonic, shorthand, dialectic), Arabic without vowels, Mandinka and Mende syllabaries, Blissymbolics, the Japanese use of Chinese ideografs and the possibility of Eurowords with Eurospelling, he concluded that it is possible that the English expect too much definition of detail in their script, and it may be enough for most purposes that our writing signs should just stimulate the memory into the correct response with internationally recognizable word-shapes.

Experimental investigation of spelling reform.

It is to be hoped that. this is the new growth area, to achieve practical results.

Dr. Robert Baker of the Univ. of Southampton asked literate adults to respell English words in ways they considered more rational and then asked them to explain the reasons for the changes they had made. The findings show popular opinion about what is important in spelling English, which is necessary information in designing and bringing in reform.

Dr. John Beech of the New Univ. of Ulster described an experiment in which adults learnt to read text in two proposed spelling systems, one on the single principle of sound-symbol correspondence (World English Spelling) that changed 67% of present spelling, and one that modified fonemic spelling with consistent principles to change only 30% of English spelling (designed by Beech). After reading 6000 words of text in Beech's Regular Spelling, adults were reading at their normal speed, but even after 8500 words of text in World English Spelling, subjects were only reading at 62% of normal reading speed. Both groups suffered no reduction in comprehension levels. Literate adults could therefore cope with a change to a more regular English spelling quite quickly-for these university students it was only a few hours-thus disproving the claims that it would be impossible. (Motivation would remain the key factor.)

Implementation of change in English spelling.

Prof. John Downing of Victoria Univ., Vancouver, President of the Simplified Spelling Society, sent in absentia his advice that printers and publishers were the key people to be involved in spelling reform, as the media were more significant than education for its introduction.

Prof. Ayb Citron, formerly of Wayne St. Univ. and now Director of the U. S. campaign 'Better Education Thru Simplified Spelling,' made an expose of the socially divisive purposes and results of complex elite spelling systems, substantiating the remark of the famous sociologist Thorstein Veblen (1899) that English spelling is a classic example of conspicuous consumption. Citron thinks that the time for simplified spelling has now come, because of economic needs for literacy, and that four institutional structures of power and prestige to support it are the business-industrial complex

which seeks to maximise profits, the Department of Defence requiring literate recruits, the world of scientists,and the movement of democracy struggling to redistribute power and give more dignity to the common man. Citron outlines how all four can be involved in the movement for spelling reform, which goes so far beyond mere tinkering with the spelling of words in what it could achieve.

Mr. Harvie Barnard, a member of the editorial board of *Spelling Progress Bulletin,* sent in absentia his paper on how alternative spellings could be a practical means of transition from present spelling to a reformed orthografy, and four principles were recommended to commence with, which fit closely with other recommendations that are currently made by reformers.

From these papers, it is clear that it is now recognized that English spelling is a world problem. More people now speak English as a second language than as their first, and this majority is increasing dramatically annually. Thirty percent of the conference attenders were concerned with English as a second language in overseas countries, and the unanimous resolution of the plenary session was that "Because of the international importance of English in commerce and science, eny future spelling reform should take into account the international aspects and implications of the proposed changes."

Attendance at the conference and presentation of a paper implied no necessary commitment to reform or involvement in the plenary session, and some of those who are doing valuable research on the nacre of spelling and spellers are still conservative in attitude. However, the majority of those who stayed on at the plenary session recommended implementation of spelling reform from two directions: official and popular:

1. Working to provide a research basis for an official commission on spelling reform with international links, to give the subject the study that has been recommended by the U. K. Bullock Report on Reading (***A Language for Life,*** 1975) which could give only eleven of its 609 pages to the subject of spelling.

2. Popular change by the existing route of 'permissible alternatives' in spelling to gradually remove the easily remediable and obvious difficulties in English spelling. The plenary session recommended:

a) Public use of the letter *f* for *ph* in line with most international usage, and as is becoming familiar to the British public through multilingual notices and EEC labelling.

b) Use of the letter *e* for the short *e* sound as in *bet* so that, for example, *insted, sed, frend, gess, plesure* would be used to replace *instead, said, friend, guess, pleasure.* This is 'Spelling Reform 1' advocated by Lindgren in Australia, and alredy in use in a variety of magazines and books published by different Australian publishers.

The Simplified Spelling Society thanks all participants in this noteworthy conference. It would be glad to receive reports of research relevant to English spelling reform, and of changes in spelling th rough public usage.

Yours gratefully, Valerie Yule, conference organizer.

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3. Index of papers

Message from H.R.H. the Duke of Edinburgh, Patron of the Simplified Spelling Society.

Cognitive processes in spelling

"Cognitive Processes in Spelling and their Relevance to Spelling Reform." Dr. Uta Frith, Developmental Psychology Unit, Medical Research Council.

"Psychological Processes in Spelling Recognition and Production." Dr. P. H. K. Seymour, Dept. of Psychology, Univ. of Dundee, Scotland.

Teaching and Learning Spelling

"Spelling errors made by 8-11 year old pupils." Miss Barbara Smith, formerly Dundee College of Education, Scotland.

"Spelling of consonant clusters: a developmental study." Dr. Maggie Snowling, National Hospital's College of Speech Sciences and University College, London.

"Spelling difficulties in school-leavers and adults." Dr. Dolores Perin, Developmental Psychology Unit, Medical Research Council, London.

"Spelling errors of 11 phonologically disordered children compared with 11 normal children." P. Robinson, Beresford, Barbara Dodd. (in abs.) U. of Newcastle upon Tyne.

Spelling in other languages and international aspects of English spelling

"Principles of Esperanto spelling." Mr. Smart Campbell, Edinburgh, Scotland.

"Experiments in teaching English in Francofone Africa." Dr. Henry Niedzielski, Univ. of Hawaii/Univ. of Burundi.

"The history of Spanish orthografy, Andres Bello's proposal and the Chilean attempt: Implications for a theory of spelling reforms:" Dr. Iraset Paez Urdaneta, Instituto Autonomo Biblioteca National, Caracas, Venezuela.

"Spelling reform in international perspective." Prof. Dr. Jesus Mosterin, Dept. de Logica, Facultad de Filosofia de Education, Univ. of Barcelona, Spain.

Spelling for Electronic Communication

"Computer transliteration of shorthand for the post-lingually def." Mr. Colin Brooks, Dept. of Electronics, Univ. of Southampton.

Development of Improvement in English Orthograly

"Semantic aspects *of* spelling reform." Dr. Neville Brown, Foundation for the Education of the Under-achieving and Dyslexic.

"How to reconcile conflicting principles for reformed English spelling." Dr. Walter Gassner, Australia.

"A Chomsky-style spelling reform for English? Directions for research:' Valerie Yule, Univ. of Aberdeen, Scotland.

"Commercial and marketing perspectives in orthografic reform:' Mr. C. H. J. Jolly, Marketing Manager, London.

"Spelling: roads to reform." Mr. George O'Halloran, formerly of the Gambian Civil Service, now teaching in London, (in absentia).

Experiment and Research in Spelling Reform

"An experimental investigation of attitudes to English spelling reform:' Dr. Robert Baker, Dept. of Electronics, Univ. of Southampton.

"An experimental comparison between adults learning to read text in two proposed spelling systems." Dr. John Beech, Dept. of Psychology, New Univ. of Ulster, No. Ireland.

Implementing English Spelling Reform

"Spelling reform – be practical." Dr. John Downing, Univ. of Victoria, Canada, Pres. Simplified Spelling Society, (in absentia).

"Simplified spelling: the real battle and the real battleground." Dr. Ayb Citron, formerly of Wayne St. Univ., Mich, Director, "Better Education thru Simplified Spelling."

"The inevitability of change, the happy alternative," Mr. Harvie Barnard, member of Editorial Board, *Spelling Progress Bulletin.* (in absentia).

4. What the 3rd International Conference on Spelling, Research & Reform hoped to Achieve

Short term and now

1. Changing the public image of spelling reform to the modernization of another obsolescent piece of British technology that handicaps the country economically, politically and socially and away from the picture, until the last few year s not unjustified, of engaging eccentrics squabbling in armchairs about pet untested schemes.

2. A public platform for work that deserves publicity and discussion, e.g. John Beech's experiments are pioneering on the crucial question of how literate adults can adapt to changes in English spelling.

Experimental work, e.g. on how the human brain processes spelling, gives the bases for design of an optimum spelling that can be used by the whole population, not just limited to the clever half.

The combined impact of the work on the spelling difficulties of children, the perceptually-handicapped, foreigners, African schools using English as the media of education, and computers, can explain the question, "We did it, why can't everybody else?"

Few people in Britain know about the successful spelling reforms in other modern countries, nor the history of English spelling. (Since its present form is only *200* years old, why should another 100 be needed to change it?)

3. A meeting-place for cross-fertilising *interdisciplinary research,* to break down `tunnel vision' on spelling, and use the combined perspectives and knowledge of cognitive psychology, linguistics, electronics, and communications technology, sociology, history of language, marketing, education and infant-schooling.

4. Set off the first simple steps in spelling reform that can get going in the same way as changes in the living languages and fashions, through adoption by trend-setters and spreding into public acceptance because they are in line with existing trends towards efficiency and economy. i.e. Spelling Reform 1 (SR-1) "Use *e* for the short *e*in bet." This step includes publicising ways in which individuals, teachers, publishing, marketing, etc. can support trends, and arousing public interest and consciousness about spelling, i.e. with Spelling Day, Spelling Games, etc. Ordinary people must become aware that they are capable of questioning obscurantism.

5. Stimulating better teaching of spelling in schools, with methods that help students and teachers to discriminate between the basic underlying system and the extraneous and dysfunctional-so that they can realise how easy and necessary it is to clean most of it up.

6. Stimulating effective research on practical and constructive issues in spelling.

7. Recruiting active support and financing for spelling reform, particularly in the key situations of influence in commerce, politics, publishing, journalism and letters, computer technology, information agencies, and overseas affairs, including EEC, UN, UNESCO, and British Council.

Long range aims of the Spelling Conference

1. Working to get a public commission, such as that in the Netherlands, to make official decisions about research and implementation of further reforms.

2. Ensuring that the research and experimental spadework is done so that when politically and socially the more far reaching decisions on English spelling can be made, the necessary research foundation will be there-and prevent the sort of defects in practice that are now apparent in a theoretically ideal metricisation. (e.g. decisions about grammatical and linguistic markers and consistent modifying rules, a consistent rule about questions such as how to represent the long vowels, and later still, eny changes or additions to the *26* letters themselves.)

3. Encouraging educational, social and political groups to take official stands in favour of spelling reforms and to work and lobby for them, (e.g. teachers' unions, government officials, legislators, the UN, UNESCO, etc.)

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5. The Spelling Exhibition at the Third International Conference on Reading, Spelling.

A dramatic feature of the conference was the comprehensive display of every aspect of spelling reform.

Miss Mona Cross organized a display of publicity and correspondence from the Simplified Spelling Society, including reports about well known reformers such as Reg. Deans, and letters from all over the world.

Mrs. Kate Chapman of the *Scottish Curriculum Development Service* provided a display of spelling teaching materials and books in current use for the edification of all of us who had forgotten what a business it all is. *Holmes McDougal Ltd.* provided a publisher's display.

Spelling reformers who supplied material, monografs, and books for display included *Prof. Vassilyev* of Moscow, with the monograf on *Maximally Simplified Spelling* written in collaboration with Prof. A. C. Gimson of London; *Edward Rondthaler's Soundspel* computer dictionary and explanatory brochures from New York; *Harry Lindgren* of Australia sent copies of teachers, students and computing magazines, and books by well known Australian authors published by six different Australian publishers, all using SR-1, Spelling Reform One, *e* for the short *e* sound (demonstrating it is practical for printers) as well as copies of his book explaining his approach, *Spelling Reform, a New Approach;* there was F*rank du Feu's* Eurospelling, *Reg. Dean's* Britic, *Dr. Walter Gassner's* Consistent Evolutional Spelling; the *House of Lords Debate* on Language Reform initiated by Lord Simon, reported in *Hansard* in January, *1981,* copies of *Spelling Progress Bulletin,* some S.S.S. literature, and recent as well as standard books on the subjects of spelling and spelling reform.

There were poster displays of spelling cartoons, on various aspects of spelling, amplified in seventeen topic brochures-Spelling Facts, Computers and Spelling, Teaching Spelling, Spelling Research, Popular Spelling, Spelling can be Fun, Society and Spelling, Ideas about Spelling, A Handbook of Spelling Reform Proposals, and so on. Available for sale (and still available) were booklets of Spelling Games, Spelling Action Calendar for 1982*,* Car Stickers for Spelling Reform 1, and a booklet of a 6000 word school spelling list set out in a Tonic analysis to make it easier to learn now, and easier to understand how easily the chaos could be reduced or avoided.

We want to thank everyone who contributed to this rather impressive sight, and also thank Fergus McBride, the man on the spot, who was responsible for selecting the excellent conference venue with its magnificent views of history and scenery (when we had time to look) and who provided invaluable assistance in organization of venue arrangements and transportation of materials. We also want to thank the University of Edinburgh for their cooperation and help with this project.

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Papers Presented at the Third International SSS Conference on Reading and Spelling

6. Message by the Patron of S.S.S., H.R.H. Philip Duke of Edinburgh:

To simplify the spelling of English has been the ambition of any number of reformers. A few successes have been achieved, largely in the United States of America, but otherwise little has happened. One very good reason for this lack of progress is the, not unexpected, inability of the different reformers to agree on a common system. It would be nice to think that the Third International Conference will have some achievements to its credit and I wish all the delegates the very best of luck.

Philip, Duke of Edinburgh

7. Cognitive Processes in Spelling

"Cognitive Processes in Spelling and their Relevance to Spelling Reform." Dr. Uta Frith.*

*Developmental Psychology Unit, Medical Research Council, London.
*MCR Developmental Psychology Unit, London, England.

Abstract

Cognitive psychology has opened up some new and interesting ways of thinking about spelling and reading. In the past there have been innumerable studies investigating relationships between all sorts of psychological variables and visible language skills with often disappointing results. In contrast, the cognitive approach does not take any of these "skills" at their face value but attempts to analyse them into components. These components have a place in models that specify operations, strategies and processes suggesting how reading and spelling are acquired, *how* they function and *how* they fail.

This analytical approach has demonstrated that reading and writing are related in a complex way and that they both go beyond a letter-sound correspondence principle. It is useful for spelling reformers to consider reading (input) and writing (output) processes separately, in their own right. This is because the demands of the reader and of the writer ate to a large extent incompatible. The writer might wish to use a sound-to-letter strategy, possibly on individual shorthand. The reader, on the other hand, finds phonetic or shorthand writing very demanding, since he rarely uses a letter-to-letter strategy. He tends to rely on a variety of cues present in conventional English orthography. These cues may relate directly (visually rather than phonologically), to the meaning, origin and syntactic function of words.

Seen from this point of view, a purely phonetic spelling reform would favour only the writer, but penalize the reader. An ideally efficient communication system for written language would have to allow for the different requirements of the writer and the reader. A no longer Utopian solution would be a device that is linked to a keyboard or writing pad and essentially transforms input written phonetically or in individual shorthand into output which appears on screen or in print as widely readable copy, and which could be programmed to give as much graphic and orthographic information as is desirable. (end of abstract)

Cognitive psychology has flourished on a highly effective, yet astonishingly simple model of how we perceive, remember, think and do things. All these are activities that involve cognitive processes, but most of all, cognitive processes are identified with communication skills. Information processing is the key phrase to characterize this simple model, and it is ideally suited to describe spoken or written language. The model distinguishes between INPUT processes-these could be listening to speech or reading – and OUTPUT processes, such as speaking or writing. In between input and output we have traditionally a "black box." Inside we imagine to exist our internal representation of language – and indeed our representation of the world.

This input-output model is also useful in order to consider what we mean by spelling. There are really three subtly, but importantly different meanings of spelling, which are easily confused. If seen in relation to input processes, spelling denotes *orthographic structure.* We can talk of spelling patterns, letter position, specific graphemic units, etc. It is clear that 6 year old beginning readers are already sensitive to orthographic structure (Henderson and Chard, 1980). Even non-readers, for instance, can distinguish illegally spelled words (prtd) from legally spelled ones (prid). It is easy to observe this by asking them to sort out such stimuli into the categories "possible words" and "definitely not words."

If seen in relation to output processes, spelling means *word production.* In order to be correct, the word has to be correct letter-by-letter. It is this production process that has received least study and that yet gives rise to more problems than other aspects of literacy. Spelling also sometimes means *spelling knowledge,* which is represented inside the black box, as if in some internal dictionary. How this knowledge is actually acquired and how it is available for use is still largely unknown. An example would be the knowledge we bring to bear in spelling entirely new words by analogy and in detecting errors in our own writing.

If we go along with the model, these three meanings of "spelling" have to be kept apart, as quite different psychological processes are involved in the three functions. Spelling as on INPUT skill has most to do with *reading.* Spelling as on OUTPUT skill has most to do with *writing.* The third function of spelling is the least accessible to study and rests largely on inference, while input and output skills can be observed directly. Nevertheless, we cannot do without the assumption that a literate person has a vast store of knowledge about the written forms of words. There must be on internalized system of *visible language* just as there is of spoken language.

One very intriguing question is in what form is this knowledge represented? Is there 'really something like a collection of specific visual images for every word? That visible language has a "visual" component must be taken for granted. However, this component is *abstract-visual,* not physical-visual: structures that are not photographs, but like programmes that specify each letter in its correct position, whatever physical shape the letter may have.

The internal representation of spelling knowledge is not as speculative on assumption as it might appear. That the notion has a psychological reality can perhaps be shown by the existence of spelling riddles in folklore. A number of these have been collected and discussed by Green and Pepicello (1980). They classified spelling riddles into several types, two of which are especially relevant here.

The first type is like this: "What's black and white and red/read all over? (a newspaper)." This is concerned with the fact that the same sound can have a different spelling. The sound in context tricks you into thinking of the wrong member of the pair, namely (red) as colour rather than (read) as in reading. This type of riddle belongs to the vast class of jokes that are known as puns. Although puns can be understood without spelling knowledge, one wonders if their enjoyment is not enhanced by the fact that similar sounding words can be written differently.

The second type of riddle is as follows: "What tune does everyone like?" (fortune) "What ants are the largest?" (giants) "What age is served at breakfast?" (sausage) This type is concerned with the fact that the same spelling can have different sounds (e.g. *tune* sounds /tju:n/ in *fortune*). What is interesting about this type of riddle is that it really shows that letter strings are known or represented internally without respect to a specific sound. It is the same /t/u/n/e/ if it is pronounced /tju:n/ or /tʃən/.

These few examples suffice to show that there is some psychological reality to the notion of internal spelling knowledge and that this knowledge rests on a quite complex system of visible language.

Naturally, cognitive psychologists have elaborated the *simple input-output* model into highly sophisticated versions and excellent accounts are available (e.g. Cohen, 1977; Morton, 1979; Seymour, 1979). The findings that emerged from experiments based on a cognitive model are very relevant to students of reading and spelling. I believe that they have brought about a significant advance in our understanding of reading and spelling skills (Frith, 1980). The main advance compared to older studies probably rests in the microanalysis of reading and spelling. The black box has in fact begun to be unpacked.

A specific example is the analysis of reading and spelling skills in terms of two relatively independent strategies. We can read a word-to some extent at least-as if it were a Chinese symbol, that is, disregarding any relationships of letters to speech sounds. Hence this strategy has been termed "Chinese." This strategy is very fast, but the problem with it is that every single word needs to have a specific entry in an internal lexicon. If it is a short word, it can be recognized as a whole pattern straight away; if it is a long word, or is inflected, then it needs to be .broken down into proper meaningful segments first, each of which are then instantly recognized. The important point is that this is not letter-by-letter reading; the meaningful segments are groups of letters taken in at once. Furthermore, individual letters are not translated into sound. With this "Chinese" strategy it is therefore quite irrelevant, if the letter-sound correspondences are ambiguous or unpredictable from general rules. We can illustrate this with an example of "Chinese" reading that is familiar to all of us: seeing "12" or "XII" makes us say /twelv/ or /tsvɜ:lf/, or /du:z/ or /doditʃi:/, etc.

The other and truly alphabetic strategy has been termed "Phoenician." This strategy treats the alphabetic writing system as it was originally intended by its inventors, the Phoenicians. Letter and speech sound are intimately connected, but in such a way that the stream of speech is broken up into small artificial units which are designated phonemes and which are represented by particular graphemes. To use this strategy, one does not require specific word recognizers: any word can be read-in theory- by pronouncing each letter according to the rules. The problem here for English is that we need to put together the single letters into bigger meaningful units before we can really pronounce them, or to know where to put the stress (Smith, 1980). For the most part this is not the fault of the orthography, but the "fault" of the spoken language itself. Phonemes do change in context. Hence we have problems with, for example, *finite-infinite, active-action, courage-courageous*. Here the same vowel in the word pairs is pronounced very differently, but spelled the same. This orthographic convention makes transparent the underlying relationship of the words-in spite of the fact that our speech (at present) does not make such a relationship very clear. The examples also serve to illustrate that written language is not merely parasitic on spoken language rather it makes an independent contribution to communication. Indeed, it may itself affect speech and can be shown in numerous examples even to have changed speech over time (Levitt, 1978).

The two reading strategies, "Chinese" and "Phoenician" are well known to teachers by the labels "Look-and-say" and "Phonics." Both have been applied to reading as well as to spelling, but there is some indication that "Phoenician" has more affinity to spelling. One reason for saying this is that

reading errors are usually not mispronunciations of component sounds, but an error is usually a completely different word that is substituted. It seems that the wrong lexical entry was being activated, rather than that a string of sounds was laboriously and falsely marked out. On the other hand, spelling errors and slips of the pen are very often phonetic, that is, they do seem to be derived by an application of sound-to-letter rules. Marsh et al (1981) compared errors in reading and spelling the same material in three age groups and concluded that the strategies were markedly different.

Even good spellers make spelling errors, usually by accident rather than by ignorance. Interestingly enough, many of their unintentional slips of the pen are in homophonic words, e.g. *their* for *there, to* for *too,* etc. Two aspects of these slips are important: that they are words themselves and that they sound similar to the target word. Since word is substituted by word, probably a confusion between two automatic spelling programmes occurred. Since the correct sound is retained, it appears that the spelling program was retrieved through sound. Morton (1980) suggests that a phonological code could be used as a unit to access the letter-by-letter code for the word. The mental lexicon itself may be organized phonologically (Fay and Cutler, 1977). Thus the direct ("Chinese") or lexical route still may be triggered by a phonological code. However, its role would not be to provide phoneme to grapheme correspondences, only to retrieve an automatic spelling program for a whole word. Why should a sound code rather than a visual code take on this role?

A theory that is relevant to this notion has been proposed by O'Connor and Hermelin (1978). According to their theory, there is an affinity of temporal-sequential processes (which include speaking and spelling) with phonological coding. Thus, while writing, sound is the appropriate code and would override a visual code, and, as in speech, does not distinguish for instance, *their* from *there* (Frith and Frith, 1980). In contrast, in reading, a visual code would seem highly appropriate. It is a very fast process, where sound enters at a later stage only. It can readily be imagined that if there was a race between "Chinese" and "Phoenician" word recognition, the Chinese one would win. On the other hand, in writing this speed is not necessarily an advantage as the writing process itself is slow enough for a sound code to catch up easily.

Evidence for the separation of reading and writing strategies is also available from another source. In young children just beginning to learn to read and write, Bryant and Bradley (1980) observed that they would read words they could not write and write words they could not read. This odd discrepancy was explained by the fact that the children spontaneously preferred to read words by Look-and-say, but to write them by Phonics. The important observation that young preschool children may take quite readily to writing, given basic knowledge of letter names and sounds, was analysed by Charles Read (1971). He also found that often such precocious children could not read what they themselves had written. To decode sound to letter seemed more "natural" than to decode letter to sound.

Discrepancies between reading and writing should not come as a surprise. Indeed, they are expected in terms of an information processing model, since input and output are not just the same process in reverse, but are in fact quite independent of each other. Using a computer analogy, the information typed in at the keyboard terminal bears only a superficial relationship to what appears on the print-out. The information that is typed in can be, but need not be, converted into signals that activate a printer. The speeds of the various operations involved also are independent of each other. The printing time is presumably limited by mechanical conditions specific to the printer. Similarly, writing or typing by hand cannot be faster than the motor system allows.

This notion of independence of input and output has important implications for teaching and for changing spelling. It implies that learning to read does not at the same time necessarily lead to learning to spell. Furthermore, as already mentioned, input and output processes seem to have

specific preferences for particular codes. For example, a lexical recognition might rely on a "visual" code, a sound-letter translation system may well rely on a sound-based code. A sound-based code, as O'Connor and Hermelin have suggested, is essentially a sequential code; a visual code on the other hand is a spatial code that is not dependent on temporal sequence. In reading, we can imagine that a spatial code is efficient. In spelling, a sequential code might be especially advantageous, as it goes along with sequential programmes.

All this supports the idea that the requirements for input (reading) and for output (writing) processes are not only independent, but in some sense incompatible. It seems as if the Phonecian invention of the alphabet is tailor-made for writing, while the Chinese system is tailormade for reading.

One particular difference regards flexibility and rigidity of the processes. It seems to me that flexibility is desirable where processing of input is concerned, simply because the form of the input can vary so much. Material to be read does come in many different forms: prints vary, even given perfect legibility, but legibility also varies, depending on the conditions of, e.g. light, distance, state of the material, etc. The idiosyncracies of the sender of the communication may have to be taken into account, his handwriting and his spelling ability. It pays, therefore, for an input processing system to be flexible and adjustable to the situational demands. This is the opposite of having a pre-programmed system, where we would utterly depend on input material being reliably the same in every case. I would like to suggest that this sort of system is not viable for reading, but is very well suited for an output process, such as writing.

For output processes to function efficiently, pre-programming is needed. This requires a fixed sequence of actions. Preprogramming is evident in handwriting-which is characteristic of each individual. There may be a number of quite long automatic sequences for frequent words and frequent word-components. Studies are in progress that look at the exact timing of writing movements in order to discover the size of basic units as well as longer spelling programs. It is important, however, to realize that spelling programs do not reside in the actual writing movements. This would be absurd, since we can spell equally well if we type, or print, or write with our non-preferred hand, or spell orally. The spelling program underlies the motor program, but is not identical to it. It is true that we still know little about the nature of the output programmes, and we also know very little about the input programmes, but experimentation is following along quite promising paths. It is clear that what appears to be a superficially simple relationship of spelling and reading processes is in fact not at all simple.

What conclusions can we draw at this point that might have some bearing on spelling reform issues? It seems to me that any reform that is guided by a single principle, if it is an advantage to one process, it is bound to be a disadvantage to the other. A single principle cannot satisfy both processes. If we take the principle of unambiguous letter-sound correspondence, it may well be that spelling would benefit by a simplified sound-based system, but, inevitably, reading would suffer. Fluent reading is not primarily a sound-based process, but much more a visual one and could be simultaneous rather than sequential. Writing must always be sequential, in contrast.

In recognizing words we can actually benefit from an orthographic system such as the present one where information is presented at many different linguistic levels. There is a lot of redundancy in the conventional spelling of many words, which enables us, if we wish, to learn about, e.g. the word's language origin, the word's prior pronunciation, the word's form class, or its relationship to other words. Visible language, as I have already pointed out, is not just a derivative version or imperfect reflection of spoken language. Language is more than speech and has many more aspects than sound. Although there is slow but continuous change in both domains of written and spoken language, it is not clear who or what exactly controls the change. If we knew we would presumably be on the way towards an optimal orthographic system. Clearly, as an experimental psychologist, I

would prefer to understand the psychological processes underlying reading and spelling, before trying to change them. Nevertheless, I would like to make a suggestion that is based on the study of cognitive processes. This study taught us that the ideal orthography is different if seen from the point of view of the reader, and the writer. Instead of trying to achieve a compromise – which I believe is actually the continuous state of English orthography-we might look for a radical alternative with help from computer technology. All we need is a translator device (our "black box") that mediates between the ideally efficient sender and the receiver of the written message. The sender, if he likes the Phoenician style, could write in his own preferred system, possibly in shorthand. The reader (if he likes the Chinese style) could read the message in as non-phonetic and as redundant a way as he liked. The "black box" would have stored all necessary spelling programs.

As recent work by Colin Brooks and Robert Baker presented at this conference shows, such a solution is not as Utopian as it sounds. What makes this technological solution especially exciting to me is that it seems backed by theory and results from cognitive studies in spelling. I hope therefore that it can cut through the tangled controversy of pros and cons of spelling reform and provide a new alternative of communicating in visible language.

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[Spelling Progress Bulletin Spring 1982 pp9,10 in the printed version]
[Philip Seymour, see **Media**]

8. "Psychological Processes in Spelling Recognition and Production"

Dr. P. H. K. Seymour.*

*Dept. of Psychology, Univ. of Dundee, Scotland.

Abstract

English spelling is a complex system which signals information about meaning, grammatical function, and pronunciation. In order to read, a child must acquire a visual recognition system which is sensitive to these properties, and which can make contact with the systems involved in comprehension and production of language. It is likely that the visual recognition system is capable of dealing with words as wholes (not necessarily ideographs), and also of analyzing them into smaller units, such as morphemes, syllables, or vowel and consonant spelling patterns. Skilled reading is probably achieved by a direct whole word process, but the ability to segment and use grapheme-phoneme correspondence rules is important at the early learning stage. Spelling production similarly involves a capacity to segment speech and select corresponding letters or letter groups (phoneme-grapheme correspondences) in writing. This selection cannot be based on sound alone, but must additionally take account of grammatical conventions, and idiosyncrasies in the spellings of individual words, Thus, skilled spelling seems to depend on the establishment of a vocabulary store in which spellings of individual words are fully or partially specified. Reading and spelling disability (dyslexia) often seems to involve a problem in handling the correspondence between segments of written and spoken language combined with failure to establish a spelling vocabulary. These difficulties sometimes co-occur with problems in acquiring other sequentially structured forms of knowledge, such as the systems for labelling clock or calendar time, and possible reasons for this will be discussed.

Implications for teaching and spelling reform are not straightforward since it is still unclear whether disability reflects a general difficulty in comprehending correspondences between segmented arrays or a more specific difficulty relating to lack of perfect spelling-to-sound correspondence.

Corpus

The Logogen model (Morton & Patterson, 1980) distinguishes three channels for reading words: (1) direct connection between visual word recognition (input logogens) and speech production (output logogens); (2) indirect connection between input and output logogens via the cognitive (semantic) system; and (3) a non-lexical grapheme-phoneme conversion channel.

Studies with developmental dyslexics (Seymour & Porpodas, 1980) indicate that processing of grapheme-phoneme correspondences (tested by reading of regularly spelled nonsense words) is defective, especially with regard to rate of (letter-by-letter) processing. Processing time anomalies are also found in tasks involving analytic comparison of letter arrays, and internal scanning of spelling information. Older dyslexics appear to have developed a rapid and efficient word recognition system despite these anomalies.

An alternative model (Shallice & Warrington, 1980) postulates a parser (word-form system) prior to semantic or phonological analysis which categories the letter string into familiar subsets (whole word, morphemes, syllables, spelling patterns) using an abstract graphemic code. Speed of

operation of this stage can be selectively influenced by format distortion (e.g. $^{T}_{A}{}^{B}_{L}{}^{E}$), and the stage is sensitive to variation in word length, and orthographic regularity.

For spelling production there also seems to be an initial reliance on a process of phoneme-grapheme translation. This depends on segmentation of the speech code into appropriate units (analogous to operation of the word-form on visual graphemes). A lexically indexed spelling store (functionally distinct from a visual word recognition system is essential for achievement of normal competence. However, this is also dependent on phoneme-grapheme processing as is shown by strong effects of spelling irregularity on spelling error frequency in dyslexics and normal children (c.f. Seymour & Porpodas, 1980).

The structural coding hypothesis (Seymour & Porpodas, 1980) states that representation of segments in both the phonemic and graphemic domains, and the establishment of mapping relations between them, depends on a general capacity for coding properties of arrays, including (a) approximate location of elements, (b) inherent directionality, and (c) precise locations and adjacencies. A defect in some aspect of this coding system, will disrupt the development of the segmenting functions of the word-form system, and the phoneme-grapheme channel, with adverse consequences for lexical word recognition and 'sight vocabulary' development, and for the storage of structures defining the precise spelling of words.

It is argued that certain other cognitive systems, such the numbers, the clockface, the months of the year, and the days of the week, also constitute arrays which are coded with respect to approximate location, direction and precise location. The learning of these systems is often disrupted in dyslexia, as can be shown by retrieval time measurements.

The generality of this conclusion, and the exact basis of the relation between the time systems and spelling structure is being examined in current research. In these studies defects are noted in the coding of arrays in the absence of problems of phonemic segmentation or variability of mapping.

This would not support an argument to reform spelling to achieve more obvious phoneme-grapheme consistency. Written language already contains a great deal of structure at levels of letter frequencies, grapheme-phoneme correspondences, syllabic and morphemic structure, and it is unlikely that disability of this fundamental nature would be eliminated by improving structure at one level at the expense of the other.

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[Spelling Progress Bulletin Spring 1982 pp9–19 in the printed version]

Teaching and Learning Spelling

9. "Spelling errors made by 8–11 year old pupils." Miss Barbara Smith.*

*former lecturer, Dundee College of Educa. Scotland.

Abstract

Survey of spelling errors:
1. Categories of error, using Peter's Manual, and arranging the results in grids.
2. Range and distribution of the number of errors.
3. Individual and class preponderance of error.
4. Further diagnosis from an `Informal Writing Inventory.
5. Sample remediation, indicating changes in spelling behaviour.

TOPIC HEADINGS:
Spelling behaviour. Spelling is a `tool' subject in the context of communication skills. The complexity of the continuous writing process has been considered in the Informal Writing Inventory.

Factors to be considered in learning spelling: (a) Motivation, (b) What is learning? (c) Short term or long term memory? (d) Transfer to writing vocabulary, how?

Establishing a method of self instruction.

Teaching spelling after diagnosis.

What to *do in case of faulty perception.*
School studies: Six are described, with handouts of scripts.

Conclusion:
Spelling behaviour can be altered by systematic remedial teaching, but there is the danger of remaining at permanent instructional level.

Factors needing exploration are:
(a) What constitutes learning to spell a word? Short term memory or long term, and how long term?
(b) How to transfer words learned in isolation to spontaneous use as part of the writing vocabulary?
(c) Remediation for faulty auditory perception.

Corpus

The points of view of multitudes of children who have to learn English spelling, of thousands of teachers who try to teach children how to learn spelling, and of lecturers who hold inservice courses for teachers on the teaching of spelling, form the background to the following thinking,

Spelling – a Communication Skill
The complexity of the continuous writing process has been considered in "I enjoy writing. . . it teaches me," an article in *Teaching English,* Spring '79, vol. 12, No. 2, pages 38-43, in which I stated:

"Informal Reading Inventories are teacher-structured reading situations. The teacher finds passages related to the pupil's interest or to the current class theme, selects the components for diagnosis

according to her awareness of the pupil's needs, and uses the results in planning her reading programme."

Informal Reading Inventories differ from standardised tests which have the same prescribed passages for all, standard procedures and statistically competent norms. In *The Reading Curriculum* (O.U. 1973), the Betts levels of attainment in IRI are given (1) independent, (2) instructional, (3) frustration. The IRI uses the concept of readability in its wide sense, matching books to readers.

In view of a changing climate of opinion about excellence and failure in children's writing and the lack of standardised tests, I had to devise structured writing situations to give some degree of uniformity of procedure. I taught the P4, P5, P6 classes in the preliminary build-up and timed the writing to last twenty minutes. At the end of the experimentation, I had four pieces of writing from each child, written at six-monthly intervals. The preliminary teaching involved my reading aloud literary extracts on a theme and talking over possibilities with the children. For the children the learning situation was a listening one, with the opportunity to ask and answer questions.

On several occasions, to create atmosphere, I read the classes an introductory "horse" poem, "The Runaway," by Robert Frost. Excerpts about horses from a tape on "Dreams" prepared by a P7 Class were played. I read parts of "The Night of the Wild Horses" by G. Harrison (OUP), a long narrative fantasy poem. The fantasy element is in the notion of fairground horses coming alive and transporting their child riders into the past. There was some classroom interaction in discussion which ranged from cavalry charges in historic battles to the contemporary Grand National. The children were then invited to write their own dream ride for twenty minutes.

By dint of repetition, the teaching situations became almost standard procedures. With the current interest in Informal Reading Inventories, it might be not unfair to coin a parallel phrase and to call the procedures Informal Writing Inventories. The levels of attainment in the Informal Writing Inventories were tentatively named (1) independent, (2) instructional, and (3) fumbling, to match the Informal Reading Inventory with its independent instructional and frustration reading levels. An attempt was then made to isolate the skills involved in written communication and a paragraph devoted to "Handwriting and Spelling" suggested that action be deferred in these fields. The establishment of other categories in a detailed assessment instrument was further described in the article and the way was cleared for consideration of spelling as a "tool" subject in the context of communication skills.

Spelling-Learning Problems

Before experimentation began, thinking and discussion suggested the following problem factors: (a) motivation to learn spelling? (b) What constitutes learning? When is a word correctly spelled? Short term memory or long term memory? How long is long term memory? (c) How transfer to writing vocabulary by spontaneous use in the continuous writing context of words learned in lists, in dictated passages, or inserted in contrived but meaningless sentences?

Spelling – Diagnosis using Peters' Manual

Six schools were selected as available for diagnostic investigation, providing a wide range of ability in varying socio-economic environments. Schools A and C were city schools, schools B and D burgh schools, and schools E and F rural schools. 8, 9, 10 year olds in P4, 5 and 6 of these schools formed a total of 500 children. Peters' diagnostic dictations were given to class groups and the results were tabulated in grids which could be read horizontally for individual diagnosis and vertically for class diagnosis.

Table 1. Fragment of a Grid.

	I. Substitutions (a) Reasonable phonic alternatives	(b) Phonic not conforming to spelling precedent	II. Faulty Auditory Perception	III. Perseveration	IV. Analysis of structure Omissions
Pupil Y		satisfactshon sertinly	dog (=dodged) dangeris		frightend were (=where)
Pupil Z	here (=hear)	stage fritend satisfackion traffick			brige troting
	1	6	2	-	4
	Insertions	Transpositions	Doubling	V. Unclassifiable	Totals
Pupil Y	tiyed	niosey			8
Pupil Z	noisey				8
	2	1	-		16

Table from Interim Report

My comments in the Interim Report were "Pupil Y's lack is in auditory perception as seen in "dog" for "dodged" and "dangeris" for "dangerous"; and "were" for "where" could possibly be entered here too. The pupil makes some use of phonics, e.g. satisfactshon and "sertinly" but the errors under "Analysis of Structure, e.g. Insertions "tiyed" and Transposition "niosey", suggest faulty visual perception. Pupil 2 uses phonic knowledge in 5 out of 8 errors satisfactorily but has not established word patterns to fit into the phonic knowledge. The same applies to "niosey", with its insertion of "e". In both cases, the omissions of single letters may well be single-occasion, usually called "careless" errors, but it could be argued that such errors are also symptomatic of the problems of imprecise visual perception of words.

What is noteworthy in diagnosis is that the two pupils should not be regarded as identical problems though they have the same number of errors. The preponderance of error may well be different and requites different remediation.

The detailed grid information was duplicated, distributed to and discussed with head teachers and class teachers so that the diagnosis should influence their teaching procedures. Later the same classes were given an Informal Writing Inventory, after which the spelling of the scripts was subjected to the Peters? diagnostic categories and the results, tabulated in grids, were compared with the results of the Peters' dictations. The number of errors and the patterns of error were compared. In the Interim Report, I commented on dual category errors and multiple errors:

"When considering the categorisation of errors, there is need to call on knowledge of local accents and dialect usages to decide on categories. Ideally, the best judge of category is the child's teacher. Examples taken from P4, School Are (1) were (=where), (2) certainlay (=certainly), (3) hores (=horse). (1) might be either "Faulty Auditory Perception" or "Omissions ', (2) might be either "Faulty Auditory Perception" or "Transposition."

Some words also have multiple errors within them, e.g. (1) remode (= removed), (2) shage (= shaggy). (1) might be either "Faulty Auditory Perception", or "Insertion" or "Omission", or

"Transposition", (2) might be either "Phonic Alternative not conforming to Spelling Precedent", or "Omission", or "Insertion", or "Doubling". Subjective judgement is exercised in categorising these errors."

Finally, the diagnostic dictation was administered again, and, at each step in the experimentation, copies of the detailed results were discussed with Head Teachers and Classroom Teachers. Topics which took prominence in discussion were (a) the writing vocabulary overlapping but not identical with, the speaking, listening, and reading vocabularies of the children, (b) use of the dictionary, (c) subvocalization in recalling the spelling of a word, (d) spelling, though a single skill at the independent level, remains a complex skill at the fumbling level.

School Studies
Teacher enthusiasm and effort did accomplish spelling development.

School C (City)
Blackwell's Spelling Laboratory was a systematic school compensatory programme. There were no "at risk" spellers (a phrase coined from the Tizard Report's kindly-phrased reference to children "at risk" in reading).

The preponderance of error was in the faulty auditory perception category for the diagnostic dictation tests. The Informal Writing Inventory gave a different distribution with equalised categories.

School D (Burgh)
Again, the preponderance of error was in the faulty auditory perception category, though School D is socio-economically different from School C. In the P5-6 classes, the omissions category catches up on faulty auditory perception.

School B (Burgh)
In P4, the faulty auditory perception category, though still the largest, was relatively much smaller than for schools C and D. In P5 and 6, omissions was the largest category. A socio-economic difference was also evident in spoken language, especially in articulation.

School A (City)
Again, the preponderance of error was in the faulty auditory perception category. The teaching was above average and as devised by individual teachers. The results were poorer than for School C with its systematic school compensatory programme.

Faulty Auditory Perception
Discussion of early results with teachers on inservice courses showed that most passed off the problem of faulty auditory perception, and therefore faulty sub-vocalization, on recall, as "lack of phonic knowledge" and failed to appreciate that a major linguistic problem had been isolated.

Remedial Teaching School E (Rural)
In addition to the testing as for Schools, A, B, C, and D, Arvidson's method for self learning was taught. Short term and long term memory results were tested and there was incidental learning of dictation within a thematic situation. Two P4 pupils "at risk" were given individual tuition. The attached results, pages headed SCHOOL E, 1251, 1252, show improvement in long term memory for two boys who had been in danger of opting out of written communication.

School F (Rural)
As for School E, the method for self-learning was taught and short term and Iona term memory testing was given. The attached results for pupil 626, show development of: 1. The ability to use the self-learning method. 2. The ability to write words learned-progress from 1/5 to 2/5 to 5/10 words correct. 3. The attempt at Peter's diagnostic dictation improved from four words correct, 96 wrong, to 29 words correct, 71 wrong. Systematic remedial teaching can alter spelling behaviour but there is the danger of remaining at permanent instructional level.

General Conclusions

Two problems need further exploration:
(a) What constitutes learning to spell a word?
Short term memory or long term memory and how long term?
(b) How can teaching transfer words to spontaneous use as part of the writing vocabulary?
The motivation-to-learn problem was to a certain extent solved but another problem is now revealed in:
(c) What is the remediation for faulty auditory perception?

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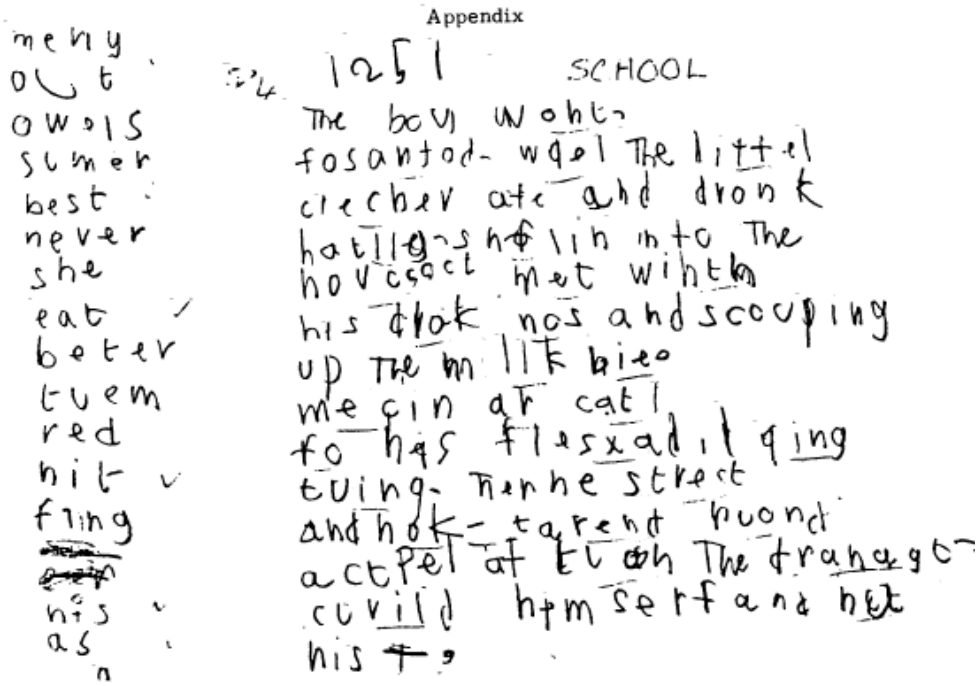
Appendix

Appendix



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10. "The Spelling of Nasal Clusters by Dyslexic and Normal Children," by Dr. Margaret J. Snowling.*

*The National Hospitals College of Speech Sciences, London, England.

Abstract

The spelling of nonwords containing nasal clusters either in final position (*hent*) or preceding syllabic 'l' *(wemble)* was explored. Subjects from 6 to 14 years old heard the word, repeated it, and then spelled it in a word completion task. A tendency to reduce clusters when writing but not when speaking was evident in less skilled spellers. The nasal consonants 'n' and 'm' were often omitted when occuring in clusters with other consonants.

Acknowledgements

Thanks are due to Dr. Uta Frith and Dr. Dolores Perin for assistance and helpful discussions. Also to the dyslexic children who participated in the experiment and for the co-operation of the staff and pupils of Bromley High School, Kent, and Surrey Square School, Forest Hill, London.

Corpus

In recent years it has become popular to carry out qualitative analysis of spelling errors in order to throw some light upon spelling difficulties (Peters 1975, Cromer 1980). It is customary to distinguish between a phonetic error which correctly preserves the sound sequence of a word (e.g. *speshull* for *special, trafick* for *traffic*) and a nonphonetic error in which the sound sequence is not preserved (e.g. *deter* for *doubt, heyou* for *hay*). This distinction is an important one which has been shown by many investigators to be of diagnostic significance. (Boder, 1971, Nelson & Warrington, 1974, Frith, 1979).

Phonetic errors are usually assumed to be less serious than nonphonetic errors because they are easily deciphered. A more liberal approach to spelling would regard these versions as acceptable. Furthermore, an individual who makes primarily phonetic errors shows evidence off the ability to segment the target words into appropriate speech units (phonemes) and of being able to translate these units into letters using phoneme-grapheme rules (Frith, 1980). In contrast, an individual whose errors are primarily nonphonetic may have difficulties at either or both of these initial stages. However, the available evidence suggests that these children have difficulty in organizing the speech sounds comprising words even before they begin to apply phoneme-grapheme translation rules to them. (Bradley & Bryant, 1978, Stringer & McKenzie, 1981). Thus, it is important to distinguish these two basic error types because they might point to the need for different sorts of remedial intervention. Whereas individuals who make primarily phonetic errors may require only a systematic introtroduction to conventional spelling patterns and spelling rules, individuals whose errors are primarily nonphonetic may require more specialized auditory skills training.

However, the ability to spell by ear is still a little understood process and before any definite remedial recommendations can be made upon the basis of spelling errors, it is necessary to know how well any individual of a given age and intelligence could be expected to spell 'by ear.' Even the first step in phonetic spelling-the ability to analyse the speech sounds in the target word, depends upon a variety of perceptual, linguistic and cognitive factors (Golinkoff, 1978). It would be unrealistic to expect these to be available in equal measure to young children just starting school and to school leavers. Moreover there is growing evidence that the individual's ability to segment words into phonemes is partly dependent upon their orthographic knowledge (Read, 1975, Marcel, 1980, Perin, 1982)

The importance of orthographic knowledge was first reported by Read (1971) following a study of the writings of pre-school children who had received no conventional instruction. Their spellings could be regarded as phonetically acceptable although they represented speech sounds in a far less conventional manner than that used by older children who were familiar with the orthography. For instance, they wrote 'trouble' as *chrubl,* 'train' as *chran.* Evidently, in analysing these words for spelling, they regarded the consonant cluster [tr] as similar to the acoustically-similar [tʃ]. As children learn to read, they presumably realize that words beginning with [tr] and [tʃ] are marked differently in the orthography and this influences their subsequent perceptual analysis of words containing these sounds. Indeed Read (1973) showed that whereas five and six year olds said that words beginning with [cr] sounded more like words beginning with ['t]than others beginning with [tʃ], seven and eight year olds: who were better readers, classified the words beginning with ['tr]' with those beginning with ['t]. Thus, it is undoubtedly important to take account of an individual's spelling knowledge when making a qualitative assessment of errors. Errors which at first glance may appear to be due to perceptual difficulties may in truth only arise because the individual is unfamiliar with the spelling convention being tested.

Read (1975) also reported the tendency for pre-school children to omit nasals from their spellings of nasal clusters, e.g. they spelled *bent* as *bet, camping* as *capin.* While this type of error could well be classified as 'nonphonetic', its occurence in the early stages of spelling development may well be acceptable. Read argued that, although the young children did not mark the nasals in their spellings, they were nonetheless aware of their presence. They could distinguish between minimal pairs such as *camp-cap, bent-bet* and could provide rhymes for words like 'trunk' without difficulty. Therefore it was suggested that while the children were aware of the nasal, they regarded it as a feature of the vowel. Thus, in spelling, as long as they had printed the vowel, they believed that they had represented the nasal characteristic. It would be only after sufficient exposure to the written word that children would realize that the nasal sounds [m] and [n] have always to be represented by graphemes in the standard Orthography.

Marcel (1980) observed the same tendency to reduce nasal clusters in the spelling of children who were poor spellers, in adult literacy students and in certain neurological patients. He argued from the nature of their errors that they were analysing speech in a manner similar to that used by young children. As they had not yet acquired spelling knowledge or, in the case of neurological patients, as they had lost this knowledge, they were making use of intuitions about the phonetic characteristics of words, uninfluenced by spelling conventions. The aim of the present study was to extend the findings of Marcel (1980) by investigating the ability of normal and dyslexic children of different ages to spell nasal clusters and to examine the contribution of spelling knowledge to this process. Furthermore the importance of perceptual factors was to be investigated. Both Read (1975) and Marcel (1980) reported that nasals were omitted more frequently from clusters in which they were paired with unvoiced consonants (e.g. tent, bank, bump) than from clusters in which they were paired with voiced consonants (e.g. tend, fence). They argued that this fits with the phonetic facts. In American English, nasals do not constitute true phonetic segments prior to unvoiced stops (Malécot, 1961). In standard English, a final unvoiced obstruent has the effect of shortening all preceding continuants. Thus, in most English accents, nasals are experienced as less perceptible in clusters where they preceded unvoiced stops and this may well be why they are omitted more frequently in these contexts. In the present study, by examining subjects' ability to spell all possible nasal clusters (nasals paired with voiced and unvoiced segments) the aim was to examine the role of perceptual factors in more detail.

Method

The method chosen was a completion-spelling task. Following auditory presentation of a target word containing a nasal ending, the subject was required to repeat the word and then to add the appropriate ending to an incomplete version of the target word. All possible nasal endings were

tested. In addition, stimuli endings in the sounds {m], [a] and [ʃ] were included to ensure that the graphemic responses for nasal sounds were available. Each of the nasal endings was tested in the context of a nonsense word to minimize the effect of knowledge of specific word spellings.

Two groups of subjects were tested and within each group, subjects of lower and higher spelling ability were included. There were three levels of task difficulty, the spelling of nasals (e.g. *blem*), final nasal clusters (e.g. *clest*), and medial nasal clusters followed by syllabic [l] (e.g. *stemple*). The number of spelling errors made by each subject under each level of difficulty was calculated.

Thus, there were two between subjects variables, Group (dyslexic and normal), Spelling Ability (High versus low), and one within subjects variable, Task Difficulty (nasal alone, nasal cluster, nasal cluster preceding [l,]). The dependent variable was percentage spelling errors.

Subjects

For the purpose of this study, an objective definition of dyslexia was adopted. Dyslexia is an impairment of the ability to read and to spell.

The children were all of at least average intelligence with reading and spelling ages which were significantly below the level to be expected given their age and intellectual ability. All had been referred for psychological assessment because of significant under-achievement at school. 23 dyslexic children were tested. They ranged in age from 7 years 8 months to 15 years. Reading ages (as measured by the Schonell Graded Word Reading Test) ranged between 7 years 2 months and 10 years 7 months and Schonell Spelling Ages ranged between 6 years 8 months and 9 years 7 months.

The normal subjects were selected from two schools in the London area to match the dyslexic children as closely as possible for reading and spelling achievement. They were selected by their teachers as being average for their age in reading and spelling. 19 children aged between 6 years 5 months and 9 years 6 months were tested. Schonell Reading Ages ranged between 6 years 3 months and 10 years 2 months, with Spelling Ages ranging between 6 years 8 months and 9 years 10 months.

Within each group of subjects (dyslexic and normal), subjects of high and low spelling ability were separated. Amongst dyslexics there were 15 children of lower and 8 children of higher spelling ability. Amongst the controls there were 12 children of lower and 7 children of higher spelling ability. The lower ability groups had Spelling Ages ranging from 6 years 8 months to 8 years. The dyslexics had a mean chronological age of 9 years 10 months. They were on average 18 months older than the normal controls whose mean chronological age was 8 years 4 months.

The higher ability groups had Spelling Ages from 8 years to 10 years. The dyslexics had a mean chronological age of 12 years 2 months, some three years older than their controls with a mean chronological age of 9 years 1 month.

There was no significant difference between the Reading Ages or the Spelling Ages of the dyslexic subjects and the normal controls. Normal children of Spelling Ages greater than 10 years were also tested but as they made no errors in the experimental task, they were not included in the analyses.

Stimuli

A list of all possible nasal endings was compiled using Rockey's Phonetic Lexicon (1973). A phonetic classification of the exhaustive list is presented in Table 1. A list of nonsense words, each composed of a CV or CCV structure followed by a target nasal ending was devised. Each nasal ending was tested three times in the context of three different nonsense words (e.g. plankle, nunkle. minkle). Thus, there were 48 stimuli altogether. The experiment was carried out in three parts, each

nasal spelling being tested once during each part. The testing order of the various nasal endings was randomized once but then presented in that order for all subjects. This allowed each subject to be given the same three page booklet with 16 incomplete spellings on each page. The order of presentation of the three parts of the experiment (pages of the booklet) was randomized across subjects.

Procedure

The experimental procedure was explained to the children and sufficient practice was given to ensure that they were familiar with the task. First of all, the experimenter pronounced the target stimulus in a clear voice. The subject was then required to repeat the stimulus. Only very occasionally was the stimulus mispronounced and in these cases further repetition was elicited before proceeding. Having pronounced the stimulus satisfactorily, the subject completed the partially spelled version on the page in front of him.

Scoring

Each subject's protocol was scored for phonetic accuracy. Provided that the subject's response was phonetically acceptable it was regarded as correct.

No account was taken of illegal spelling patterns (e.g. nj for [ndʒ]) and b/d reversal errors were ignored. Furthermore, no account of order of errors was made. So, if the subjects included both elements of a target cluster in their spelling, but the order was wrong (e.g. one subject added 'ten' to 'he-' for "hent"), their version was still marked correct. This type of error occurred only very occasionally.

Given the nature of the completion task, a maximum number of three errors per stimulus could occur. Errors could occur with respect to the nasal itself (e.g. ble*n* for ble*m*), with respect to the other consonant in a nasal cluster (e.g. hen*d* for hen*t*), or with respect to the syllabic [l] ending (e.g. stemp*er* for stemp*le*). In each case the target element could either be omitted or replaced. (The above gave examples of substitution errors – examples of corresponding omissions might be: *twage* for *twange*, *hen* for *hent* and *stemp* for *stemple).*

Examination of the total corpus of errors indicated that the nasal elements of the spellings provided the greatest source of difficulty (c.f. Marcel, 1980). Over all subjects 85.2% of errors were made with respect to the nasal segments. A much smaller proportion of errors, some 11.9%, occurred on the other consonants and a negligible 2.88% of errors were made on the syllabic [l] endings. Hence, a decision was made to concentrate primarily upon nasal errors in subsequent analyses. Furthermore, 87.4% of the nasal errors were found to be nasal omissions, i.e. reduction of nasal clusters. Nasal substitutions occurred in only 12.6% of cases. Nasal substitutions were made primarily by children with Spelling Ages of less than 9 years who tended to represent [ŋ] by 'n' instead of 'ng.' The phoneme [m] was never confused with [n]. Thus, since the main purpose of including nasal-alone spellings was to ensure that the graphemic responses 'm' and 'n' were available, it seemed justified to spend no further time in discussing the error category of nasal "substitutions."

Hence, the number of nasal omissions made by each subject at each of the three levels of difficulty was calculated. (Nasal alone, nasal cluster, and nasal cluster +[l]). These scores were divided by the total number of errors possible at each level of difficulty (9, 12, and 18 errors respectively) and the results were expressed as percentage errors.

Results

The data describing each subject's performance under each level of difficulty of the experimental task was transformed using a (log + 1) transformation. These data were then subjected to an ANOVA with two between and one within subjects variable (see Table 2).

The results of the ANOVA indicated that there was a significant difference between the various levels of difficulty of the task $F(2,76)=48.1$, $p<0.001$. For all subjects significantly fewer nasals were omitted from nasal-alone endings than from nasal-cluster items. Furthermore, significantly fewer nasals were omitted from final nasal clusters than from medial nasal clusters followed by syllabic [l] (F 0.5: 2,80=83-008, $p<0.001$).

There was a significant effect of Spelling Ability, $F(1,38)=5.925$, $p<0.05$ which confirmed that subjects of higher spelling ability made fewer nasal omission errors than subjects of lower spelling ability. However, the Groups effect did not reach significance, which indicated that dyslexic subjects omitted no more nasals during the experiment than their Spelling Age controls. None of the interactions were significant.

Qualitative Analysis of Errors

Having confirmed that the Task Difficulty Effect was significant, it was of interest to establish the hierachy of difficulty of the various nasal cluster spellings within each level. (Nasal alone, Nasal + voiced stop, Nasal + unvoiced stop, Nasal + fricative, Nasal + affricate, Nasal + voiced stop + [l], Nasal + unvoiced stop +[l]. Thus, the percentage of error rate for each subject on each ending-type was tabulated (see Table 3 for subject means). A Friedman two-way analysis of variance by ranks indicated there was a significant difference in error rate across the various nasal cluster endings ($\chi^{2=}$ 13.26, df =6, $p< 0.025$). However, the variability of the data was such that none of the more detailed comparisons (e.g. nasal + voiced vs nasal + unvoiced stop) reached significance. Therefore it was only possible to discuss the apparent trends tentatively.

Thus, amongst nasal cluster endings, the endings, nasal + affricate caused most difficulty (*nch, nge*). The remaining endings, nasal + voiced stop (*nd*), nasal + unvoiced stop (*nt, nk, mp*), and nasal + fricative (*ns*), appeared to be of equivalent difficulty. Amongst nasal cluster and [l] endings, those in which the nasal was followed by an unvoiced stop *(-nkle, -ntle, -mple*) appeared to cause more difficulty than those in which it was followed by a voiced stop *(-ngle, -ndle, -mble*).

Discussion

The results of the experiment confirmed that there was a significant improvement in the ability to consistently represent nasals in spelling with an increase in spelling ability. The absence of a dyslexic-normal group difference suggested that this improvement was due primarily to increased spelling knowledge and was not dependent upon chronological age. Moreover the improvement could not be attributed to perceptual development because all of the subjects were able to repeat the stimuli accurately in all conditions.

The Task Difficulty Effect is of interest because it points to an important factor determining spelling accuracy, namely the number of phonetic segments in the target word. For all subjects, accuracy was greatest when only one phonetic segment had to be identified and transcribed as in the nasal alone endings. Performance in this condition also confirmed that graphemic responses for [m] and [n] were available for all subjects. Accuracy was less when two separate phonetic segments had to be identified and transcribed as in the final nasal clusters and least when it was necessary to deal with more than two segments as in the nasal cluster preceding syllabic [l] endings.

The observed order of difficulty cannot be attributed to a deterioration of phoneme-grapheme translation over time. This explanation would predict that the majority of errors on the nasal cluster

+ syllabic [l] spellings (e.g. stemple) would occur on the syllabic endings. However, the data shows that relatively few errors were made in these positions and the majority of errors were reductions of the medial nasal clusters. The Task Difficulty Effect also rules out the possibility that the accuracy with which a nasal is represented is entirely dependent upon its perceptual salience. If this were so, then nasals should be omitted as frequently from the final nasal clusters as from the same nasal clusters in medial position preceding syllabic [l]. The data show clearly that this is not the case, for many more reductions of medial clusters were made than of the same clusters in final position. A further argument against the perceptual salience explanation is that, although there was a tendency for nasals to be omitted more than when they were less "perceptible", i.e. prior to unvoiced stops (*tantle*) than when they were more "perceptible", i.e. prior to voiced stops (*dundle*), this tendency did not reach significance ($F(1,36) = 3.76$). Thus, while perceptual factors undoubtedly have a part to play in determining spelling proficiency, their role may be less important than previously suggested (Read, 1975; Marcel, 1980).

In order to provide a parsimonious explanation of these results, it is necessary to consider the various stages in the process of "spelling-by-ear." There are at least two possible ways in which this process could proceed. The target word could first be segmented into phonemes. Following this, each of the segments could be encoded and held in short term store for transcription in a left to right sequence. However, introspection suggests that it is more likely that the transcription process begins as soon as the phoneme has been segmented. In this case, the content of the "working store" is the unanalysed target word. A detailed examination of the time course of phonetic spelling could possibly shed light upon these two alternatives. For present purposes, the important consideration is that the processing demands presented by the nasal cluster + syllabic [l] spellings are greater than those presented by the final nasal clusters. More phonemes have to be segmented and also more 'bits' of information have to be held in short term store. As already argued, medial clusters cannot of themselves be more difficult to segment than similar final clusters but they may be more difficult to analyse when an additional segment, (e.g. [l] has to be stored simultaneously. In such cases, less attention can be devoted to their analysis and subsequent transcription. Hence, the nasal clusters are analysed in a superficial phonetic manner guided by perceptual factors instead of drawing upon knowledge of conventional spelling patterns. As spelling knowledge becomes more automatic, these spelling patterns are utilized more easily.

If this theory were to be accepted, it could also explain a discrepancy between the present results and those of Marcel (1980). Marcel reported a strong tendency for nasals to be omitted from final clusters in which they preceded unvoiced stops. This effect was absent from the present results. A possible explanation lies in the difference between the two experimental tasks. Marcel required his subjects to spell complete nonsense words while in the present study, subjects had only to add the target spelling patterns to incomplete versions. Thus, Marcel's subjects had to deal with a greater number of phonetic segments than the subjects in the present study. It is interesting that a similar tendency to that reported by Marcel, i.e. the reduction of more nasal clusters preceding unvoiced than voiced stops arose in the present study when the clusters were followed by syllabic [l]. In these cases, processing demands were higher just as they were in Marcel's free-spelling situation.

If the theory is a plausible one, then nasal reductions should occur in other instances when information processing demands are high. For instance, nasals should frequently be omitted if other phonemes with which they occur are difficult to analyse or transcribe. There is at least preliminary evidence that this is true in that nasals were frequently omitted when they were paired with affricates, ([ntʃ], [ndʒ]). Affricates pose difficulty for several reasons. First, they are more complex sounds and each appears to be composed of features common to more than one other phoneme. Thus, /dʒ/ starts like the phoneme /d/ but is released with affrication common to /ʒ/. Similarly, /tʃ/ starts like the phoneme /t/ but is released with the friction associated with /ʃ/ Secondly, the affricates /dʒ/ and /tʃ/ are not only similar to other phonemes but they also sound very similar to one

another particularly in unfamiliar contexts (e.g. nonsense words). Thus, they are often confused by children (Ingram, 1976). In the present experiment, a significant number of substitution errors occurred in the nasal + affricate spellings (9%). These did not occur at any significant rate for any of the other final nasal clusters. The most common substitutions were [tʃ] for [dʒ] or vice versa, confirming their confusability. However, the substitution of [d] for [dʒ] and [t] for [tʃ] was noticed, which lends credence to the previous argument.

Finally, the affricates [dʒ] and [tʃ] also cause more problems for the speller than the phonemes like stop consonants because their orthographic representation is less straight forward. Whilst the phoneme /d/ can only be represented as *d* or *dd,* the phoneme /dʃ/ can be represented as *j, ge, gi, gy*.

Similarly, while the phoneme /t/ can be represented by a single grapheme *t* or by *tt*, the phoneme /tʃ/ is represented by a consonant digraph ch. Children usually learn digraphs later than single letters (Perfetti & Hogaboam, 1975) and may confuse them with other digraphs e.g. *sh* for some time. Therefore there are several reasons why the nasal + affricate endings place heavy demands upon processing capacity. The difficulty posed by their analysis and transcription means that most of the speller's attentional resources are directed towards the affricate. This causes only superficial processing of the nasal and consequently it is frequently omitted.

Hence, it is proposed that children reduce nasal clusters whenever they have to deal with novel materials which place heavy demands upon their processing capacity. The simplifications which they make are systematic and rule governed and can be likened to 'phonological rules.' In the present experiment, the children were found to omit nasals from their spelling when a large number of phonetic segments had to be transcribed. However, it is interesting that a similar phenomenon is noticed at an earlier stage in child speech.

In the same way that pre-school children can distinguish minimal pairs such as 'cap' and 'camp' but spell 'camp' as *cap* (Read, 1975), young children have been shown to perceive certain phonemic distinctions but not to produce them (Smith, 1973, Dodd, 1975). For instance a child may recognize that 'pay' and 'play' are different but may produce [pei] for both. Another analogy between spelling and speech can be drawn in that in the present study, nasal clusters would be spelled correctly in certain contexts but not in others. In child speech development, it is often the case that a given sound may be produced in one context but not in another (Ingram, 1976). For instance, a child may produce a correct rendering of the cluster [st] in *star* [sta]. However, the same child may resort to a less mature pronunciation when learning a new word, e.g. *stable* [teibl].

Thus, the explanation proposed may be a general one. Basically, each individual is assumed to possess a system of phonological rules. The status of an individual's phonological system is dependent upon several factors, including age, language experience and, as argued in the present paper, orthographic knowledge. When an individual has to process familiar verbal materials, either for speech or for spelling, automatic motor programmes are available so there is no reason to call upon the phonological system. However, when unfamiliar materials have to be processed, phonological rules are brought to bear. These are basically just simplification devices which allow the individual to handle processing demands which exceed their processing capacity. Examples would be [nt] → [t], [mp] → [p], and so on. While this hypothesis could offer an attractive explanation, it must await further evidence and remain highly speculative at the present time.

Conclusions

The present study has shown that the ability to consistently represent nasals in the spelling of nasal clusters is primarily dependent upon spelling knowledge.

The perceptual salience of the nasal has a part to play but its role is minor in comparision to that played by the overall phonological complexity of the target spelling. The study highlights the importance of taking Spelling Age into account when assessing the quality of spelling errors. For instance, had comparison been made between the spelling of the dyslexic subjects and normal spellers of the same chronological age, a preponderance of nasal omissions would have been observed in the dyslexic's spelling. These spellings would have been classified as 'nonphonetic' under some schemes or as arising because of perceptual difficulties under others. In turn, this classification may have led to the prescription of auditory skills training for the dyslexic children and such training may, in many cases, have been misdirected. First, there is evidence that children could already 'perceive' the nasal segments and secondly, perceptual salience has itself been shown to be of minor importance. The present study suggests that a more appropriate course of action might be initially to familiarize the children with the nasal spelling patterns visually (by analytic reading) or kinaesthetically (by copying or tracing). It may only then be reasonable to expect them to be able to organize spoken versions of words containing nasal clusters into the form required for accurate spelling.

Hence, the purpose of the present paper is not to suggest that a distinction between phonetic and nonphonetic spelling categories should be abandoned. Rather, it is meant to suggest that much more information is required about the development of the ability to spell-by-ear before this potentially fruitful approach to remediation can be pursued.

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TABLE 1

PHONETIC CLASSIFICATION OF NASAL ENDINGS

CLASSIFICATION	CONVENTIONAL SPELLING PATTERN
Final nasal [n], [m], [ŋ]	-n, -m, -ng
Nasal + unvoiced stop[nt], [nk], [mp]	-nt, -nk, -mp
Nasal + voiced stop [nd]	-nd
Nasal + fricative [ns]	-ns -nse -nce
Nasal + affricate [ntʃ], [ndʒ]	-nch, -nge
Nasal + unvoiced stop + [l] [ntl], [nkl], [mpl]	-ntle, -nkle, -mple
Nasal + voiced stop + [l] [ndl], [ngl], [mbl]	-ndle, -ngle, -mble

TABLE 2

Log percentage error rate of dyslexic and normal subjects of high and low spelling ability under three levels of task difficulty.

	Nasal alone (blem)	Nasal cluster (lound)	Nasal cluster + /1/, (wemble)
Low Spelling Ability (S.A. < 8.0)			
Dyslexics	0.627	1.181	1.539
Controls	0.294	0.898	1.264
High Spelling Ability S.A. 8.0 -10.0)			
Dyslexics	0.	0.702	1.039
Controls	0.464	0.750	0.891

TABLE 3

Spelling of nasal endings by normal and dyslexic children.
Qualitative assessment: Mean percentage of nasal reductions errors.

Type of Ending	Dyslexics	Controls
Nasal alone	7.5	12.0
Nasal + voiced stop or fricative	13.5	16.5
Nasal + unvoiced stop	13.0	12.0
Nasal + affricate	28.0	20.0
Nasal + voiced stop + [L]	29.5	18.0
Nasal + unvoiced stop + [L]	37.3	25.5

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Teaching and Learning Spelling *(continued)*

11. "Spelling errors made by phonologically disordered children." by P. Robinson, R. Beresford, and Barbara Dodd.*

*Dep't of Speech, School of Education, The University, Newcastle-upon-Tyne, England.

Abstract

The spelling errors of eleven phonologically disordered children were compared with those of eleven normally articulating children. The groups were matched pairwise for age, sex, educational experience and reading ability. The subject pairs received spelling tests designed individually to investigate words pronounced correctly and incorrectly by the phonologically disordered children. The results indicated that phonologically disordered children make significantly more spelling errors, but that they made as many errors on words they pronounced correctly as they did on words they mispronounced. However, regularity of phoneme-grapheme correspondence was an important factor. Phonologically disordered children made as many errors for regularly spelled words as they did for irregularly spelled words. Their performance on irregularly spelled words equalled that of the control group. That is, phonologically disordered children appear to rely on orthographic representations of words, and have difficulty generating phoneme-grapheme correspondences.

Corpus

By the time children reach five years of age they should have acquired the ability to use all the phonemes, i. e. speech sounds, of their native language appropriately. However, about 5% of the normal school population have communication disorders, and well over half of these children present with an inability to produce consonant phonemes correctly in the appropriate context. Usually the children can produce all phonemes in CV syllables, e.g. /tʃə/, but /tʒt/ church; and they also can usually discriminate phonemes, e.g. /tʃ/ – /t/, chip-tip, but their spontaneous speech is marked by:

(1) reduction of consonant clusters, so that *train* becomes [teɪn]
(2) limited range of final consonants, e.g. all word final consonants may be omitted or signalled by a glottal stop so that *bed* becomes [bə?]
(3) a limited range of phonemes used contrastively, e.g. fricative sounds such as /ʃ/, /tʃ/, /s/ may be realized as /t/ so that *ship*, *chip*, and *tip* are all produced as [tip], and
(4) lack of a voice-voiceless distinction, so that *pin* and *bin* would both be realized as [bɪn].

Teachers often report that children with a spoken phonological disorder also have difficulty learning to read. Their most frequent comment is "Since I can't understand a word he says, I don't know whether he's reading, or making it up." However, teachers rarely complain about the children's spelling performance, and this is reflected in the literature.

Few studies have been directly concerned with the relationship between the mispronunciations and the misspellings of children. Schonell observed in 1934 that "if a child constantly pronounced inaccurately, he not infrequently spelt inaccurately, and the nature of his written errors have remarkable similarity to the nature of his spoken errors." However, Carrell and Pendergast (1954) and Ham (1958) found no such relationship. Thus the literature is limited, and the results contradictory.

The study I am reporting here was designed to answer the following questions:

(1) Do children with a spoken phonological disorder make more spelling errors than children with normal speech?
(2) Are mispronounced words more likely to be spelled incorrectly that words pronounced correctly?
(3) Do phonologically disordered children, like normal children, have more difficulty spelling words which have NO strict phoneme-grapheme correspondence, e.g. *night,* than regularly spelt words, e.g. *bit?*

Subjects

Eleven phonologically disordered children, who were all receiving speech therapy, but attending normal schools, were matched individually, with normally speaking children from their own class for age, sex, and their teacher's assessment of their reading ability. Note, however, that some teachers felt that the reading ability of some of the phonologically disordered children was the poorest in the class. The age range was 7 years, 1 month to 10 years, 8 months. Thus 22 children were tested, 11 in each group, for spelling ability.

The results showed:
(1) Children receiving speech therapy for a phonological disorder made more spelling errors than did the control, normally speaking subjects (351.2 plays 245.9)•
(2) Children with a phonological disorder made as many spelling errors on words they pronounced correctly as they did on words they mispronounced (178.2 plays 173.2).
(3) Phonologically disordered children made the same number of errors on irregularly spelled words as they did on regularly spelled words (169.3 plays 181.9).
(4) Whereas the normally speaking control subjects made significantly more errors on irregularly spelled words than they did on regularly spelled words (98.3 plays 147.8).
(5) The phonologically disordered subjects made significantly more errors than the control subjects on regularly spelled words (169.3 plays 98.3). There was also attend for the phonologically disordered subjects to make more errors on the irregularly spelled words, but this was not statistically significant, i.e. both groups made similar number of errors on irregularly spelled words.

These results indicate that 7 to 10 year old children who have a spoken phonological disorder also have difficulties in spelling. This appears to be due to a particular difficulty in generating phoneme-grapheme correspondences, since they are much worse than normal children in spelling words that have a 1:1 sound/letter relationship; but are equally bad /good at spelling irregular words.

In one way these results are like those found for deaf children in a similar experiment. I found that profoundly prelingually deaf children also make as many errors when spelling regular words as they do spelling irregular words (Dodd, 1980). This would seem to indicate that phonologically disordered children have a problem using auditory information, even though, of course, they have no sensory
hearing loss. Thus, they would have to rely heavily on orthographic information when learning to spell, as do deaf children.

However, this cannot be the sole explanation for the phonologically disordered children's poor spelling abilities. Several studies have shown that deaf children can spell remarkably well; some experiments have indicated that deaf children spell better than normally hearing children matched for Chronological Age. One simple explanation for this surprising finding is that hearing may detract from spelling accuracy in languages lacking exact phoneme grapheme correspondence. It is possible to argue that there are so few invariant phoneme-grapheme correspondences in English orthography that being deaf may be an advantage in learning to spell.

However, it is obvious that phonologically disordered children's poor spelling abilities cannot be solely accounted for by an inability to fully use auditorally derived information, they would appear to have additional difficulties.

In hope of finding some clues that might indicate the nature of these difficulties, we examined the types of spelling errors made by the phonologically disordered children and their control group. Perhaps the most striking finding from the qualitative analysis was that normally speaking children's spelling errors were easy to classify, whereas the phonologically disordered children's errors were bizarre.

Table 1
Mean (%) Spelling Errors

	Phonologically Disordered Children			Normally Speaking Children		
	Regular	Irregular	Total	Regular	Irregular	Total
Mispronounced Words	84.6	93.6	178.2	45.9	77.9	123.6
Correctly Pronounced Words	84.7	88.3	173.2	52.4	69.9	122.3
Total	169.3	181.9	351.4	98.3	147.8	245.9

Thus, as you can see from these typical examples, classification of the phonologically disordered children's spelling errors was virtually impossible, since so many had to be labeled "Other Errors." We did find, however, that 25% of the control subjects' spelling errors were phonetic alternative spellings, e.g. *erth* for "earth', whereas only 6.5% of the phonologically disordered children's spelling mistakes could be classified as such.

One further finding of interest was gained from comparing the errors of the two oldest phonologically disordered children with the younger phonologically disordered subjects. The older subjects made many more error-phoneme/ grapheme correspondences, e.g. if they said leloo for 'yellow', they were more likely to spell the word *yellow.* Thus, they seemed to have better use of a phonological strategy for using sound to letter spelling rules. Perhaps a longer period of reading and spelling practice and instruction had established the use of the strategy which had not yet been grasped by the younger phonologically disordered children.

In summary, the phonologically disordered children tested made significantly more spelling errors than normally speaking children, both in words they mispronounced and in words they pronounced correctly. They made as many errors when spelling regularly spelled words as they did for irregularly spelled words, but their ability to spell irregular words did not differ much from that of the control group. Thus, phonologically disordered children appear to rely on orthographic representation of words, and have difficulty generating phoneme-grapheme correspondences. The effects of their phonological disorder are not limited to speech, but also underlie a difficulty in learning to spell.

Table 2
Examples of Phonologically Disordered Children's Spelling Errors

frod	= thunder	zroor	= zebra
yomo	= yellow	rotabteot	= room
fmetaio	= family	tasinaclejath	= tortise
acox	= hedgehog	seepper	= shepard
tonked	= thought	calkael	= castle

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[Spelling Reform ed Newell Tune t17.6 p236 in the printed version]
[Spelling Progress Bulletin Spring 1982 pp20,18 in the printed version]

12. Grandpa's reply to Timmie A. Dropout by Harvie Barnard

Dear Timmie.

Thanks for writing to tell me about your school experiences. I think it's wonderful that you've made such good progress with your reading in spite of all that spelling bee nonsense. How do you like the Treasure Island story? It's one of the best!

But I'm disappointed to hear that you're thinking of quitting school. What does mother and dad think about that? Of course I can understand why you don't enjoy or care for the Dick and Jane running and jumping stuff. Apparently they're still teaching the same kind of "kid stuff" that we were bored with when I was your age.

Still, I wouldn't agree that you should quit school just because of that "dum bunny" spelling bee business. You'll just have to lern that lots of words are spelt in strange ways, and that kids have had to lern what they call "sight words" where the spelling has no connection with the sound of the word or the sound of the letters.

It's surely a shame that you lost your Dr. Rider who was teaching you to use fonetic spelling. Maybe if he goes back to college to study education he'll be able to teach those college people some things they ought to know about teaching kids.

If your father decides to send you to a private school perhaps he'd better check to see what kind of a program they have before he sends you there. If they have spelling bees perhaps you'd be just as happy to stay in public school where you are. It might be a good idea for you to talk things over with Jorje's dad to see what can be done to arrange a reading program which would be fun insted of nonsense.

I certainly agree with your mother that you should have a good dictionary for your birthday. A dictionary doesn't teach you to think, but it does help in lots of ways. I remember a good teacher I had who used to say, "A dictionary is a wonderful thing – if you will lern to use it." I use one for nearly every letter I write. I went to grade school 70 years ago, and there are still lots of words I'm not sure about, so I hav to use my dictionary, not only to check up on my spelling but to find fonetic spellings which tell me how words should be pronounced. Besides that, I very often hav to find the best word to use to explain what I am trying to say. And there's another interesting thing about using a dictionary -each time I use one I discover some other words that I've often wondered about, but never used because I wasn't sure how the words were spelt, or what they ment, and you could sometimes find words which were much better than the ones you were planning to use. Yes, Tim, I'm sure you ought to hav a dictionary and I'm going to see to it that you get a really good one, and not a paperback either, but one which will get you thru grade school and help start you off right in high school.

But don't quit yet! You might get lucky and get a better teacher next term! And I think I'll talk with your dad about private school. If you're reading Mark Twain and Robert Louis Stevenson I should think you're reddy for 4th grade, and maybe more. So let's quit talking about quitting school. Besides, I'm sending you some new books that should be a lot more interesting than Dick and Jane. And please write agen soon. I want to hear more about how you do in school.

With love, Gramps.

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