

*A review of legibility research published between 1972 and 1976 yielded 285 references. The journals which most frequently contain reports on legibility research are indicated. A list of those journals likely to be most useful to the designer wishing to keep abreast of the literature is provided.*

Visible Language, XII 2, Spring 1978, pp. 201-205  
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# Locating **Legibility** Research: A Guide for the Graphic Designer

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There is a considerable output of research reports describing the effects of visual display format upon the ability to identify or comprehend the display. Part of this research effort is devoted to problems which are pertinent to designers, but until recently there has been little use of this material by designers. A number of authorities have suggested reasons for this state of affairs, but one which has not received much comment is inaccessibility. Frequently it is published in the technical journals of psychology,

education, and ergonomics in a form which the designer may find difficult to locate and comprehend.

In a review of the literature published in this area between 1972 and 1976, I included 285 references. All but a handful were journal papers, and in all 61 different journal sources figured in the eventual list of references used in the review. It may be helpful for those interested in legibility research to know which journals were most frequently the source of papers for the review, and hence are the ones likely to repay regular scanning.

List I (below) indicates the number of references from each journal which provided more than one paper cited in the literature review. It will be seen that 23 journals are listed, so that 38 others provided a single reference.

There are a number of considerations to bear in mind when examining List I. First, it applies only to the references which I selected for inclusion in the review paper. To some extent this was necessarily a personal choice, restricted by my access to bibliographic sources and guided by my estimate of what was worth including. The literature review contained sections on problems of measuring legibility, the study of eye movements, digit and letter identification, reading, typography, graphic displays (signs), visual instruction, engineering drawing, cartography, quantitative data, algorithms and the reading of projected material. Some of these topics are of less direct concern to the designer than to the research-worker; many of the papers from the *Journal of Education Psychology* or the *Journal of Experimental*

*List I. Number of papers on legibility research appearing in each journal 1972-1976.*

*Journal of Educational Psychology (18)*

*Cartographic Journal (16)*

*Applied Ergonomics (14)*

*Ergonomics (14)*

*Journal of Applied Psychology (14)*

*Human Factors (13)*

*Journal of Experimental Psychology (13)*

*Perceptual and Motor Skills (12)*

*AV Communications Review (11)*

*Visible Language (11)*

*Perception and Psychophysics (10)*

*Reading Research Quarterly (8)*

*Programmed Learning and Educational Technology (7)*

*Dissertation Abstracts International (6)*

*Journal of Verbal Learning and Verbal Behavior (5)*

*Review of Educational Research (5)*

*Bulletin of Psychonomic Society (4)*

*Psychology* are concerned with theoretical issues which are relevant to instructional design but do not involve direct investigation of graphic features of the display. Examples are the extensive literature on “mathemagenic behavior,” much of which examines the value of inserting questions into instructional text. Slightly more remote from the designer is the controversy over models of word recognition; papers on this topic are likely to appear in journals such as the *Journal of Verbal Learning and Behavior* or *Cognitive Psychology*.

An important factor influencing the interpretation of the list concerns the number of journals publishing research on a particular topic. The *Cartographic Journal* occupies the number two position in the list because the large majority of research reports on map-reading appeared in that one journal. Experimental studies of the effect of text format on reading performance, on the other hand, appear in a much wider range of journals, so that the total for one specific journal is lower. A further qualification is the occurrence of “one-off” events which distorts the picture. *Programmed Learning and Education Technology*, for instance, had a special issue on typographic research in 1975. But for this, it would have been much lower down the table.

List II is the result of my attempt to show the journals most frequently containing reports on legibility research likely to interest the graphic designer. Again I made allowance for the various factors discussed above. The journals in

*Cognitive Psychology* (4)  
*Journal of Psychology* (4)  
*Journal of Research in Science Teaching* (3)  
*Memory and Cognition* (3)  
*British Journal of Psychology* (2)  
*Communication of Scientific and Technical Information* (2)  
*Journal of Experimental Child Psychology* (2)  
*Journal of General Psychology* (2)  
*Journal of Reading Behaviour* (2)

List II are not in any order of merit. The designer who wishes to keep abreast of the research literature but can scan only a limited number of journals will probably find that List II contains the ones most likely to achieve his or her aim.

An alternative procedure is to rely on secondary sources. Of these, the regularly-published printed (as opposed to computer-based) ones which I have found most useful are given in List III. *Dissertation Abstracts International* consists of summaries of higher-degree theses, categorized according to discipline. In some cases, the research is published subsequently in a conventional journal. The size of DAI has its drawbacks, and I have been directed to particular entries via an initial scanning of *Psychological Abstracts*. The scope of *Ergonomics Abstracts* is indicated in the title. The coverage is wide, and the categorization system helpful in locating items of interest. *Psychological Abstracts* summarises all types of psychological research. Since "legibility" no longer occurs in the index, finding relevant material is sometimes difficult. The *Psychological Readers' Guide* simply reproduces the contents pages of journals. No indexing system is provided, so that it is likely to be rather frustrating for the non-psychologist to use. *Reading Research Quarterly* is included in List III because it publishes annually a summary of reading from the previous year. The summary is constructed around a category system which helps one to locate particular topics. Unfortunately, however, much of the legibility research does not get included.

*List II. Sources of first-hand reports on legibility research.*

*Applied Ergonomics*. IPC Science and Technology Press, IPC House, 32 High Street, Guildford. More technical than most of the other journals.

*4V Communications Review*. Association for Educational Communication and Technology, 1126 16th Street North West, Washington, DC 20036. Mainly for studies of picture format and content.

*Cartographic Journal*. British Cartographic Journal, Department of Land Surveying, North East London Polytechnic, Forest Road, London, E17 4JB. For studies of maps.

*Ergonomics*. Taylor and Francis Limited, 10-14 Macklin Street, London, WC2B 5NF.

*Human Factors*. Johns Hopkins University Press, Baltimore, MD 21218.

*Journal of Applied Psychology*. American Psychological Association, 1200 17th Street North West, Washington, DC 20036.

*Visible Language*. P.O. Box 1972 CMA, Cleveland, OH 44106.

A most valuable secondary source, not included in List III because it does not appear on a regular basis, has been provided by the Open University. In 1974 M. Macdonald-Ross and E. Smith published "Graphics in Text: A Bibliography" (Open University Institute of Educational Technology Monograph No. 3). A revised version appeared in 1977 under the title "Graphics in Text: A Bibliography" (Open University IET Monograph No. 6). This includes a series of introductory essays by Macdonald-Ross, but the main content is a bibliographic list which does not include a summary of each reference. Nevertheless it is a most valuable source of material.

Finally, mention should be made of occasional review papers which authorities in the area provide. The problem here is that they may appear in journals which do not frequently publish reports of legibility research, and consequently are likely to be missed. Two recent reviews are J. Hartley and P. Burnhill's "Fifty guide-lines for improving instructional text," *Programmed Learning and Educational Technology*, XIV (1977), 65-73; and P. Wright's "Presenting technical information: a survey of research findings", *Instructional Science*, VI (1977), 93-134.

*List III. Secondary sources for locating legibility research.*

*Dissertation Abstracts International.* Xerox University Microfilm, 300 North Zeeb Road, Ann Arbor, MI 48106.

*Ergonomics Abstracts.* Ergonomics Information Analysis Centre, Department of Engineering Production, University of Birmingham, England

*Psychological Abstracts.* American Psychological Association, 1200 17th Street North West, Washington, DC 20036.

*Psychological Reader's Guide.* Elsevier Sequoia - SA, P.O. Box 851, CH - 1001, Lausanne 1, Switzerland.

*Reading Research Quarterly.* International Reading Association, Inc., 800 Barksdale Road, Newark, DE 19711.



Marie M. Clay. *What Did I Write?* Auckland: Heinemann Educational Books, 1975. 7½ x 9 inches. 78 pp.

This little book seems at first sight intended only to charm. At the turn of almost every page there are reproductions of writing by young children – a few shaky lines, a half-dozen curlicues, a stately array of repeated letters, an unpronounceable word, a clear but not-quite-there sentence (“the ship is or the oear”). On many pages the writing accompanies drawings, some of them in delightful color. The type set in 11-point Optima, the arrangement of the text in two comfortable columns, and the relation of the reproductions to the text give it the appearance of a children’s book for adults. The important observations that Marie Clay brings together in the text on how writing abilities emerge in children are therefore well served. She is in the Department of Education at the University of Auckland, New Zealand.

Most of the samples of writings were produced by five-year-old children who were learning how to print in school. They first drew pictures and dictated captions that the teacher wrote down for them. They later traced or copied the captions, remembered whole words on their own, and even constructed word forms independently. Some of the children received specific instruction in letter formation, but others apparently made as much progress without it. Clay examined many such samples for features which the children’s writing still lacked or only grossly approximated, relative to mature norms. Her objective was to trace

This  
This

the ship is or the  
oear

NO  
NO  
NO  
NO

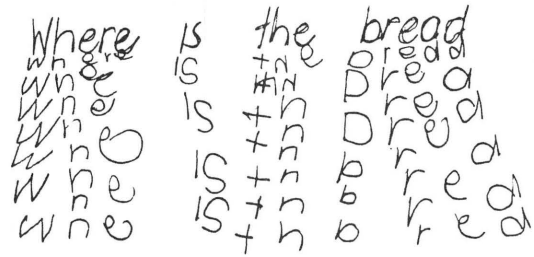
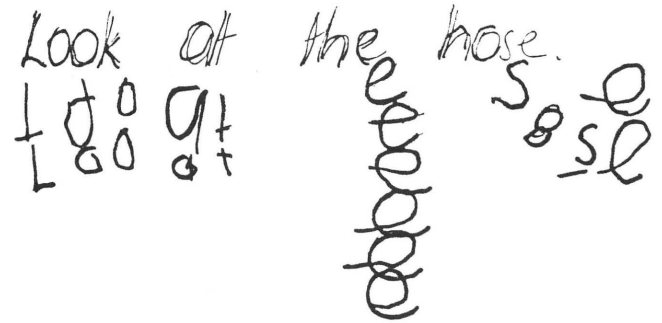
NO  
NO  
NO  
NO

Yes Yes  
Yes Yes  
Yes Yes  
Yes Yes

the route by which children come to master English in its visible form. Taking account of the children's intentions, she noted aspects of their efforts that revealed emerging control and selected samples for the book that exemplify her conclusions.

For instance, several samples show violations of directionality conventions. One shows how a child appreciated part of the left-to-right, top-to-bottom pattern by starting out in the upper left corner and continuing below, but failed to return to the left margin. Another shows that a child knew the letters in his name, but did not appreciate that they must appear in a particular order. In her discussions, Clay goes beyond such welcome but obvious inferences to more subtle considerations. With respect to directionality, for instance, she speculates on the significance of the starting point, showing how a child's false start may be the source of subsequent violations. And she takes up the relation of small scale to large scale directionality, suggesting how well-practiced movements involved in making letters may act as a kind of brake that prevents a child from embarking on a word in the reverse direction.

Clay discusses other strategies that children use in their development as literates. They explore the various forms that letters can take and still retain their identity by turning them around and upside down. They repeat elements as though they are aware of the value of developing quick, habitual movements. Unexpectedly, they show several ways of ordering their knowledge externally by laying out complete inventories of the words they know and arranging sets of elements into contrasting patterns. Clay speaks persuasively because she combines





her scrutiny with an appreciation for the children's creativity and liveliness.

It is a disappointment, therefore, that Clay's analytic framework for bringing order and new meaning to her observations is weak. She talks about principles in offering her observations and inferences; we have referred above to observations that she groups with respect to the directionality principle, the flexibility principle, the recurring principle, the inventory principle, and the contrastive principle. But she does not satisfactorily explain what they are principles of, nor how they relate to another analytic category that she uses, the concept. Her discussions on the significance of the children's writing to questions of learning to read are stronger, although sketchy. Since her book is addressed to sensitive and enterprising teachers, she offers a rating technique for assessing children's early progress and describes a test of writing vocabulary that has shown itself to be a valuable predictor of reading progress. With respect to questions of psychological development, her remarks are suggestive but do not attempt to be systematic. They are important, however, to her purpose of placing the young learner in focus. It is her conviction, which this book successfully communicates, that a strategy for teaching writing that proceeds from an adult's logical analysis cannot succeed so well as one based on observation of the constructive process that children undertake on their own.

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