



This item was submitted to Loughborough's Institutional Repository by the author and is made available under the following Creative Commons Licence conditions.



CC creative commons
COMMONS DEED

Attribution-NonCommercial-NoDerivs 2.5

You are free:

- to copy, distribute, display, and perform the work

Under the following conditions:

BY: **Attribution.** You must attribute the work in the manner specified by the author or licensor.

Noncommercial. You may not use this work for commercial purposes.

No Derivative Works. You may not alter, transform, or build upon this work.

- For any reuse or distribution, you must make clear to others the license terms of this work.
- Any of these conditions can be waived if you get permission from the copyright holder.

Your fair use and other rights are in no way affected by the above.

This is a human-readable summary of the [Legal Code \(the full license\)](#).

[Disclaimer](#) 

For the full text of this licence, please go to:
<http://creativecommons.org/licenses/by-nc-nd/2.5/>

Dyslexia-related difficulties in the development of abilities in Craft, Design and Technology: The design of a research strategy

Price G W and Lumb S
University of Manchester

Abstract

Those specific learning difficulties in reading and writing commonly described under the general term "dyslexia" may have counterparts in non-verbal skills development in the Design and Technology subject area. To investigate this a spectrum of tests is being used alongside evidence of pupils' "statements": analysis of pupils' written work, standard and LEA psychometric tests, teacher evaluation of technology skills and specially designed practical technology tests.

The paper describes the design of the research strategy and preliminary findings will be presented at the conference.

Introduction

Specific learning difficulties which are classified under the term "dyslexia" have their main emphasis in the fields of reading and writing. In the local education authorities where this research is being carried out, as in others, pupils with such difficulties are identified by a "statement" of their difficulties and are popularly referred to as "statemented" pupils.

There is no unified or agreed code of description of dyslexia, and a variety of descriptive models are available to aid interpretation of observed conditions in children. There are ongoing difficulties in the search for definition (Hamill, 1990). This is not the place to review the alternative theoretical analyses nor to summarise the fairly extensive research now available. A report to be published (Pumphrey and Reason, 1991) recommends against dogmatic assertions regarding specific learning difficulties and recognises that the term "dyslexia" has considerable currency in spite of the of definition difficulty. However, it must be noted that the term "dyslexia", providing as it does a single umbrella for a variety of observed characteristics, may also cover a variety of different underlying causes. For this and other reasons the term "dyslexia" is not favoured by some researchers and clinicians. Whereas about 90% of practising educational psychologists found the term "specific learning difficulties" useful the fraction who claimed to find the term "dyslexia" useful was (perhaps surprisingly) only about a third (Pumphrey and Reason, 1991). It is used here therefore as a convenient shorthand only for those difficulties in reading and writing which have caused certain pupils to be statemented.

Some pupils in schools have seemed to have unusual difficulties in the use of tools, or in particular aspects of workshop skills. For example, in an extreme case one of the authors noted that a 16-year old pupil experienced difficulty in retaining knowledge of the direction of rotation of a screwdriver whilst assembling manufactured wooden parts. That pupil was regarded as well motivated, of above average intelligence and co-operative, but was statemented because of some key difficulties in the field of reading and writing.

Such observations were seminal to the present research. It is hypothesised that features of dyslexia seen in reading and writing, such as difficulties in sequencing, spatial orientation, short term memory or in problems linked with verbalisation might have counterparts in the design and technology field.

This paper considers the design of research methods for identifying similarities of problem between the reading/writing field of interest and design and technology.

Selection of the sample and control groups

For each pupil within the schools the headteachers have available measures of general intelligence, verbal and non-verbal scores. These data concerning the statemented pupils are being made available to the writers, together with permission to make further observations of learning difficulties in general and in the CDT skills area. Notes on the nature of the learning difficulties of statemented pupils are also available.

Inspection of the data for the sample and for the general population of one school indicates that the measures of intelligence of the sample are probably not sufficiently typical of school populations for a randomly selected control group to be appropriate. The small sample size adds to the risk associated with using a randomly selected control group and a matched pairs control is therefore constructed by selecting pupils (of the same sex and teaching group) nearest in measured attributes to each member of the sample. Because of potential difficulties caused by socialisation or other factors giving a difference of bias towards design and technology for boys and girls, the selection of control members of the same sex as the sample members is considered necessary. The sample and control are also being inspected and discussed with teachers to ensure that no major differences between members of each pair have inadvertently arisen regarding age, physical size or major social features which might be considered possible sources of unreliability.

Two general methods of constructing matched pairs may conveniently be used for dyslexia studies (Snowling, 1987). Crudely expressed, the first matches pairs primarily by mental age, the second by reading age. The latter route is therefore less helpful for this research because of the probable variation in experience of pupils (which will span a greater chronological age for dyslexic pupils) using tools and technological equipment in different school year groups, and differing learning styles operating in the school at

different ages. Matching using general intelligence and non-verbal scores only is used. The potential unreliability caused by the effect of verbal ability on the measurement of general intelligence and, to some extent on non-verbal score, is noted. The effect of any such unreliability will be to offset slightly the measured differences between sample and control; this is therefore regarded as acceptable, though it does decrease the test's sensitivity. Differences of verbal scores may then be used in the analysis.

The principle of comparing *differences* between control and sample in dyslexia and writing tests with *differences* between control and sample in the skills tests reduces concern about the unavailability of exact matches being available for control. Close similarity of learning experience is regarded as a prior requirement.

Experimental design (1): non-craft learning difficulties

The Bangor Dyslexia Test (Miles, 1983) is used in this research as a general programme to record pupils' abilities in spatial and other matters. This test uses a variety of sub-tests to provide a profile of the pupils' abilities in some features normally associated with dyslexia. It is a clinical test in which information is acquired in a one-to-one situation involving only the researcher and the child. (It is planned for a separate recorder to be used). It has a crude scoring scheme to convert information from observations to numerical form.

In this the test has limitations and there are questions regarding its suitability in some forms of empirical research into reading and writing. For the present purposes and as a supplement to other records of the pupils specific learning difficulties it has some particular strengths. It is quick to administer and interpret in school (thus reducing problems associated with motivation) and needs no reference to specialised facilities. Whilst the numerical data is not in the form of scaled or rank measures, it gives some basis for comparison with data from other sources. In particular the separation of tests for features of short term numerical and verbal memory from tests of spatial orientation is convenient for comparison with results from CDT skills research.

The above test can thus be administered quickly to both sample and control groups under identical conditions using the same observer and recorder for each pair in all cases.

Statements concerning members of the sample may be inspected at the interpretation stage and only after all clinical observations are completed to avoid prejudgments of likely outcomes.

The use of recorded verbal scores for the pupils forms a further body of useful data, used both separately and offset by differences of general intelligence.

For each member of the sample and control a piece of written work is also assessed to complement the data obtained from the Bangor Dyslexia Test. To

adopt a standardised approach to this categorisation of spelling errors, a piece of "free" written work from each of sample and control in each pair is used for comparison. The pieces are written under the same conditions, undrafted, and must (as far as is possible) be identified as written with no assistance with spelling from a dictionary or other party. Preliminary analysis of the writings of dyslexic children suggests that a section of 200 words should be used and examined for particular types of error. The errors are categorised under five specific heads, the categories being devised with guidance based on the "British Ability Scales".

Phonetic errors include (i) semiphonetic errors which show use of phonetic information, but with lack of phonic strategy, eg. xolent (for excellent), (ii) completely phonetic spellings using incorrect phonemes, eg. ruff (for rough), and (iii) inappropriate use of phonemes which also depart from the rules of spelling, eg. sqware (for square). Order of letters errors are spellings using all letters but placed in the wrong sequence, usually being non-phonetic errors, eg. eihtg (for eight). Non-phonetic errors have some visual or other association with the word but the sounding is wrong, eg. eyet (for eight). The fourth category of letter reversal is popularly identified with dyslexics, eg. banb (for band) or quage (for gauge). Finally errors which cannot be easily classified are noted, though care has to be taken; errors breaking a phonetic rule can be very subtly hidden and various attempts to "voice" the word may be needed.

Experimental Design (2): CDT Skills Learning Difficulties

Two main areas of interest are investigated. In the first, experienced class teachers have agreed to describe qualitatively where possible, and without prompting (i) the types of difficulty encountered by each statemented pupil, (ii) the quality of work fabricated by the statemented pupil and (iii) any major differences between the work of the statemented pupil and the control.

The second, and main, test is an empirical investigation of the use of design and technology equipment and tools. It has been noted that physical strength characteristics of children may affect the precision of workmanship (Price and Reid, 1990) and tests which might involve the muscular strength were avoided as sample and control were not matched in this respect. It was hypothesised that the features in which differences might be noted would be related to activities requiring the pupil to think in ways involving (i) reflection, (ii) rotation, and (iii) memory and sequencing. For each of these a set of tests, in order of anticipated difficulty, has been devised. Each test is based on a fairly traditional workshop activity with which it is known pupils will have some familiarity and which involves terminology with which they will be familiar. The wording used in the administration of the tests is defined in advance.

The first group of tests concerns linear measure and reflection. For example the sequence of movements in the use of a try square in different circumstances is to be used as an indication of difficulties encountered by the pupil with regard to spatial orientation. Measurements from different positions requiring

reorientation of the rule, or use of an offset zero give further clues to positional and orientation problems. Tests of rotational processes as used in the workshop follow, ranging from simple rotation of an element (screwdriver) in line with the eye, to out-of-line tests, compound rotations etc. The tests end with a series of short term memory exercises using familiar workshop items and drawings.

Each of these is postulated to have its counterpart for dyslexic children in reading and writing.

Analysis of Data

The data from the various tests is to be compared by quantification of those variables which can have numerical values ascribed to them. As there is no evidence to suggest otherwise, the data will be processed by non-parametric statistical methods. For example, the initial comparison of the writing errors with the workshop skills measures will be in the form of Spearman rank-order correlation coefficients, from which significance of groups of attributes may be obtained, and which will aid in the interpretation of the anecdotal evidence from teachers.

Final Notes

At the time of writing the tests were defined and printed and initial testing imminent. It is anticipated that some preliminary results will be available for presentation at the conference if time permits.

The assistance of postgraduate students Malcolm Beckford, Peter Marsh and John Tarrant in the development of various parts of the tests is gratefully acknowledged.

References

Hamill, D.D. (1990), "On Defining Learning Disabilities; An Emerging Consensus"; Journal of Learning Disabilities, Vol.23, No.2, November 1990,

Miles, T.R., The Bangor Dyslexia Test; Wisbech, Learning Development Aids, (Ref. LD245)

Miles, T.R. (1983), Dyslexia: The Pattern of Difficulties; St. Albans, Granada.

Price, G.W. and Reid, D.J. (1990), "Prediction of the Development of Craftsmanship Skills in Children"; International Journal of Technology and Design Education.

Pumphrey and Reason (1991), Specific Learning Difficulties (Dyslexia): Challenges and Responses; Windsor, NFER-Nelson.

Snowling, M. (1987), Dyslexia: A Cognitive Developmental Perspective; Oxford, Blackwell