LASS 8-11

Lucid Assessment System for Schools

FOR AGES 8 TO 11 YEARS

Teacher's Manual

Third Edition
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Lucid

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1 Introduction

1.1 What is LASS 8-11?

LASS 8-11 is a fully computerised multifunction assessment system for use with pupils in the age range 8 years 0 months to 11 years 11 months. (Lucid Assessment System for Schools)
It has five broad applications:

- screening of all pupils for literacy problems
- assessment of special needs in literacy
- identification of specific learning difficulties and dyslexia
- regular monitoring of progress in literacy
- assessment of general ability

The software is very easy to administer: the computer delivers the assessment tasks to the pupil in the form of games, without the need for individual supervision, and scores the results immediately. The tasks, which are challenging and enjoyable, have been created specifically for pupils in this age range, with colourful cartoon-style graphics and high-quality digitised sound.

LASS comprises the following eight assessment modules that can be used individually or in combination:

- single word reading
- sentence reading
- spelling
- reasoning
- auditory memory (‘Mobile Phone’)
- visual memory (‘The Haunted Cave’)
- phonic skills (‘Funny Words’)
- phonological processing (‘Word Chopping’)

The full suite of eight computerised modules takes about 45 minutes, on average, to administer, but teachers may choose to administer only some of the tests if they wish. Most of the modules are adaptive tests — that is, the computer automatically adjusts the difficulty of the items to suit the ability level of the pupil. This means that assessment is faster and more efficient, and also prevents pupils becoming bored by items which are too easy or frustrated by items that are too difficult.

LASS 8-11 enables teachers to:

- obtain a reasonable estimate of the pupil’s intelligence
- assess the pupil’s attainments in reading and spelling and identify pupils who are under-performing in these areas
- measure discrepancies between actual literacy attainment and expected literacy attainment based on intelligence
- identify underlying problems in memory or phonological processing skills that could be the cause of under-performance in literacy
- identify pupils with dyslexia (specific learning difficulty)
- monitor development in reading and spelling on a regular basis
- assess improvements in memory, phonological and phonic decoding skills brought about by appropriate training or intervention

1.2 How LASS 8-11 was developed

LASS, which stands for 'Lucid Assessment System for Schools' was created by Lucid in conjunction with the same research team from Hull University that collaborated in the development and validation of the assessment programs ***CoPS Cognitive Profiling System*** (Singleton, Thomas and Leedale, 1996, 1997; see also Singleton, Thomas and Horne, 1999) and ***Lucid Baseline Assessment*** (Singleton, Thomas and Horne, 1998). The first version of LASS was LASS 11–15 (Horne, Singleton and Thomas, 1999), which in 2001 was restyled 'LASS Secondary' but recently renamed to its original title of LASS 11-15. The LASS 8-11 suite of tests is modelled on LASS 11-15, but with new items developed specifically for the 8–11 age rage.

Results are analysed in relation to norms in 12-month age bands, and are shown as centile scores (or standard deviations) on a graphical profile that can be printed out. In addition, detailed results from every item delivered to the pupil are accessible to the teacher. The system is maintained under password security, so that the teacher is in complete control of what tests the pupils are permitted to do, and only the teacher has access to results.

Interpretation of results obtained from LASS 8-11 is straightforward. It is easy to spot pupils who are under-performing in literacy in relation to their age and/or intellectual potential. It is also straightforward to verify if any difficulties are likely to be of a dyslexic nature — i.e. caused by underlying cognitive problems in phonology and/or memory. All this information can be used in formulating Individual Education Plans (IEPs) and is valuable when deliberating whether or not to request a formal assessment by an Educational Psychologist. LASS can also be used on a regular basis (e.g. every term) to monitor progress in reading and spelling, or check development in phonic skills.

At the time of publication of this 3rd edition of the Teacher's Manual, LASS is used in several thousand schools in the UK, as well as in many English-speaking schools across the world. Since its first release it has become an indispensible assessment tool for many teachers. The ease of use of the program, the flexibility of the system, and the value of the results in informing educational decisions all play a very significant part in decision-making. However, feedback from users also indicates that most children tend to prefer this method of assessment over conventional forms of assessment. In fact, it is a fairly well-established finding that most students prefer computer-based tests to conventional tests (see Singleton, 1997, 2001, 2003). In the LASS validity study carried out by Horne (2002) (see Section 1.4) the pupils were asked whether they preferred the computer-based tests or the conventional tests. The results were that 54 of the 75 pupils (72%) preferred the computer-based tests while only 17 preferred the conventional tests (23%). There were no significant gender differences in this preference pattern. These findings have implications for assessment, especially where disaffected pupils are concerned. If students enjoy doing computer-based tests, they are likely to be more motivated and stay on-task. This helps to produce results that teachers can have confidence in.

Like all Lucid products, LASS 8-11 conforms to the British Psychological Society's guidelines for the development and use of computer-based assessments (British Psychological Society, 1999a).

1.3 Standardisation

The eight tests in LASS 8-11 have been standardised so that teachers using the system can establish where any given pupil falls on any of the components of the suite, in relation to the population norms. This means that direct and meaningful comparisons can be made between the individual tests that a single pupil takes. In addition, direct and meaningful comparisons can be made between pupils as well as between the pupil and national norms.

The standardisation sample for LASS 8-11 totalled 1107 children in eleven different schools in different parts of the UK. These schools were selected as being representative of the overall primary school population. The breakdown by age is shown in Table 1.

Table 1. Breakdown of LASS 8-11 standardisation sample by age.

Age	7	8	9	10	11
Number	61	219	245	321	261

1.4 Validation

Validity of new psychological and educational tests is usually established by comparing them with equivalent established tests. This is usually called 'concurrent validity'. Some difficulties may arise in the case of computer-based tests, where the modes of response (typically using a mouse) are different to those used in conventional tests (typically either oral or written responses). Inevitably, this tends to result in somewhat lower correlation coefficients that those obtained when comparing two similar conventional tests (for a discussion of these issues, see Singleton, 2001).

A validation study was carried out on 100 children aged 8–11, comparing a selection of the LASS 8-11 tests with the NFER Sentence Completion Test of reading comprehension.[1] Significant correlations were found across all the LASS 8-11 measures, with the highest correlation being found for Sentence Reading (see Table 2).

Table 2. Correlations between LASS 8-11 tests and NFER Sentence Completion Test

LASS 8-11 Test	Sentence Reading	Single Word Reading	Funny Words	Word Chopping	Reasoning
Correlation	0.60	0.56	0.34	0.49	0.57

LASS 8-11 has the same structure and very similar item content to LASS 11-15, and therefore validation studies of LASS 11-15 contribute to the overall validity of the approach used in both systems. Horne (2002) carried out a concurrent validity study of LASS 11-15 using 75 students (47 boys and 28 girls), age range 11 years 6 months to 15 years 11 months (mean age 13 years 6 months; standard deviation 17.0 months). This sample had been randomly selected from Year 7 to Year 11 registers in five different secondary schools in different regions of England and Scotland, the schools having been chosen so that pupils from a broad range of socioeconomic backgrounds were adequately represented. (These were not the same schools in which the reliability study had been carried out.) The students were tested on LASS 11-15 (all modules except the Single Word Reading Test) and also tested within four weeks using well-known published conventional tests of skills that, as far as possible were equivalent or similar to those in LASS. The order of test administration was counter-balanced to control for order effects. The results, which are shown in Table 3, indicate significant correlations between the LASS 11-15 tests and the comparison measures, with the highest correlation coefficients being obtained for the literacy measures (where there is the closest correspondence in the tasks involved). The somewhat lower correlation coefficients for the cognitive measures may be explained by differences in the modes of response (oral or motor in the conventional tests, via mouse input in LASS) and requirements of the tasks (e.g. in WMS-III spatial span, no semantic elements are included, whereas in the Cave test the student has to remember the object as well as its spatial position). Despite these inevitable limitations when comparing computer-based tests with conventional tests, it may be concluded that the results provide satisfactory concurrent validation for the tests in LASS. This study has been submitted for publication (see Horne, Singleton and Thomas, submitted, a).

Validity of assessment instruments may also be established by another method, in which the instrument is used to predict which individuals do, and which do not, fall into a given category. This is usually called 'predictive validity'. In the case of LASS the most obvious test of this would be to see how

[1] We are grateful to Ms Hollie Drinkwater for collecting these data.

effective it was in identifying dyslexia in a group of students that contained by known dyslexic and known non-dyslexic individuals. Horne (2002) carried such a study using LASS 11-15 with 176 students (102 boys and 74 girls), age range 11 years 6 months to 15 years 11 months (mean age 13 years 7 months; standard deviation 17.4 months). This sample had been randomly selected from Year 7 to Year 11 registers in five different secondary schools in different regions of England and Scotland, the schools having been chosen so that pupils from a broad range of socioeconomic backgrounds were adequately represented. The sample was broken down into a group of 30 students (21 boys and 9 girls) who had been diagnosed by educational psychologists as having dyslexia, 17 students (11 boys and 6 girls) with other special educational needs ('other SEN group'), and 129 students (76 boys and 59 girls) without special educational needs ('non-SEN group').

Table 3. Correlation coefficients obtained between LASS 11-15 tests and equivalent or similar conventional tests (n=75).

LASS 11-15 test	Comparison test	Correlation coefficient (r)*
Sentence reading	NFER Sentence Completion Test	0.75
Spelling	British Spelling Test Series 3	0.88
Reasoning	Matrix Analogies Test	0.52
Cave (Visual memory)	Wechsler Memory Scales (WMS-III) Spatial Span (total score)	0.37
Mobile (Auditory memory)	Wechsler Memory Scales (WMS-III) Digit Span (total score)	0.55
Nonwords (Nonword reading)	Phonological Assessment Battery (PhAB) Nonword Reading	0.43
Segments (Syllable segmentation)	Phonological Assessment Battery (PhAB) Spoonerisms	0.45

** All correlations except Cave are significant at p<0.001 or better; the correlation for Cave was significant at the p<0.01 level.*

The dyslexic group scored significantly lower than the non-SEN group on five of the seven LASS tests (sentence reading, spelling, auditory memory, nonword reading and syllable segmentation). There were no significant differences between the dyslexic group and the non-SEN group on reasoning or visual memory. However, the other SEN group scored significantly lower than the non-SEN group on all seven of the LASS tests used in the study. Comparable results were found when the same groups were compared on several conventional tests (the tests used are listed in the column headed 'Comparison tests' in Table 3). These findings fit well with established views about dyslexia – i.e. that dyslexic students are comparatively poor on measures of literacy, phonological skills and auditory memory and these weaknesses are not due to low intelligence (see Snowling, 2000) – and provide validation for the use of LASS in the identification of dyslexia. When the overall profile of scores was examined, LASS was found to have correctly identified 79% of the dyslexic students as having dyslexia, compared with 63% success rate for the equivalent conventional tests and only 59% using the phonological measures alone. These results provide convincing predictive validity for the use of LASS 11-15, which had rather greater accuracy than a mixture of conventional tests. This study has been submitted for publication (see Horne, Singleton and Thomas, submitted, b).

1.5 Reliability

The term 'reliability', when applied to a psychometric test, usually refers to the extent to which it can be expected to yield similar results when administered to the same individual on different occasions. This is sometimes referred to as 'test-retest reliability'.

Horne (2002) investigated the test-retest reliability of LASS 11-15 using 101 students (55 boys and 46 girls) aged between 11 years 6 months and 15 years 11 months (mean age 13 years 8 months; standard deviation 16.5 months). This sample had been randomly selected from Year 7 to Year 11 registers in seven different secondary schools in different regions of England and Scotland, the schools having been chosen so that pupils from a broad range of socioeconomic backgrounds were adequately represented. The students were tested on LASS 11-15 (all modules except the Single Word Reading Test) and then retested four weeks later. The results (see Table 4) show that in all cases, significant test-retest correlation were obtained, indicating satisfactory test-restest reliability. Higher correlations were found for the literacy measures than for the cognitive measures. It appears most likely that the somewhat lower (but nevertheless significant) correlations for the memory measures is due to greater susceptibility of these task to practice effects arising from enhanced motivation and application of strategic thinking at the retest. This study has been submitted for publication (see Horne, Singleton and Thomas, submitted, a).

Table 4. Test-retest correlation coefficients for LASS 11-15 tests over a four week period (n=101).

LASS 11-15 test	Correlation coefficient (r)*
Sentence reading	0.85
Spelling	0.93
Reasoning	0.51
Cave (Visual memory)	0.53
Mobile (Auditory memory)	0.58
Nonwords (Nonword reading)	0.77
Segments (Syllable segmentation)	0.74

** All correlations are significant at p<0.001 or better.*

1.6 Gender differences

Studies of gender differences in education typically find that girls out-perform boys in school attainment (see Fergusson & Horwood, 1997) and that boys are more likely to be referred for educational difficulties (see Vardill, 1996). Nevertheless, it is generally held that psychological and educational tests should, as far as possible, be free of gender bias, so that when decisions about children's progress are being made (especially where special support may be required) this can be based on information derived from sources that favour neither girls nor boys. On the other hand, it has sometimes been suggested that computer-based tests may favour boys because of their supposed greater interest in computers (see Crook, 1996). If this is the case, it could distort results obtained using a computer-based assessment such as LASS 11-15.

Horne (2002) carried out a study to investigate possible gender bias in LASS 11-15, using 176 students (102 boys and 74 girls), age range 11 years 6 months to 15 years 11 months (mean age 13 years 7 months; standard deviation 16.7 months). This sample had been randomly selected from Year 7 to Year 11 registers in twelve different secondary schools in different regions of England and Scotland, the schools having been chosen so that pupils from a broad range of socioeconomic backgrounds were adequately represented. The results (see Table 5) showed that although girls scored consistently higher than boys in all except the Cave test (Visual memory), in no cases were these differences found to be statistically significant. When the same sample was examined for possible gender bias on equivalent conventional tests (the tests used are listed in the column headed 'Comparison tests' in Table 3) the only significant difference to be found between boys and girls was on the British Spelling Test Series 3, where girls outperformed boys. With this one exception, therefore, there was no evidence that either the conventional or the LASS 11-15 computer-based tests are biased in favour of boys or girls. This study has been submitted for publication (see Horne, Singleton and Thomas, submitted, c).

Table 5. Gender comparisons on LASS 11-15 tests (mean z scores).

LASS 11-15 test	Female	Male
Sentence reading	0.87	0.71
Spelling	0.79	0.64
Reasoning	0.62	0.54
Cave (Visual memory)	0.27	0.33
Mobile (Auditory memory)	0.66	0.40
Nonwords (Nonword reading)	0.78	0.51
Segments (Syllable segmentation)	0.56	0.47

1.7 Getting started with LASS 8-11

1.7.1 Correct time, date and date format used by your computer

Before you install the *LASS 8-11* program it is important that your computer is configured to use dates correctly. *LASS* has to calculate students' ages using their date of birth and the computer system date. Ensure that the computer's system date is accurate (in *Windows* ® you can check the date and time using the digital clock/calendar at the extreme right of the Task Bar). For users in the UK, Eire and many other English-speaking countries you should use the computer's *Regional Settings* (see *Windows* ® *Control Panel*) to check that the *Short Date style* used by the computer is in the format *dd/mm/yy*.
If you are in North America you should use the American version of *LASS 8-11*, which is called ***LASS Junior***. You can then use the appropriate US date format *mm/dd/yy*.
If your computer is brand new please check that the *Regional Settings*, including the *Short Date style* are configured appropriately.

1.7.2 Installing LASS 8-11

Installation of *LASS* is fairly swift for stand-alone versions. Networked versions require some planning and a few more steps for deployment. To view the start-up menu screen put the *LASS* CD in the CD-drive. On the Windows desktop select **Start** and then **Run** and enter the command line:

D:\SETUP

where D is your CD drive letter. The start-up menu has options to install the software (and database components if you are using the networked version) and to view the user manuals in *Adobe Acrobat* ®. You can obtain a free copy of the *Acrobat* ® *Reader* ® from www.adobe.com.

1.7.3 Running LASS 8-11 — Serial Number and Password

After installation you should launch the *LASS 8-11* program from its Desktop icon. If this is the first time you have used LASS you will be required to register your software by entering details for the licensee, school or institution and serial number. The serial number will be found in the inside of the DVD case in which the CD was delivered.

Whenever you run *LASS 8-11* you will need to enter the administrator password.
Your password is initially set to **lucid** (all letters lower case)
You can alter this password at any time should you wish to.

For information on registering new students, deleting students, archiving, security settings and passwords, please consult the **LASS Software Guide,** which can be found on the *LASS* CD as an *Adobe ® PDF* file, or can be viewed from within the LASS program as a web page.

1.7.4 Using the tests in LASS 8-11

Before administering any test in LASS 8-11 users should first read Chapters 2 and 3. Together, these provide detailed guidance on how to select LASS 8-11 tests and administer them.

1.7.5 Interpreting LASS 8-11 results

Before attempting to interpret LASS 8-11 results, and especially when drawing up an Individual Education Plan (IEP) or considering educational provision for any pupil in detail, teachers are strongly advised to consult Chapters 4 and 4.4.1. Chapter 7 provides case studies in interpreting LASS 8-11 results, which teachers will find very helpful.

1.7.6 Teaching activities and resources

Chapter 6 provides guidelines and suggestions regarding teaching activities and resources that may be adopted in cases where LASS 8-11 results indicate a problem or potential problem in the pupil's learning. The case studies in Chapter 7 also include suggestions on learning and teaching, and in Chapter 8, Anita Keates describes how the LASS assessment software has been implemented in two different UK schools.

The suggestions in this manual may be supplemented by further information and resources on the Lucid website (www.lucid-research.com), which is updated from time-to-time. Teachers should be aware that the educational software that is recommended in this manual may have been withdrawn from sale, superseded or augmented by new programs since this manual was published, and should therefore consult suppliers for current information (see Section 9.2 for addresses of recommended suppliers).

Use of LASS 8-11 does not imply any obligation to follow a particular line of teaching, and teachers, as professionals, will naturally wish to use their own judgement regarding what is, and is not, suitable for any given pupil. Nevertheless, it is strongly recommended that teachers read the teaching advice provided in this manual, as it is likely that they will find ideas and strategies that they had not previously considered. This is especially likely if the teacher is not very experienced in working with pupils who have specific learning difficulties.

To keep up to date with software developments and other teaching resources, teachers should consult the Lucid website (www.lucid-research.com). In addition, the British Dyslexia Association publishes information on recommended software and teaching materials (www.bdadyslexia.org.uk).

1.7.7 Training courses

Training courses in the use and interpretation of *LASS* may be available through Lucid-approved third party organisations, usually within the UK.
For further information please contact Lucid, or visit the website (www.lucid-research.com).

1.7.8 Troubleshooting

Problems in running Lucid assessment software are rare; those that do occur are usually related to installation or connection problems on school or college networks, User Account restrictions, computer date and time inaccuracies and incorrect Regional settings on computers.
Lucid's technical support team can usually resolve these types of issues fairly quickly - please contact us if you need help. It is often quicker and more efficient to use email, as an initial exchange of information may be required to diagnose and resolve an issue. Initial information which will be required by Lucid

includes (1) Software title (2) Software version number (3) Software serial number (4) Software licence details.
The technical support email address is technical@lucid-research.com.

You can also contact Lucid by telephone during office hours 9-5 Monday to Friday (GMT). See our website www.lucid-research.com for contact details.

2 Administering LASS 8-11 tests

2.1 Composition of the LASS 8-11 suite

2.1.1 Outline of tests

The LASS 8-11 suite comprises three **attainment** tests (single word reading, sentence reading and spelling), one **ability** test (reasoning) and four **diagnostic** tests (auditory memory, visual memory, phonic skills and phonological processing). An outline of each test is given in Table 6. Six of the eight tests are *adaptive*, i.e. they are based on statistical item response theory (IRT), whereby each test item is selected from a large bank of items, each of which is of known difficulty for pupils of that age group. The remaining two tests (***The Haunted Cave*** and ***Mobile Phone***) are *progressive* in format, i.e. they utilise a graded series of items of increasing difficulty for pupils of that age group together with a discontinuation algorithm whereby the test will automatically cease once the pupil's current attainment or ability level has been exceeded beyond reasonable statistical error.

For each test, instructions are spoken by the computer, and practice items are given to familiarise the pupil with the test requirements. When the pupil has completed the practice items, the test phase begins. The program automatically discontinues the test when the pupil's ability level has been exceeded.

2.1.2 Adaptive assessment

The term 'adaptive testing' refers to any technique that modifies the nature of the test in response to the performance of the test-taker. Paper-based tests are *static* instruments, fixed in their item content, item order, and duration. By contrast, computer-based assessment can be *dynamic*. Since the computer can score performance at the same time as item presentation, it can modify the test accordingly, tailoring it to the capabilities of the individual taking the test much more effectively than has ever been possible before.

Conventional tests can be very crude instruments in which, much of the time, the individual's abilities are not being assessed with great precision because the items are either too difficult or too easy. In an adaptive test the individual can be moved swiftly to that zone of the test that will most efficiently discriminate his or her capabilities, thus making assessment shorter, more reliable, more efficient, and often more acceptable to the person being tested. The savings in testing time are distinctive and can far outweigh any disadvantages of transferring from conventional methods to computer-based methods. For example, Olsen (1990) compared paper-based and computer-administered school achievement and assessment tests with computerised adaptive tests. The computer-based non-adaptive version took 50 – 75% of the time taken to administer the conventional version, while the testing time for the adaptive version was only 25% of the time taken for the paper-based version.

Table 6. Composition of the LASS 8-11 suite of tests

TEST	CATEGORY	TYPE	DESCRIPTION
Sentence reading	Attainment	Adaptive	Cloze reading — completing sentences by identifying the missing word from a choice of five alternatives. No spoken assistance is given.
Single word reading	Attainment	Adaptive	Reading individual words out of context — identifying from a choice of five alternatives the printed word that corresponds to a spoken word.

TEST	CATEGORY	TYPE	DESCRIPTION
Spelling	Attainment	Adaptive	Spelling individual real words that are spoken by the computer.
Reasoning	Ability	Adaptive	Non-verbal intelligence — analogical reasoning where the correct item from a choice of six alternatives has to be selected in order to complete a spatial matrix.
Mobile Phone	Diagnostic	Progressive	Auditory sequential memory (digit span) — recall of between two and nine digits in correct (forwards) sequential order.
The Haunted Cave	Diagnostic	Progressive	Visual memory — immediate recall of objects and their spatial positions, beginning with two items and progressing to seven items.
Funny Words	Diagnostic	Adaptive	Reading individual nonwords — a pure measure of phonic decoding skills. For each nonword there is a choice from four spoken alternatives.
Word Chopping	Diagnostic	Adaptive	Phonological processing ability — segmentation and deletion of syllables and phonemes in real words. For each item there is a choice from four spoken alternatives.

In each of the six adaptive tests in LASS 8-11, the program first gives the pupil a series of 'probe' items to determine the range of optimal item sensitivity for that pupil. These are followed by a series of test items starting in the range of optimal item sensitivity of increasing difficulty until the pupil's current attainment or ability level has been exceeded beyond reasonable statistical error, whereupon the test ceases. The program incorporates a facility to regress to easier items should it transpire that, by chance, the result of the probe items has overestimated the pupil's approximate ability or current attainment level.

2.2 Summary details of each test

2.2.1 Sentence reading

Sentence reading is an adaptive test that involves finding the missing word in a sentence. Pupils are presented with a sentence that has one word missing and a picture to go with the sentence. Pupils select the correct word from five words at the bottom of the screen by clicking on it and then clicking on the OK button to move on. The pupil starts by attempting some 'probe' items to determine the level at which they should start the test. Their progress through the test depends on their performance and the test is discontinued when the pupil fails a certain number of items within one level.

2.2.2 Single Word Reading

Pupils are presented with a picture of an object on the screen and hear the word spoken by the computer. Pupils select the correct word from five words at the bottom of the screen and then click on the OK button to move on. The pupil starts by attempting some 'probe' items to determine the level at which they should start the test. Their progress through the test depends on their performance and the test is discontinued when the pupil fails a certain number of items within one level.

Single Word Reading is the only test in the LASS 8-11 suite for which scores are not distributed in a normal curve. In fact, there is a significant negative skew, indicating that most pupils will achieve a maximum or near-maximum performance (in statistical terms this is sometimes referred to as a '*ceiling effect*'). The ***Single Word Reading*** test does not have sufficient sensitivity to discriminate amongst pupils within the average range, and so its use should be confined to pupils who are *significantly behind* in reading development, either to determine their attainment level or evaluate progress.

2.2.3 Spelling

Spelling is an adaptive test that involves spelling single words. Pupils are presented with a picture on the screen and hear a word and a sentence putting the word into context. Pupils spell the word using keyboard entry and then click on the *Enter* key or *OK* button to move on. The pupil starts by attempting some 'probe' items to determine the level at which they should start the test. Their progress through the test depends on their performance and the test is discontinued when the pupil fails a certain number of items within one level.

2.2.4 Reasoning

Reasoning is an adaptive test involving matrix puzzles that can be solved by a careful application of logical reasoning, using both visual and verbal strategies. Pupils are shown a 3×3 matrix with the bottom right hand square empty. Pupils choose which of six squares at the bottom of the screen complete the pattern. They then click on the OK button to move on. The pupil starts by attempting some 'probe' items to determine the level at which they should start the test. Their progress through the test depends on their performance and the test is discontinued when the pupil fails a certain number of items within one level.

2.2.5 The Haunted Cave

Cave is a visual spatial memory test set in a cave with eight hollows in the wall. Different pictures, called 'phantoms', appear in different hollows one at a time and then disappear. The pupil must remember which phantom went in which hollow. After the phantoms have disappeared they are shown on the bottom of the screen along with two distractors. The pupil must select the phantoms that were presented, by clicking the mouse on them, dragging them to the correct hollow and dropping it. The pupil can put the phantoms back in any order as this is not a test of sequential memory. Each item has a (fairly generous) time limit in order to increase the challenge of the task: the instructions are that the phantoms must be put in their correct positions 'before the candle burns out'.

All pupils start with a presentation of two phantoms and complete twelve trials in total. When a pupil has correctly placed two phantoms on two occasions they move on to three phantoms and so on until the twelve trials have been completed. The maximum number of phantoms that can be presented is seven. The number of distractors also increases as the test progresses, so increasing the overall difficulty of the task.

2.2.6 Mobile Phone

This test, which is usually referred to simply as 'Mobile', is a measure of auditory sequential memory involving digit span. The pupil is given a telephone number to remember which they then enter onto a mobile phone using the mouse. The pupil then clicks on the green phone button when s/he has finished. Pupils must get both practice items (two digit numbers) correct before moving on to the test items. All pupils start with two trials of two digit numbers and if they answer one or both correctly then they move on to two trials of three digit numbers and so on up to nine digits. If a pupil fails both trials on a level then the test is discontinued.

2.2.7 Funny Words

Funny Words is a test of phonic decoding skills. A nonword is presented visually on the screen, the sound system represented on screen will then play four different versions of the word. The pupil can hear these different versions as many times as they want to by hovering the mouse over the loudspeakers. When they hear the version of the word that they think is correct they click on that loudspeaker and then on the red button to move on to the next item. The pupil starts by attempting some 'probe' items to determine the level at which they should start the test. Their progress through the test depends on their performance and the test is discontinued when the pupil fails a certain number of items within one level.

2.2.8 Word Chopping

Word Chopping is a test of syllable and phoneme deletion that identifies poor phonological processing ability. Pupils are presented with real words and asked what each word would sound like if part of the word was removed. Pupils can hear the instructions for each item as many times as they want by clicking on the question mark on the sound system represented on screen. The sound system plays four different answers which the pupil can hear as many times as they want to by hovering the mouse over the loudspeakers. When they hear the answer that they think is correct they click on that loudspeaker and then on the red button to move on. The pupil starts by attempting some 'probe' items to determine the level at which they should start the test. Their progress through the test depends on their performance and the test is discontinued when the pupil fails a certain number of items within one level.

2.3 Guidelines for administering LASS 8-11 tests

2.3.1 Is the teacher familiar with the test being administered?

Assessing pupils with LASS is straightforward but before you attempt to test any pupil you should first run through the complete suite of tests to familiarise yourself with it thoroughly. To do this you should register yourself as the 'pupil'. If you wish to exit any test and return to the *tests menu* before the end, then press F4. This quick exit from a test is also useful when demonstrating the program to other teachers or for use in training sessions. However, they should not be used when testing a pupil unless absolutely necessary (see Section 2.3.11).

2.3.2 Is the testing environment satisfactory?

The ideal testing environment is one that is reasonably quiet, with minimal distractions. This could be a separate room, but LASS has been designed to use in the ordinary classroom, where distractions are often unavoidable. Visual and auditory distraction (both to the pupil being tested and to other pupils in the class) should be minimised. It is recommended that the computer and the pupil are positioned in such a way that the pupil is not looking directly at the rest of the class, nor should the rest of the class easily be able to see the monitor screen. The best position for this is usually in the corner of the room. To minimise auditory distraction, headphones are recommended. Inexpensive lightweight headphones of the type used for portable audio equipment will be adequate (but not the type that are inserted into the ear).

The pupil should be sitting comfortably at a suitable level in front of the computer screen (not too high or low in order to see the screen and use the mouse satisfactorily). It is not recommended that pupils attempt the tests standing up, as they are more likely to move about and alter the angle at which the screen is viewed – this can lead to failure to see everything that is happening on the monitor, and can also disrupt mouse control. The supervisor should check for reflections on the monitor from windows and lights that could impair the pupil's perception. To do this the supervisor should check by viewing the screen from the same position that the pupil will adopt.

It is not recommended that pupils attempt the tests when other pupils are standing or sitting in a position in which they can become involved in the task or act as a distraction. It will be hard for other pupils to inhibit their responses and their behaviour may influence the decisions of the pupil being tested.

2.3.3 Is the equipment functioning correctly?

The supervisor should check that (a) the monitor display is clear and its colours correct, (b) the sound system (speakers or headphones) is audible (not too loud or to soft, and without interference), and (c) the mouse is functioning correctly and is positioned in front of the pupil on a suitable surface so that its movements are unimpeded.

2.3.4 Is the pupil prepared for the task?

It is important that the pupil *understands* the *nature* of the task, *how* to indicate responses to the computer using the mouse, and *when* to respond (essentially when the tests will allow them to respond). Pupils should not be allowed to take the tests if they are unwell, as results are likely to be unreliable. In general, pupils will experience no difficulty in understanding the instructions spoken by the computer and in following the practice tasks. This should enable them to progress to the test phase without special attention from the teacher. However, if the pupil does not understand any instructions the supervisor may re–express them in a more suitable manner. For example, in ***Mobile*** some younger pupils may not fully understand what 'order' means. Here the tester may give examples of what is a correct order (and what is an incorrect order) to aid comprehension. Explaining and re-expressing the task requirements to the pupil may continue into the demonstration and practice stages of each test. This is particularly useful for any pupil who is experiencing problems in understanding the true nature of the task. It is often easier for the pupil to comprehend the task requirements by experience of the practice stages, than by more abstract oral explanation. Once the test items commence, there should be no further aid given to the pupil.

2.3.5 Choosing which tests to administer

LASS 8-11 is a *suite* of tests — i.e. it comprises eight tests, each of which has different functions. Teachers can choose to give *all* or *some* of the tests. LASS is a complex assessment package and a great deal of research and careful thought has gone into its development — each and every test component is there for a specific purpose, and each test can give the teacher valuable information about the pupil.

Much will depend on the purposes of the assessment and the teacher's knowledge of the pupil's difficulties. If nothing is known about a child, it is strongly recommended that all eight tests should be administered except ***Single Word Reading***, thereby accessing the fullest information. (However, if the ***Sentence Reading*** result is low, then it would be appropriate to administer ***Single Word Reading*** also.) On average, this should take between 30 and 45 minutes to complete, in total. If the teacher already has useful information (e.g. about reading and spelling attainment) it should be adequate to concentrate on the other assessment components of the program.

Although it is desirable to give the full suite of tests to each pupil, it is not absolutely *essential*. If time is short, it is acceptable to administer a subset of the tests instead of the full suite, in which case the issue of choice of tests arises. In this situation, it is helpful to think of LASS as a *kit of tools*, with the teacher choosing one or more of those tools for specific purposes. There are instances in which a teacher requires information about a pupil's abilities in a particular aspect of attainment (e.g. reading or spelling) or particular cognitive domain (e.g. memory or phonological processing). In such circumstances is perfectly acceptable for the teacher to carry out *only* the most appropriate tests rather than administering all them.

In order to make sensible choices about which tests to administer and which to leave out, teachers first need to understand what each of the tests is for. To develop understanding of the tests, teachers are advised to study Chapter 4, 4.4.1 and 7. It should be noted that the ***Single Word Reading*** test is the only test in the LASS suite for which scores are not distributed in a normal curve. In fact, there is a significant negative skew, indicating that most pupils will achieve a maximum or near-maximum performance (in

statistical terms this is sometimes referred to as a *'ceiling effect'*). The ***Single Word Reading*** test does not have sufficient sensitivity to discriminate amongst pupils within the average range, and so its use should be confined to pupils who are *significantly behind* in reading development, either to determine their attainment level or evaluate progress.

Whichever strategy teachers adopt for selecting LASS tests for administration to any given pupil, it is strongly recommended that first they should familiarise themselves thoroughly with *all* the tests, how they are delivered and what cognitive abilities they measure. In other word, to make the most effective use of LASS, teachers need to know about *all* the 'tools' in the LASS 'kit', what they are for and how they are used. This will require trying out the tests as well as consulting the relevant sections of this manual. Only then can teachers make an informed professional decision about how best to use LASS to meet their particular assessment needs.

2.3.6 Order in which tests are administered

The *order* in which LASS tests are attempted is not particularly important. As teachers become more experienced with LASS, they will find that they develop their own views about what tests are most useful to begin with, or to use in certain cases.

2.3.7 Number of tests to be administered per session

It should be obvious that a satisfactory test result cannot be obtained if pupils are not attending to the tasks and attempting to do their best. However, the LASS tests are mentally demanding and pupils can easily become mentally fatigued after a few tests. The effort which they apply can diminish significantly, although they may still enjoy the activity. Consequently, even though pupils may express a desire to continue it is recommended that not more than three or four tests are given to any one pupil in a continuous session. This may vary according to the concentration level of the pupil and other factors. The supervisor should use his or her discretion in these matters.

It is sometimes preferable to spread administration of the tests over a number of days. This avoids the situation where results may be grossly distorted because a pupil has an 'off day' through illness or some other idiosyncratic reason. Where any individual test result appears anomalous or unrepresentative the test may be re-administered after a suitable time period has elapsed.

2.3.8 Is the assessment being conducted fairly?

In order for the assessment to be 'fair' (i.e. to give a reasonably accurate representation of the pupil's abilities) it is essential for the supervisor to ensure that during the test:

- the pupil is paying attention, is 'on task' and is not distracted
- the pupil does not become unduly fatigued
- there is no teaching or helping with the task during the test items (whether from the supervisor or other pupils)
- there is no 'cheating' — this may take the form of the pupil placing his or her hands on the computer screen to circumvent the memory element of the test (e.g. in ***The Haunted Cave***).
- feedback from the supervisor is minimised and encouragement consistent

2.3.9 Giving encouragement, prompts and feedback

As much as possible, *the supervisor should avoid giving specific feedback to pupils during a test*, because this may influence their behaviour in an undesirable fashion. There is a risk of feedback differentially affecting pupils, so that some are encouraged and others discouraged. LASS 8-11 itself provides limited feedback (e.g. 'good') where appropriate. Nevertheless, some pupils will try to elicit additional feedback from the supervisor about their performance. This may take the form of verbal and

non-verbal behaviours. For example, the pupil may ask directly if they were correct. Many pupils will look for the supervisor's facial and bodily reactions to their responses. Some pupils may even try to evaluate the supervisor's reaction by observing the supervisor's reflection in the monitor screen. For these reasons it is usually preferable that the supervisor sits to the side and slightly behind the pupil to minimise any feedback to the pupils which may bias the results.

Rather than specific feedback, *general encouragement* should be given to the pupil. This encouragement should be referenced to task completion rather than task accuracy and ideally should be delivered equitably to all pupils. However, it is inevitable that some pupils will require more encouragement than others, and where this is the case the teacher should be mindful of the possibility of influencing results unduly. Differential encouragement between pupils is likely to have an influence on the results obtained, and therefore should be avoided where possible. Some key phrases and general incentive prompts which may be used to aid the administration of the tests include: "well done"; "you were good at that game (or level), now try the next one"; "you will like this game"; "now concentrate on this"; "try hard"; "listen very carefully"; "have a go at these ones"; "have a try"; "just do your best".

Unless it is felt absolutely necessary, *prompting during the actual test items should be kept to a minimum.* For the most part any necessary prompting should occur during the pauses between test levels and the tests themselves. However, these prompts and phrases must be used with careful consideration. It is very important that any prompting should not significantly affect the pupils' performances differentially. Ideally these prompts should be given to every pupil equally and are utilised as general encouragement in order to maintain concentration. They should not be related to pupils' specific accuracy performances, which is likely to lead to pupils receiving differential encouragement due to the fact that some pupils will inevitably perform better than others.

2.3.10 Keeping a Comments Record

It is recommended that the teacher keeps a brief written record of the pupil's behaviour at each time of LASS testing, particularly noting such factors as health, tiredness, attention, concentration, distractions, and general motivation. A template **Comments Sheet** is provided in the Appendices of this manual (see Section 9.3, page 83). This may be printed out or photocopied freely and used for recording any observations during testing. This record can then be referred to when interpreting the pupil's LASS profile. The teacher should particularly be on the lookout for colds and coughs, which not only disturb concentration but which can also affect hearing.

The following are examples of suggestions regarding completion of the *LASS Comments Sheet*:

Testing Room: e.g. 'quiet room', 'classroom — noisy' (also mention any uncomfortable conditions)

Health: e.g. 'good', 'had bad cold', 'coughing' (also mention any other health factors)

Attention: e.g. 'good', 'fair', 'distracted', 'tired'

Other comments: e.g. 'over-confident', 'responded very quickly', 'nervous at first', 'did not understand instructions', 'could not hear computer properly', 'unconfident — kept asking "Is that right?"'

2.3.11 Abandoning a test prematurely

Very occasionally, an administrator will want to abandon a test before the pupil has completed it. This necessity may arise as a result of some unforeseen circumstances, which may interfere with the smooth progress of the assessment. You can quit from a test prematurely by waiting until the mouse pointer is visible and then press the **F4** key **once**. It may take a few seconds to respond before you are returned to the menu screen. The pupil cannot restart the test where they left off (a consequence of this would be to invalidate the results). It may be necessary for the pupil to attempt the test at a later date depending on the reason for premature abandonment. A record is kept of the premature exiting of the test. Premature exiting from a test is generally used for demonstration purposes rather than in real testing situations. **Pupils should NOT be instructed or allowed to use the F4 key, which should only be used in extreme circumstances because all of the data for that partial attempt will be lost.**

2.3.12 Re-testing with LASS 8-11

Teachers often ask 'How soon can a pupil be re-tested with LASS ?' The answer depends on why re-testing is being considered. If the teacher has good reason to believe that a given result is not truly indicative of a pupil's ability because of some hindrance factor, then retesting can be as soon as is convenient. For example, this would be the case if a pupil had a cold and could not hear the words, was unwell and not able to concentrate, was excessively nervous, or because there were unexpected distractions in the room. Obviously efforts should be made to ensure that those hindrance factors have been resolved before re-testing. Re-testing will normally overwrite the pupil's previous results — see Section 2.4.1.

If the teacher wishes to see if the pupil has improved as a result of some intervention then a sensible interval should be allowed before re-testing. In general, three months would be recommended as the minimum interval, but this could be less if the teacher had good reason for doing so. Repeated re-testing at short intervals is not advisable, because under those circumstances any ability or attainment test is likely to show spurious improvements in performance by virtue of practice effects.

2.3.13 Problems of time-shortage for testing

In cases where teachers wish to administer all the tests in the LASS suite, but are prevented from doing so because of lack of time, useful strategies for solving time-shortage problems include:

- Ensuring that administration of LASS is part of *school policy* and that appropriate staff time is *allocated* for it on the timetable, rather than expecting teachers somehow to *create* the time on top of their other responsibilities. Giving LASS to pupils does take time, but all teachers in the school should accept that it is time well spent, because the information gained is valuable in their education.
- Encouraging staff to recognise that LASS is a useful educational activity *in its own right*. The LASS tests are mentally stimulating and involve use of concepts and skills which are vitally important in learning. Hence time spent by teachers and pupils on the tests has a wider educational value.
- Once a pupil is clear about what any given LASS test requires, only minimal supervision is needed. It is not essential for the teacher to observe the whole test administration, and the child's performance can be inspected later via the Data Tables (see Section 2.4.3).
- Training non-teaching personnel to administer LASS. Although it is essential that the interpretation of LASS results is carried out by an experienced teacher, administration of the tests can be done by any adult who understands the essentials of what the task involves. In particular, that they are *tests*, so the pupil needs to *understand* what is required, but the tester is <u>not</u> permitted to coach the pupil or give hints to the answers. In many schools LASS tests are being successfully and efficiently delivered by various non-teaching personnel, such as classroom assistants, parents, volunteers or school governors. However, it is not advisable to use older pupils to supervise testing.
- Registering all pupils in a block is more time-efficient than registering pupils singly at the time of testing. LASS can import files from other databases so if the school already has the pupils registered on a management system, for example, this can be used instead of registering the pupils afresh.
- Giving all pupils in the class the same LASS test, before moving on to another test. That way, the tester can get into a 'rhythm' and does not have to re-adjust to delivery of each different test.
- Organising activities in order to use available time most effectively. Using playtime or lunchtime can work in some cases. Amalgamating classes for some activities (e.g. story time) can free up one teacher who can use that time to administer LASS.
- Operating an efficient 'queuing' system, so that the teacher does not have to waste time locating the next pupil and bringing that pupil to the computer for assessment. Often, older pupils can assist in this type of organisation, but it is *not* recommended that older pupils should assume responsibility for supervision of the assessments themselves.

2.3.14 Assessing pupils outside the age range for LASS 8-11

Like good normative tests LASS 8-11 is not recommended for use outside its specified age range. Any test which meets basic psychometric criteria (which LASS 8-11 does) must be standardised on a given population and this will determine the range of applicability of the test. LASS 8-11 is designed for use with pupils aged 8 years 0 months to 11 years 11 months. Use with pupils outside this range will mean that you have no proper standards against which you can compare the pupil's performance. This could result in inappropriate decisions being made – e.g. that a pupil is 'at risk' (or not 'at risk') when the evidence for this is unsound.

The preferred solution to the assessment of pupils older than 11 years 11 months is to use **LASS 11-15** (age 11:0 – 15:11), and for pupils younger than 8 years 0 months is to use **CoPS Cognitive Profiling System** (4:0 – 8:11). For information on these assessment products, contact Lucid Creative Limited or visit the website www.lucid-research.com

As a general rule, if LASS 8-11 is used outside the specified age range, results should always be interpreted with extreme caution – see Section 4.3.

Under exceptional circumstances it is permissible to use LASS 8-11 outside the age range. For example, in the case of a very bright or advanced six-year-old or a pupil of thirteen or over with moderate or severe learning difficulties. In such cases, age equivalents would be the preferred form of scores for the teacher to consider. An age equivalent is defined as the chronological age range of pupils that would be expected to achieve a given raw score. Some teachers working in special education prefer to use age equivalents rather than centile scores, because age equivalents enable them to conceptualise the ability level of the pupil they are teaching, and so pitch the work at the correct level. For further information about using age equivalents see Section 4.3.

2.3.15 Assessing pupils who have limited English

Assessment of any pupil who has limited proficiency in spoken English is always problematic (see Cline and Shamsi, 2000). But there is evidence that LASS 8-11 is better than many conventional methods of assessment, because of its strongly visual format and minimal reliance on spoken instructions. The practice items enable most pupils, even those with very little English, to understand the tasks, and where there is uncertainty a teacher or assistant who speaks the pupil's mother tongue can help with explaining instructions. Case studies of two pupils for whom English is an additional language (EAL) are given in Section 7.9. Like most pupils with limited English, these children responded well to the assessment and extremely valuable information was obtained.

It will often be found that EAL pupils gain low scores low on some of the LASS tests (particularly those assessing literacy and phonological skills), which reflects their lack of experience with English. When interpreting the results of these tests, teachers may find it more helpful to use age equivalents rather than centile scores (see Section 4.3 for guidance on how to calculate and use age equivalents). However, on the memory and reasoning tests in LASS scores will normally reflect their true abilities, as these are largely unaffected by language factors (provided the pupil can cope with the digits 1–9 in spoken and written form in order to attempt ***Mobile***).

For further information on assessment of learning difficulties in literacy (including dyslexia) in EAL pupils and other multilingual children, see Cline (2000), Cline and Frederickson (1999), Cline and Shamsi (2000), Durkin (2000), and Peer and Reid (2000).

2.3.16 Pupils with coordination difficulties

Pupils with coordination difficulties may experience problems in using the mouse. In some cases, an adapted mouse device may need to be used when assessing disabled pupils. However, slowness or difficulty in using the mouse should not make any significant difference to a pupil's performance on LASS. Thus, even if a pupil is totally inexperienced with using a mouse (a rare thing these days) and is consequently very slow, the LASS scores will still be a valid measure of their performance. This is because the tests are not speeded (a 'speeded' test is one in which the individual can increase their score

by working faster, although in practice there will always tend to be a speed-accuracy trade-off). Although the time taken is recorded and shown in the Data Tables (so that teachers can take this into account when interpreting tests if they wish), it is not scored, as such. In ***The Haunted Cave*** there is a (fairly generous) time limit (the child has to put the phantoms in their correct positions before the candle burns out). If the teacher suspects that this will create significant problems for the pupil, or where extreme inefficiency with the mouse is affecting the pupil's confidence, it is permissible for the teacher to use the mouse and move the phantoms on the pupil's behalf. In such situations, it will be necessary to decide beforehand on a agreed scheme of signals or verbal instructions to be given by the child (e.g. the pupil points at the target on the screen and the teacher uses the mouse to click on that target). Alternatively, a touch screen, which plugs into the mouse port, may be used instead of the mouse.

In some cases a pupil may be slow on a LASS test because they are finding it hard — i.e. the cognitive load is high. However, if the test is *far too difficult* the pupil may appear very speedy because responses are being made at random. Such situations should happen rarely in LASS, because the tests are mainly adaptive, i.e. they automatically adjust to the pupil's ability level.

Sometimes the distinction between pupils who are slow in using the mouse (perhaps because of inexperience or lack of confidence) and those with more serious motor co-ordination difficulties may be tricky for the teacher. Pupils with motor co-ordination problems used to be called 'clumsy pupils' (Gubbay, 1975) but are now officially described as having 'Developmental Co-ordination Disorder' (DCD) (American Psychiatric Association, 1994). They are pupils who have some difficulty in performing skilled, purposive movements, which cannot be attributed to mental abnormality or physical deformity. In adults who have acquired such problems (typically due to stroke or head injury) the term 'apraxia' is normally used, 'praxis' being defined as the ability to manipulate and deal intelligently with objects in the environment (Ayres, 1985). Thus in pupils who have similar problems, the related term dyspraxia (or developmental dyspraxia) is also often used.

Developmental dyspraxia covers a range of childhood disorders affecting the initiation, organisation and performance of action (Ayres, 1988; Fisher et al., 1991). However, there is no universal agreement amongst neuropsychologists and neurologists about the categorisation of such problems because dyspraxic pupils do not form a homogeneous group. Some seem to have problems more at the planning stage of skilled action, others more with the execution of actions. Furthermore, successful actions must usually be underpinned by a number of visual processes as well as motor ones and it may be the case that these visual processes are faulty as well as (or instead of) the motor ones (Lord and Hulme, 1987).

Assessment of dyspraxia can cover a very wide range of tasks, including manipulation of small objects, shape copying by drawing, imitating and repetition of actions and postures, ability to co-ordinate arms and legs together, throwing, catching, jumping and skipping. Both large and small muscles may be involved, as well as fast and slow actions. Well-known tests of motor co-ordination include the Test of Motor Impairment (Stott et al., 1984) and the Movement ABC (Henderson and Sugden, 1992). Scores are sometimes averaged to give a 'motor age' but this is not usually very useful, because it is possible for a pupil to have a co-ordination difficulty in one area and not another. Thus a limited range of tasks may fail to identify a real difficulty and an overall measure may be misleading (Anderson and Fairgrieve, 1996; Beardsworth and Harding, 1996).

For the above reasons, the incidence of DCD is difficult to establish with any certainty. Figures vary according to the procedures used to assess the pupils. Reviewing this, Hoare and Larkin (1991) conclude that it is safe to assume that about one pupil in 10 has co-ordination difficulties, although these will vary in severity. Studies generally report a higher incidence in boys than in girls (Piek and Edwards, 1997). Evidence provided by Knuckey and Gubbay (1983) suggests that some young pupils with observed DCD have a delay in maturation and will eventually 'grow out of it'. Labelling such pupils 'clumsy' at an early age may consequently be harmful. On the other hand, several recent studies indicate that long-term effects of DCD are common, including continuing motor difficulties as well as a variety of social, educational and emotional problems (see Piek and Edwards, 1997 for a review). Because of this, many educationalists now believe that it is desirable to identify pupils with DCD as early as possible in their school lives, because it may affect their educational progress, and as such come within the heading 'Special Educational Needs'. The *Code of Practice for the Identification and Assessment of Special Educational Needs* (DfE, 1994) states that schools should take all reasonable steps to identify and

address such needs as early as possible in the pupil's school career. The *Code* includes 'clumsiness' within the general category of 'specific learning difficulties', which also includes dyslexia.

For an overview of the current state of knowledge on motor coordination disorders in children, see Sugden and Wright (1998). Guidance on assessing motor organisation and dyspraxia is given by Chapman and Ripley (1999). General advice for teachers and parents is provided by Ripley, Daines and Barrett (1997).

2.3.17 Pupils with Attention Deficit Hyperactivity Disorder (AD/HD)

'Attention Deficit Hyperactivity Disorder' (AD/HD) is the medical term for pupils who, in the past, would have usually been called 'hyperactive'. The *Diagnostic and Statistical Manual of Mental Disorders* — DSM–IV (American Psychiatric Association, 1994) distinguishes three types of ADHD:

- Type 1: the pupil with AD/HD who is predominantly inattentive
- Type 2: the pupil with AD/HD who is predominantly hyperactive and impulsive
- Type 3: the pupil with AD/HD who is *both* inattentive *and* hyperactive/impulsive

In the World Health Organisation's *International Classification of Diseases* — ICD–10 (WHO, 1990), the term 'Hyperkinetic Disorder' corresponds to DSM-IV type 3. It can be seen that the symptoms of AD/HD do not just concern hyperactivity — i.e. restlessness, difficulty with sitting still, excessive movement or fidgeting. Rather, such pupils are equally, or even more, likely to have problems in sustaining attention on the task in hand, inhibiting impulsive responding, and generally in regulating and controlling behaviour. The causes of AD/HD are uncertain, but the evidence for a biological basis is strong, with pre-natal and birth complications being most frequently cited in the research literature. Evidence for AD/HD being *due* to food allergies is rather weak, but there is some evidence that hypersensitivity to aspects of nutrition (e.g. sugars and food additives) can be a feature in individual cases of AD/HD (Hinshaw, 1994). There is considerable national variation in the incidence of AD/HD, which largely reflects differences in culture and diagnostic criteria. In the US, incidence is reported to be between 3 – 8% of pupils, while in the UK it is only about 0.5% (Barkley, 1990). Approximately 35% of pupils with diagnosed AD/HD have delays in reading, spelling, writing, and/or mathematics. Obviously these learning problems could be the result of poor attention and concentration in the learning situation (i.e. an *indirect* effect of AD/HD). In addition it has been suggested that pupils with AD/HD have problems with working memory, which affects learning *directly*, because information is not stored properly nor is it retrieved fluently and reliably. Treatment for AD/HD usually involves a combination of psychological methods (e.g. behaviour modification) and pharmacological methods (e.g. use of the drug *Ritalin*), but good educational management and committed parent involvement is crucial (Goldstein and Goldstein, 1990, 1992).

Pupils with AD/HD are liable to experience difficulty with many types of assessment (not just computerised assessment) because of inattention and impulsiveness in responding. In cases of AD/HD pupils, teachers should therefore be prepared to take such factors into consideration when interpreting the results of LASS tests. On the other hand, LASS tests are typically found to be more stimulating that conventional tests, so pupils with AD/HD will generally remain engaged and attentive for longer than might be expected. To maintain engagement and interest, however, and ensure that results are as reliable as possible, it is recommended that only one test per session should be administered to pupils with AD/HD. Particular care should be taken when administering the **Haunted Cave** as the child needs to watch the screen carefully to notice whereabouts the phantoms appear. Lapses in concentration and attention would be particular expected to affect this test.

For practical guidance on identifying and teaching children with AD/HD, the book by Cooper and Ideus (1996) is recommended.

2.4 The Report Generator

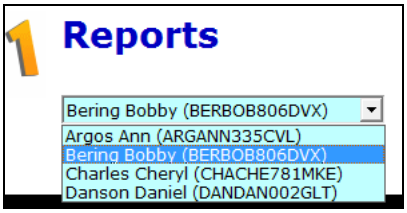
2.4.1 How the results are displayed

All scores are saved automatically to a database on completion of each test. The data saved also includes the date and time the test was completed. **If a test has been abandoned before completion, then no results will be saved for that test.**

Reports are calculated real time (at the time of access or viewing) so that if any information has changed it will be incorporated in the current displays.

The *Report Generator* can be entered by clicking on the **Report** button from the *Main menu*. Select the appropriate pupil from the pull down pupil list (see Figure 1) by clicking on the down arrow button and highlighting the pupil you want.

Figure 1 Select pupil

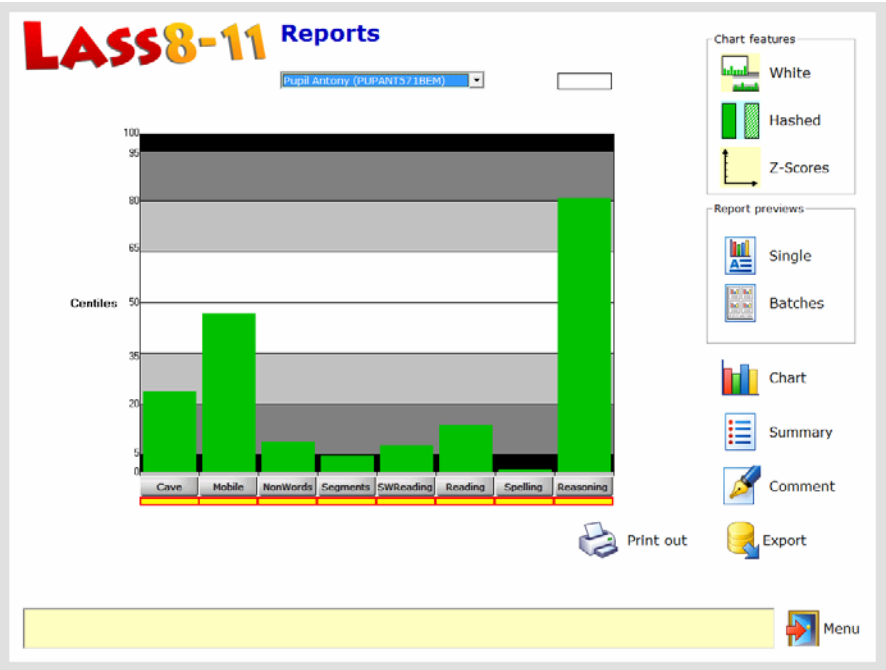


Performance of each test can be viewed in a variety of ways. Results are indicated in the *Summary table*, the *Data tables*, or the *Graphical Profile.*

2.4.2 The Graphical Profile

The *Graphical profile* (see Figure 2) automatically charts the individual pupil's performance against those of the norm referenced group, which is based on the pupil's age in the following bands: 8:0 – 8:11; 9:0 – 9:11; 10:0 – 10:11; 11:0 – 11:11. The *Graphical Profile* can be viewed in either centile scores or standard deviation units, with the former being the default. If bars are missing from any of the tests represented on the bar chart there are two explanations: (a) the pupil has not attempted that test, or (b) the pupil did not *complete* that test.

Figure 2. Graphical Profile.



2.4.2.1 Centile scores

Here the pupil's score is shown with reference to the population norms in centile units (sometimes referred to as 'percentile' scores), which range from 1 to 99. A centile score of 63, for example, means that the pupils' score lay at the point where 63% of the population scored less, and 37% scored more. For further explanation of centile scores see Section 4.1.2).

2.4.2.2 Z scores

These can be viewed by selecting the **Z-Scores option**. The score is shown with reference to the population norms in standard deviation units. The Z-scores are converted directly from the centile scores maintaining a normal distribution. A standard deviation of +1.0 signifies that the pupil's score was one standard deviation above the mean of the statistical population. These charts may be of greatest interest to a trained psychologist or others familiar with working with standard deviation units, but can be used by teachers and others who wish to determine whether or not a difference between two test results is statistically significant. For further explanation of z scores see Section 4.1.3).

2.4.3 Data tables

Tables are split into the Summary Table of results and the individual Data Tables for each test.

2.4.3.1 Summary Table

The Summary Table (see Figure 3) is viewed by selecting the **Summary icon** and will show all the scores obtained for each test completed, including age equivalents and discrepancies. To return to the Graphical Profile press the **Chart** button. For further explanation of age equivalents see Section 4.1.5, and for discrepancies see Section 4.1.6.

Figure 3. Summary Table.

Test Summary for [redacted]

A	B	C	D	E	F	G	H	I
Test name	Score	Centile	Z Score	ZScore diff	discrepancy	Test date	Age at test	Age equiv. range
Cave	28	78	0.772	1.03	Not significant	02/11/2004	8 y 3 m	10y 6m - 10y 11m
Mobile	6	39	-0.279	0.03	Not significant	04/11/2004	8 y 3 m	8y 6m - 8y 11m
NonWords	15	34	-0.413	0.16	Not significant	11/11/2004	8 y 3 m	8y 0m - 8y 5m
Segments	32	94	1.555	1.81	Not significant	18/11/2004	8 y 3 m	10y 6m - 10y 11m
SWReading	38	18	-0.915	0.66		11/11/2004	8 y 3 m	Not applicable
Reading	58	55	0.126	0.38	Not significant	11/11/2004	8 y 3 m	8y 6m - 8y 11m
Spelling	43	9	-1.341	1.09	- (p < 0.01)	11/11/2004	8 y 3 m	< 8y 0m
Reasoning	29	40	-0.253			02/11/2004	8 y 3 m	8y 0m - 8y 5m

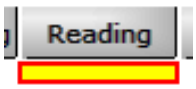
Figure 4. Example Data Table for Reading test.

A	B	C	D	E
Probes	Correct word	Word chosen	Performance	
1	see	see	1	
2	paint	paint	1	
3	alphabetically	arithmetically	0	
Test item				
32	might	might	1	
33	reach	reach	1	
34	above	above	1	
37	learn	learn	1	
38	rose	rose	1	
39	peaceful	peaceful	1	
42	ignore	loud	0	
43	generous	onerous	0	
44	habitat	habituate	0	
35	plate	plate	1	
36	rock	rock	1	
40	abroad	broad	0	
		Items correct	8	
		Projected score	35	
		Population mean	70.19	
		Population standard deviation	15.52	
		Centile score	4	
		Completion time	0:53	
		Age equiv. range	8y 0m - 8y 5m	

2.4.3.2 Data Tables

Individual responses to each item are recorded and can be viewed in the Data Tables, which provide much more detailed analyses of the pupil's responses. These are accessed by clicking on the test name button at the bottom of the bar as shown on the Graphical Profile.

For example, in order to view the Data Table for Reading click on the appropriate test name from the Graphical profile screen (see the illustration on the right).



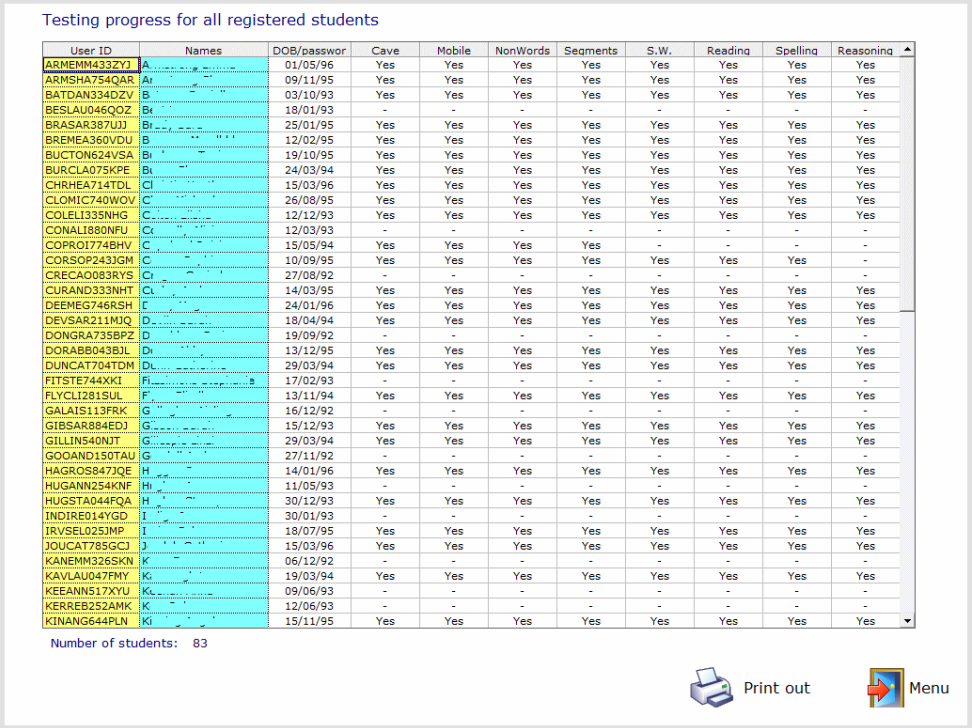
An example Data Table for the Reading test is shown in Figure 4. The column widths may be altered by hovering the mouse pointer over the column border, waiting for the mouse pointer to change to the appropriate indicator, then clicking and dragging the column width to the desired place. To return to the Graphical Profile click on the **Chart** button.

A Data Table is available for each of the eight tests (if attempted) and can be printed out. Projected Scores are scores derived from raw scores by an algorithm based on the item analysis. They represent the score the pupil would be predicted to obtain statistically if s/he had attempted the test in conventional (as opposed to adaptive) format. Projected Scores (not raw scores) should be used when calculating age equivalents (see Section 4.3).

2.4.4 Monitoring the testing progress of the class

It is possible to display the testing progress of all registered pupils in the LASS 8-11 database by selecting the **Testing progress** button on the *Administration Module* Main Menu. This opens a *Testing Progress Table* (see Figure 5 below). The pupils' names are shown down the table with the tests across the top. 'Yes' indicates that the pupil has completed the test and a dash indicates that the test has not been completed. To return to the previous screen click on **Back**.

Figure 5 - Testing progress screen



2.4.5 Printing out results

Graphical profiles can be viewed and then printed out via the *Print Preview* screen by choosing the item ***Single*** (for one report) or ***Batches*** (for up to 8 thumbnail reports) in the *Report previews* panel (figure 1). Raw Data tables or Summary tables which are displayed on the Report screen can be printed out directly by clicking on the ***Print out*** icon.

2.4.6 Copying LASS 8-11 results to another application

LASS 8-11 Data Tables, Summary Tables and Testing Progress Tables may be copied to other applications such as word processors, spreadsheets etc. The user must first make the selection of the information they wish to copy. This is done by clicking and holding down the mouse button on the first cell of the selection. Whilst still holding down the mouse button drag the mouse pointer to the last cell of the selection which you wish to copy. Once this is done you will see the block of text is highlighted. Press the **Ctrl** and **C** keys together to copy this selection. Start the other Windows application (e.g. word processor or spreadsheet program) and go to the place where you wish to “paste” the selection. Press the **Ctrl** and **V** keys together to paste the selection.

3 Principal applications of LASS 8-11

3.1 Introduction

LASS 8-11 is a *multifunctional* assessment instrument with the following principal applications:

- routine profiling of pupils' abilities
- screening for special educational needs
- diagnosis and assessment of specific learning difficulties and dyslexia
- monitoring of literacy progress for all pupils
- evaluation of response to intervention

The following subsections outline the suggested ways in which LASS 8-11 can be used for these applications.

3.2 Routine profiling

Many primary schools routinely assess the general abilities of all pupils — especially in verbal and non-verbal abilities — but sometimes in literacy attainment as well as mathematics and quantitative reasoning skills. LASS 8-11 can fulfil several of these functions, including the non-verbal ability and literacy attainment components. When used for this purpose, it would not normally be necessary to administer the modules assessing memory (***The Haunted Cave*** and ***Mobile***) or phonological skills (***Funny Words*** and ***Word Chopping***), because these are essentially diagnostic tests.

3.3 Special educational needs screening

LASS 8-11 also provides schools with a straightforward screening system for special educational needs, which can be an adjunct to routine assessment or used at any time between the ages of 8:0 and 11:11. When used for this purpose, pupils who gain low scores on any of the routine profiling modules (***Reasoning, Single Word Reading, Sentence Reading*** and ***Spelling***) or who display a significant discrepancy between their scores on ***Reasoning*** compared with their score(s) on ***Single Word Reading, Sentence Reading*** or ***Spelling,*** would automatically be administered the diagnostic modules. The procedure then becomes the same as for diagnosis and assessment of specific learning difficulties and dyslexia (see below). Details of calculating discrepancy and determining thresholds for low scoring are provided later in this section.

3.4 Diagnosis and assessment of specific learning difficulties and dyslexia

3.4.1 Dyslexia and its impact on learning

It is not possible here to give a detailed account of the nature of dyslexia. Readers are recommended to consult any one of a number of reputable texts, including Miles (1993), Reid (1998), Snowling (2000)

and Thomson (1993). The genetic and neurological bases of dyslexia are now well established and are reflected in current definitions of the condition. For example, the International Dyslexia Association (formerly the Orton Dyslexia Society) published the following definition of dyslexia:

> *"Dyslexia is a neurologically-based, often familial disorder which interferes with the acquisition of language. Varying in degrees of severity, it is manifested by difficulties in receptive and expressive language, including phonological processing, in reading, writing, spelling, handwriting and sometimes arithmetic. Dyslexia is not the result of lack of motivation, sensory impairment, inadequate instructional or environmental opportunities, but may occur together with these conditions. Although dyslexia is life-long, individuals with dyslexia frequently respond successfully to timely and appropriate intervention"* (Orton Dyslexia Society, 1994).

Dyslexia is a variable condition and not all people with dyslexia will display the same range of difficulties or characteristics. Nevertheless, the following characteristics have been widely noted in connection with dyslexia.

- A marked inefficiency in the *working or short-term memory system*, which is regarded by many experts in the field as the fundamental underlying difficulty experienced by people with dyslexia (e.g. Beech, 1997; McLoughlin, Fitzgibbon and Young 1993; Rack, 1997). Memory difficulties may result in problems of retaining the meaning of text (especially when reading at speed), failure to marshal learned facts effectively in examinations, disjointed written work or an omission of words and phrases in written examinations, because pupils have lost track of what they are trying to express.
- Inadequate *phonological processing abilities*, which affect the acquisition of phonic skills in reading and spelling so that unfamiliar words are frequently misread, which may in turn affect comprehension. Not only has it been clearly established that phonological processing difficulties are seen in the majority of children with dyslexia (e.g. Snowling, 1995), but recent research has also indicated that this occurs in many adults with dyslexia (see Beaton, McDougall and Singleton, 1997a).
- *Difficulties with motor skills or coordination.* Nicolson and Fawcett (1990, 1994) have noted that people with dyslexia can show a particular difficulty in *automatising skills*. Examples of failure to automatise skills in the pupil's situation might be the inability to listen with understanding while taking adequate notes, or the inability to concentrate on both the spelling and the content of written work. *Dyspraxia* is the generic term used to cover a heterogeneous range of disorders affecting the initiation, organisation and performance of action (Ayres, 1985; Fisher et al, 1991; Ripley et al, 1997). In childhood it is sometimes referred to as developmental coordination disorder (DCD). Pupils with dyspraxic difficulties are likely to have problems with handwriting, especially when writing for lengthy periods or under conditions of time pressure. It should be noted that by no means all pupils with dyslexia will necessarily have dyspraxic difficulties.
- A range of problems connected with *visual processing,* which can affect reading generally, but especially when dealing with large amounts of text. Such problems can include *binocular instability* and susceptibility to *visual discomfort* (see Evans, 1997; Evans, Drasdo and Richards, 1996; Stein, Talcott and Witton, 2001; Wilkins, 1991, 1995). *Visual discomfort* is a generic term for the effects of hypersensitivity to the irritating effect of strong visual contrast or rapid flicker (e.g. where parallel lines of text create the appearance of a black-and-white grating or consciously or subconsciously perceived flicker of fluorescent lighting or some computer monitors). Movement and colour illusions can be perceived, or the text may appear unstable or obscured. Reading for any length of time may cause headaches and eyestrain, and so can be done only in short bursts, which can disrupt the comprehension process. In some medical conditions (e.g. epilepsy and migraine) susceptibility to visual discomfort is generally more extreme than is usually seen in cases of dyslexia (Wilkins, 1995). It should be noted, however, that although there appears to be a statistical association between dyslexia and visual discomfort, *not all* persons with dyslexia are highly susceptible to visual discomfort and *not all* persons who suffer from visual discomfort will necessarily exhibit the typical characteristics of dyslexia outlined above. There is evidence that use of coloured overlays or filters (e.g. acetate sheets or tinted lenses) can be beneficial in alleviating

the symptoms of visual discomfort in a fair proportion of cases (Irlen, 1991; Wilkins, 2003; Wilkins et al, 1994, 2001; Whiteley and Smith, 2001).

3.4.2 Theories of dyslexia

The term 'specific learning difficulty' (which for a generation or more has been preferred by many educational psychologists to the term 'dyslexia') means little more than a discrepancy between ability and attainment. The principal difference between 'dyslexia' and 'specific learning difficulty' is that dyslexia presupposes the existence of certain cognitive deficits which are believed to underpin the condition. Such cognitive deficits (e.g. in phonological processing, memory, visual processing, or motor co-ordination) are believed to be either inherited or due to neurological anomalies which have arisen before (or during) birth or in early childhood.

There are several theories of dyslexia, which space precludes a detailed discussion of here. There is little disagreement that the condition is a neurological one, and that it has genetic causes in most cases (see Fisher and Smith, 2001). However, the exact neurological and cognitive mechanisms are still the subject of widespread research and theoretical debate (see Frith, 1997). The predominant theory is that dyslexia is due to a fundamental deficiency in the processing of phonological information — this is usually referred to as the Phonological Deficit Theory (Rack, 1994; Rack, Snowling and Olson, 1992; Snowling, 1995). This theory is supported by a wealth of research evidence (for reviews see Snowling, 2000; Vellutino et al, 2004) but is complicated because it does not explain *all* the phenomena associated with the condition (see previous section). The 'Double Deficit' Theory (see Wolf and O'Brien, 2001) proposes that in addition to phonological deficits, dyslexic individuals have inherent problems in processing information at speed, which interferes with many cognitive activities, including reading and writing. Prominent alternative theories include the Magnocellular Deficit Theory (see Stein, Talcott and Witton, 2001), the Cerebellar Deficit Theory (see Fawcett and Nicolson, 2001), both of which have less evidence in support, but which address particular aspects of the condition that demand further research. Of course, it may turn out that there are distinct subtypes of dyslexia, for which different causal theories may be applicable (see Stanovich, Siegel and Gottardo, 1997).

3.4.3 LASS 8-11 profiles and dyslexia

The chapters that follow show how LASS 8-11 profiles can be used very effectively to identify dyslexia in most cases. It can be seen the composition of the LASS tests corresponds to the phonological deficit model more closely than it fits the alternative models of dyslexia. Hence it should be expected that LASS will be at its most effective in identifying students with the 'classic' form of dyslexia — which includes by far the majority of the group — characterised by cognitive difficulties that most notably affect the mapping graphemes on to phonemes. But LASS 8-11 is actually rather broader in its scope that first might meet the eye. Since it includes a measure of visual memory measures, LASS is also adept at picking up 'atypical' cases of dyslexia where, instead of phonological deficits predominating, instead, the chief problem concerns visual memory. (Note, however, that it will not necessarily pick up children with other types of visual processing difficulties — such as susceptibility to visual stress — for which children may need to be referred to an eye clinic for further investigation; see Evans, 2001; Wilkins, 2003). Thus in various ways LASS 8-11 encompasses a wide range of psychological correlates of dyslexia which have theoretical support from different camps and consequently as an all-round screening and assessment tool it is hard to beat.

3.4.4 The pros and cons of the discrepancy approach

The conventional approach to identifying dyslexia is based on the principle of cognitive discrepancy (see Singleton, 1987), which maintains that a significant discrepancy between intelligence and literacy skills is *prima facie* evidence for specific learning difficulty; and where such discrepancy has been found, if there is also evidence of cognitive deficits in memory and/or phonological processing, this is *prima facie* evidence for dyslexia. Other evidence, such as a family history of similar difficulties, developmental

history of speech or language problems, or particular difficulties — e.g. in acquiring phonics — would support such a conclusion.

This model – which is similar to that advocated by Pumfrey and Reason (1991), Rack (1997), Thomson (1993) and Turner (1997) – embodies the view that diagnosis of dyslexia is based on the notion of *discrepancy* between what the pupil *is* achieving in literacy and what they can reasonably be *expected* to achieve on the basis of age and intellectual ability. It is assumed that the pupil has experienced normal education and that the problems are not primarily due to any emotional or medical cause. This discrepancy accounts for the fact that dyslexia is typically characterised by serious and unremitting literacy problems in children who otherwise would be expected to make reasonable progress in the acquisition of literacy.

It should also be noted that the discrepancy criterion has also come under attack in recent years (e.g. Ashton, 1996; Frederickson and Reason, 1995; Nicolson, 1996; Siegel, 1989a, 1989b, 1992; Solity, 1996; Stanovich, 1991a, 1991b; see also Turner, 1997). One problem is that it is difficult to establish that a significant discrepancy exists if the child is of below average intelligence. Yet, in principle, being a constitutional condition, dyslexia can affect children of *all* abilities (Singleton, 1987). Furthermore, such an approach relies on waiting for the child to fail, often over many years, before action is taken. Another complication is that few, if any, real differences exist in the literacy difficulties manifested by children who do and do not display significant IQ–achievement discrepancies (Stanovich, 1991a, 1991b; Stanovich, Siegel and Gottardo, 1997).

It is well accepted that the discrepancy criterion is problematic when it comes to *early* identification of dyslexia (Fawcett, Singleton and Peer, 1998; Singleton, 1988), which has led to the development of alternative systems such as *Lucid CoPS* (Singleton, Thomas and Leedale, 1996, 1997), *DEST* (Nicolson and Fawcett, 1996), and *PhAB* (Frederickson, Frith and Reason, 1997). However, in the assessment of older pupils or adults, the abandonment of the discrepancy criterion is more controversial. A report of a working party on identification of dyslexic pupils, set up by the Division of Educational and Child Psychology of the British Psychological Society, noted that the discrepancy model is vulnerable to criticism on theoretical grounds and advocated a more global approach to assessment (British Psychological Society, 1999b). Nevertheless, in the classroom, it is often the case that *discrepancy* between a pupil's expected levels of attainments (based on judgements of their overall ability) and their actual attainments (especially in reading, writing and spelling) are what first draw a teacher's attention to the possibility that the pupil may have dyslexia. It therefore seems premature to abandon altogether the notion of discrepancy. Rather, discrepancy can usefully be regarded as part of the overall evidence on which a teacher makes a judgement. For these reasons, LASS 8-11 has been developed in such a way that teachers who wish to use a discrepancy approach can do so, but this does not mean that it has to be used in a manner dictated by that model.

3.5 Monitoring of literacy progress

The two main literacy modules in LASS (***Sentence Reading*** and ***Spelling***) are both adaptive tests that can be used at regular intervals to monitor progress. The minimum interval between administration of the same module on a second or subsequent occasion should be about 4 months (i.e. other than in exceptional circumstances, LASS 8-11 should not be given more than once in a school term).

3.6 Evaluation of response to intervention

When a particular problem (e.g. specific learning difficulty or dyslexia) has been identified and intervention, such as specialist teaching, has been implemented, teachers will naturally wish to evaluate the pupil's response to that intervention. LASS can be used for this evaluation, again bearing in mind that the minimum interval between administrations of any given LASS module should be about 4 months (i.e. other than in exceptional circumstances, LASS should not be given more than once in a school term).

The literacy attainment modules (especially ***Sentence Reading*** and ***Spelling***) are obvious candidates for use in this process, but ***Funny Words*** may also be used to monitor development of phonics skills. It is unlikely that the ***Reasoning*** module would need to be repeated (little change would be expected on this module) unless there were suspicions that the first assessment using ***Reasoning*** had given an unreliable result (e.g. because the pupil was unwell or was greatly lacking in confidence, or misunderstood the requirements of the task). The memory modules (***The Haunted Cave*** and ***Mobile***) would be useful for evaluating growth in memorisation ability, especially where a memory training programme has been used.

4 Guidelines on interpretation of results

4.1 Types of scores in LASS 8-11

LASS 8-11 results on each individual test are available in six different forms:

- Raw score
- Projected score
- Centile score
- Z-score (standard deviation units)
- Age equivalent
- Discrepancy

Each of these is described in the following sections and it is important that teachers understand these. Of these different types of scores, centile scores will generally be most useful for teachers, although educational and clinical psychologists may prefer to work with z-scores.

Centile and standard deviation scores are shown in graphical form as bar charts on-screen and both these and the data pages can be printed out if desired. The *Graphical Profile* automatically charts the individual pupil's performance against those of the norm referenced group, which is based on the pupil's age in the following bands: 8:0 – 8:11; 9:0 – 9:11; 10:0 – 10:11; 11:0 – 11:11 (see Section 2.4.2). If required the raw scores and projected scores may be accessed via the on-screen *Data Tables* for each LASS 8-11 test, which also show the means and standard deviations for the population norms of each test, together with the overall time the child took to complete that test in minutes and seconds (see Section 2.4.3.2). Finally, the *Summary Table* shows all the test results for that child (except raw scores), including date of test, age when tested, age equivalents and discrepancies (see Section 2.4.3.1).

4.1.1 Raw scores and projected scores

Raw scores are the number of items the pupil got correct. As the tests on LASS 8-11 are mostly adaptive, this information is not very helpful. Two children may have passed the same number of items, but one child may have done items that are more difficult than those tackled by the other child, so they will not be at the same level of performance. For this reason we need scores that reflect item difficulty, and these are called projected scores. Projected scores are scores derived from raw scores by an algorithm based on the item analysis carried out as part of the standardisation. Projected scores represent the score the pupil is statistically predicted to obtain if the test had been completed in conventional (as opposed to adaptive) format. Unlike centile scores and z-scores, projected scores are not corrected for age. Projected scores (not raw scores) should be used when calculating age equivalents (see Section 4.3).

4.1.2 Centile scores

A centile score (sometimes referred to as a 'percentile score') should not be confused with percent correct. It reflects a pupil's ability on any given test on a scale of 1 to 99 in comparison with other pupils in the reference group (i.e. the norm group or the same age group). Hence the average pupil will obtain centile scores in the middle range (e.g. in the range 35 – 65), whilst an above-average pupil will have centile scores higher than this, and the below-average pupil will have centile scores lower than this. For example, a pupil with a centile score of 5 will be just inside the bottom 5% of pupils for that particular

ability, and a pupil with a centile score of 95 will be just inside the top 5% of pupils for that particular ability.

4.1.3 z-scores

It is not essential for users to understand the statistical principles behind z-scores, and readers who do not have a particular interest in this may wish to skip this section. The following outline is necessarily brief: it is not intended to be a comprehensive tutorial on the subject. Readers who desire to find out more about these ideas are recommended to consult any standard textbook of statistics.

A z-score (also known as a standard deviation unit) is a statistic based on a normal distribution of scores. Most human characteristics are distributed in a normal[2] (or approximately normal) fashion (i.e. a bell shaped curve, sometimes called a 'Gaussian curve'), in which individuals cluster towards the mean (or average) and become less common as one approaches the extremes (or 'tails') of the distribution. The proportion of individuals that will fall in any given portion of a normal distribution can be calculated. For example, two-thirds (66%) of individuals will lie between + or – one standard deviation of the mean, while slightly less than 3% will fall below 2 standard deviations of the mean.

An advantage of z-scores is that they facilitate analysis of the *extremeness* of individual scores or of differences between scores, which are not apparent when using the centile score format. For example, consider the following results:

Centile scores	Reasoning	Sentence Reading	Difference
Pupil 1	60	40	20
Pupil 2	90	70	20

In both cases, the pupils' sentence reading performance is 20 centile points below their reasoning scores. Which (if any) of these is a significant difference, i.e. one that we should take notice of when interpreting results? On centile score difference, both appear to be the identical, so this format does not help us. The same results in equivalent z-score format reveal a different story:

z-scores	Reasoning	Sentence Reading	Difference
Pupil 1	0.25	– 0.25	0.5
Pupil 2	1.6	0.6	1.0

Now it is apparent that the difference between the two scores for Pupil 2 is *twice* the magnitude of the difference between the same scores for Pupil 1. In fact, the former would not be regarded as significant, but the latter certainly would (for further explanation of this see Section 4.1.6). In practice, scores at the tails of the distribution are much rarer than scores in the middle of the distribution, so differences between them will tend to assume greater significance. The z-score format allows us to determine that significance.

4.1.4 Relationship between centile scores, z-scores and standard scores

Centile scores and z-scores have a consistent relationship to each other (and also to standard scores, which, like IQ, are usually expressed with a mean of 100 and a standard deviation of 15). The table below shows this relationship. Many educational tests (e.g. of reading, spelling and numeracy) use standard scores. If you need to compare LASS 8-11 results with the results of other test, you may need to convert z scores into standard scores before making the comparison. To convert a z score to a standard score, multiply the z score by 15 and if the z score was positive, add the result to 100, or if the z score was negative, subtract the result from 100. Conversely, to convert a standard score to a z score divide the

[2] The term 'normal' here is being used in its statistical sense.

difference between the standard score and 100 by 15. The z score will be positive if the standard score was greater than 100, and negative if less than 100.

centile score	3	5	17	20	25	50	75	83	97
z-score	–2.0	–1.75	–1.0	–0.85	–0.66	0	+0.66	+1.0	+2.0
standard score	70	76	85	87	90	100	110	115	130

4.1.5 Age equivalents

The Summary Table also gives the age equivalent score for each test completed. An age equivalent is defined as the chronological age range of pupils that would be expected to achieve a given raw score (or, in this case, projected score). Age equivalents are relatively crude indices of attainment (in comparison with centile scores and z scores) and so should always be used with caution. However, they can be encountered in some tests of reading and spelling and other measures, and so occasionally teachers may wish to compare such test scores with the results obtained from LASS 8-11.

Age equivalents also provide a suitable way of reporting results of children who are outside the age range for LASS. Although as a general rule, LASS 8-11 should not be used outside the age range for which it is normed (8:0 to 11:11) there are circumstances when it is necessary and appropriate, e.g. in the case of a very bright or advanced six-year-old, or a pupil of twelve or over with moderate or severe learning difficulties. Here, the centile norms may not be particularly helpful because they would be comparing the pupil with (in the first example) eight-year-olds, and (in the second example) eleven-year-olds. In such cases, age equivalents can often provide the teacher with more useful information. In fact, some teachers in special education prefer to work with age equivalents rather than centile scores, because it enables them to conceptualise the ability level of the pupil they are teaching, and so pitch the work at the correct level.

Age equivalents are designed to be used only in special circumstances such as those illustrated above and should not be used routinely in cases where centile norms are applicable, because age equivalents give only a very rough approximation of the pupil's ability. Nor should LASS 8-11 be used routinely above the age of 11 years 11 months because there is an assessment suite designed specifically for, and standardised for use with, this older age group, i.e. **LASS 11-15** (for further information visit the website www.lucid-research.com).

4.1.6 Discrepancy

When we observe the scores obtained by any given pupil, we will almost invariably find some differences. Some scores will be higher than others. But how do we determine whether any observed differences are 'significant'?

By 'significant' we mean 'so much poorer than the level that would be expected on the basis of the person's age and intelligence that the discrepancy is unlikely to be due to normal variation within the population or to chance'. What is important is not so much the *absolute* level of the pupil's performance but rather the *degree of discrepancy* between their observed literacy skills and the level of literacy ability that we would reasonably *expect* such pupils to have. The conventional way in which psychologists make valid comparisons between performance on different tests or measures is by reference to standardised scores (such as centiles or standard deviation units), which have a clear rationale in psychometric test theory and practice.

On the other hand, poor literacy and/or study skills *may* also be the result of inadequate teaching or insufficient learning and/or experience and *do not necessarily* imply that the pupil has dyslexia. Establishing a discrepancy, as well as seeking evidence of neurological anomalies or cognitive impairments, helps the assessor to rule out these environmental factors as primary causes of the pupil's problems. However, the discrepancy model of identification should not be used blindly: it should be part of a more extensive process by which the assessor seeks to build up an understanding of the individual's difficulties based on quantitative and qualitative evidence.

There is an ongoing scientific debate about the role of intelligence in dyslexia (e.g. Ashton, 1996; Frederickson and Reason, 1995; Nicolson, 1996; Siegel, 1989a, 1989b, 1992; Solity, 1996; Stanovich, 1991; Turner, 1997). Some researchers argue that other types of discrepancy have better diagnostic value (e.g. between *oral* language abilities and *written* language abilities, or between *listening* comprehension and *reading* comprehension), although these could be problematic in cases of dyslexic individuals who have developed effective strategies for compensating for reading and writing difficulties. Others suggest that identifying those with chronic difficulty in phonological processing would be the most efficient way of diagnosing dyslexia (Snowling et al, 1997), although by no means all dyslexics seem to have phonological difficulties (Rack, 1997). For further discussion of these issues, see Section 3.4.4.

LASS 8-11 automatically calculates whether or not there is a statistically significant discrepancy between the ***Reasoning*** score and the other scores. First of all, it works out the difference between the z scores, and then determines whether this difference is statistically significant. By convention, statistical significance is shown as the probability [p] of the result occurring by chance, e.g. if the obtained result could occur by chance fewer than 5 times in every 100 occasions, this would represent a 5% level of significance (also sometimes depicted as $p < 0.05$ because the probability statistic p can vary between 0 [never occurs] to 1.0 [always occurs]). In other words, on 95 out of 100 occasions such a result would reflect a *true difference*, as opposed to a *chance variation*.) Correspondingly, the 1% significance level indicates that the obtained result would be expected to occur by chance less than once in every 100 occasions, and the 0.1% significance level indicates that the obtained result would be expected to occur by chance less than once in every 1000 occasions.

However, teachers should not assume that when a given discrepancy is found to be statistically significant this automatically means that the given test score is significantly lower than the ***Reasoning*** score, because the discrepancy might be in the other direction (in other words, the child's reading, or spelling, or memory or whatever, is actually much better than would be expected from their non-verbal reasoning ability). If the given test score is significantly poorer than the ***Reasoning*** score the z score difference will be shown as positive, but if the given test score is significantly better than the ***Reasoning*** score the z score difference will be shown as negative. Teachers should check this by noting whether the number shown in the z score difference column is negative or (−) or positive (no sign shown).

LASS 8-11 does not automatically calculate other discrepancies (e.g. between visual memory and auditory memory) but it is a straightforward matter to do this if required. Simple subtract the z scores of the two tests from each other and look up the result in the following table.

z-score difference	**discrepancy**
less than 0.66	not significant
0.67 to 0.99	significant at 5% level ($p < 0.05$)
1.0 to 1.66	significant at 1% level ($p < 0.01$)
greater than 1.66	Significant at 0.1% level ($p < 0.001$)

In the example given earlier, in which a pupil had a ***Sentence Reading*** score of centile 30 and ***Reasoning*** score of centile 85, the z-scores are –0.67 and +1.12, respectively: a difference of 1.79, which is highly significant at the 0.1% level.[3]

[3] Technically, when calculating discrepancies between scores on psychometric tests, allowance should be made for the statistical phenomenon known as 'regression to the mean'. Regression to the mean is not easy to explain in layman's terms, but it can distort the picture, particularly in cases of children whose scores are near to the extremes on one or other of the tests under comparison. However, to make things as uncomplicated as possible for teachers, the probabilities specified in the table have been set at very conservative levels which in most cases should suffice to compensate for any likely regression effects.

4.2 Interpreting scores and profiles

4.2.1 Critical thresholds

How low must a LASS 8-11 individual module result be before the teacher should be concerned about the pupil's performance? Put another way: what is the critical cut-off point or threshold that can be used when deciding whether or not a given pupil is 'at risk'? Unfortunately, this is not a question that can be answered in a straightforward fashion, because much depends on other factors. These include: (a) the particular LASS test undertaken, (b) whether the results of other individual LASS tests confirm or disconfirm the result being examined, (c) the age of the pupil being tested, and (d) the school's or LEA's own SEN criteria or thresholds.

Conventional SEN thresholds are: below 20th centile (i.e. the '1 pupil in 5' category) and below the 5th centile (the '1 in 20' category). At one time, it was maintained that Statements of Special Educational Needs under the *1981 Education Act* would be appropriate for only about 2% of pupils. Experience has shown that this, in general, is far too restrictive and concentrating just on the lowest 2% will result in many pupils with special educational needs being overlooked.

Any individual LASS module result which falls *below the 20th centile* (i.e. near or below *one* standard deviation below the mean) is by definition significantly below average and thus indicates an area of *weakness*. This is a fairly conventional cut-off point in identifying special needs or moderate educational weaknesses. A pupil who falls below this threshold should always be *considered* for intervention of some kind, depending on other factors (see below). Sometimes a weakness is identified which can be remedied by appropriate training. In some cases the problem is more pervasive and requires a differentiated approach to teaching in basic skills. Where there is strong confirmation (e.g. a *number of related tests* at or below the 20th centile) then the assessor can be convinced that concern is appropriate.

Where a pupil is scoring *below the 5th centile* on any particular module (near or below *two* standard deviations below the mean), this generally indicates a *serious difficulty* and should always be treated as diagnostically significant, and usually this will be a strong indication that a pupil requires intervention. Again, where there is strong confirmation (e.g. a *number of related tests* at or below the 5th centile) then the assessor can be even more confident about the diagnosis.

However, it should not be forgotten that LASS is also a *profiling* system, so when making interpretations of results it is important to consider the pupil's *overall profile.* For example, a centile score of 30 for reading or spelling would not normally give particular cause for concern because it does not fall below the 20th centile threshold. But if the pupil in question had a centile score of 85+ on the reasoning module, there would be a significant discrepancy between ability and attainment, which *would* give cause for concern. How this is calculated is described below.

It should also be noted that the ***Single Word Reading*** test is the only test in the LASS 8-11 suite for which scores are not distributed in a normal curve. In fact, there is a significant negative skew, indicating that most pupils will achieve a maximum or near-maximum performance (in statistical terms this is sometimes referred to as a *'ceiling effect'*). The ***Single Word Reading*** test does not have sufficient sensitivity to discriminate amongst pupils within the average range, and so it should be confined to use with pupils who are *significantly behind* in reading development, either to determine their attainment level or evaluate progress.

4.2.2 Understanding profiles

When considering LASS 8-11 results, it is important to bear in mind that it is not one test which is being interpreted, but the performance of a pupil on *a number of related tests*. This is bound to be a more complex matter than single test interpretation. Hence the normative information (about how a pupil is performing relative to other pupils of that age) must be considered together with the ipsative information (about how that pupil is performing in certain areas relative to that same pupil's performance in other areas). The pattern or profile of strengths and weaknesses is crucial. Where appropriate, the teacher can calculate statistical discrepancies between the child's scores on different tests if desired, but in most

cases visually examining the profiles will usually give sufficient indication of the areas where a child is underperforming in relation to other scores. This particular skill improves with experience, so teacher's should not be discouraged if at first it seems overly complex.

However, it is *not* legitimate to average a pupil's performance across all tests in order to obtain a single overall measure of ability. This is because the modules in LASS are measuring very different areas of cognitive skill and attainment. It would be like adding the length of a person's legs to their waist measurement in order to obtain a size for a pair of trousers. The trousers would be unlikely to fit very well!

On the other hand, where scores in *conceptually similar areas* are *numerically similar*, it is sometimes useful to average them. For example, if scores on the two memory modules ***(The Haunted Cave*** and ***Mobile)*** were at similar levels, it would be acceptable to refer to the pupil's memory skills *overall*, rather than distinguishing between the two types of memory being assessed in LASS (i.e. visual memory and auditory-verbal memory). On the same basis, if scores on the two phonological modules ***(Funny Words*** and ***Word Chopping)*** were at similar levels, it would be acceptable to refer to the pupil's phonological skills *overall*. Note that this applies only to conceptually similar areas and where scores are numerically similar (within about 10 centile points of each other). It would not be legitimate to average scores across conceptually dissimilar modules (e.g. ***Reasoning*** and ***Funny Words***). When scores are dissimilar, this indicates a differential pattern of strengths and/or weaknesses, which will be important in interpretation. In such cases it will be essential to consider the scores separately rather than averaging them. For example, if ***The Haunted Cave*** and ***Mobile*** produce *different* results, this will usually indicate that one type of memory is stronger or better developed (or perhaps weaker or less well developed) than the other. This information will have implications for both interpretation and teaching.

Teachers should also remember that the computer is not all-seeing, all-knowing — nor is it infallible. For example, the computer cannot be aware of the demeanour and state of the pupil at the time of testing. Most pupils find the LASS tests interesting and show a high level of involvement in the tasks. In such cases the teacher can have confidence in the results produced. Occasionally, however, a few pupils do not show such interest or engagement and in these cases the results must be interpreted with more caution. This is particularly the case where a pupil was unwell at the time of assessment or had some anxieties about the assessment. Teachers should therefore be alert to these possibilities, especially when results run counter to expectations.

Many LASS profiles display a complex pattern of 'highs' and 'lows' that at first sight appears quite puzzling. When tackling such profiles it is particularly important to bear in mind any extraneous factors that might have affected the pupil's performance. Examine the data to see on what days and times different tests were done. Motivation, ill heath (actual or imminent) and impatience are often causes of a pupil under-performing. Or the pupil may simply have 'got the wrong end of the stick' (e.g. assuming that they have to do a test as quickly as possible when in fact it is accuracy which is most important). Very occasionally it may be found in such cases that the child was simply 'messing around' and not taking the test seriously. The fundamental rule of thumb is: if the teacher is not confident about any particular result, then the safest course of action is to repeat the test(s) in question after first checking that the child does understand the task(s), is not unwell, and has the right frame of mind to attempt the activities to the best of their abilities.

4.2.3 Must pupils be labelled?

Labels for different special educational needs (especially the label "dyslexia") have been unpopular for the best part of a generation. However, labels are not always undesirable, and there are signs of a change of opinion amongst educationalists. Although all SEN pupils are individuals, there are broad categories that are useful in teaching. The *1981 Education Act*, which encouraged a non-labelling approach to special educational needs, was then superseded by the *1993 Education Act* and the *Code of Practice for the Identification and Assessment of Special Educational Needs (DfE, 1994).* It is interesting that the latter embodies a fairly broad labelling of special educational needs categories, including the category 'Specific Learning Difficulties (Dyslexia)' [Code of Practice, 3:60]. This development is an acknowledgement of the fact that SEN labels are often necessary to ensure that the pupil receives the

right sort of support in learning. Application of LASS 8-11 in relation to the *Code of Practice* is discussed in detail in Section 4.4. More recently, the *1996 Education Act* has consolidated the provisions of previous Acts, in particular the 1993 Act.

On the other hand, there is still a need for differentiation of teaching and learning activities within a single category. This is particularly true of the category 'dyslexia' (or Specific Learning Difficulty), in which some pupils may be affected more in the *auditory/verbal* domain, others in the *visual/perceptual* domain, and a few in *both* domains or who may have *motor difficulties*. Hence, dyslexic pupils may exhibit a variety of difficulties and dyslexia has been described as a variable syndrome (Singleton, 1987). Nevertheless, dyslexia is a condition that can usually be helped tremendously by the right type of teaching, even though dyslexic pupils cannot all be taught in exactly the same way (Thomson, 1993; Augur, 1990; Thomson and Watkins, 1990; Miles, 1992; Pollock and Waller, 1994).

Many teachers are justifiably worried that labelling a pupil — especially at an early age — is dangerous, and can become a 'self-fulfilling prophecy'. Fortunately, the LASS approach does *not* demand that young pupils be labelled — instead it promotes the awareness of pupils' individual learning abilities and encourages taking these into account when teaching. Since the LASS graphical profile indicates a pupil's cognitive *strengths* as well as *limitations*, it gives the teacher important insights into their learning styles. In turn, this provides essential pointers for curriculum development, for differentiation within the classroom, and for more appropriate teaching techniques. Hence it is not necessary to use labels such as 'dyslexic' when describing a pupil assessed with LASS, even though parents may press for such labels.

The term 'dyslexia' is often reserved for those pupils who show a significant discrepancy between ability and attainment that is known to be caused by particular cognitive limitations. Dyslexics also tend to show particular patterns of strengths and weaknesses (see Section 3.4). By identifying cognitive strengths and weaknesses it is easier for the teacher to differentiate and structure the pupil's learning experience in order to maximise success and avoid failure. By appropriate early screening (e.g. with ***CoPS Cognitive Profiling System***, or **LASS 8-11**) the hope is that pupils who are likely to fail and who might subsequently be labelled 'dyslexic', never reach that stage because their problems are identified and tackled sufficiently early. (This is not to suggest that dyslexia can be 'cured', only that early identification facilitates a much more effective educational response to the condition.)

It is often satisfactory (especially where younger children are concerned) to explain to the parents that the screening or assessment using LASS reveals the cognitive (or learning) strengths and weaknesses of *all* pupils. If LASS has shown some weaknesses in certain areas for a given pupil the parents may be informed that the school will be addressing those weaknesses with appropriate teaching. Where LASS is being used as an assessment device for diagnosis of older pupils who are already failing in literacy and parents are aware of this (as they should be if the child is already on the SEN register), explanations necessarily have to be more complex. Labels such as 'dyslexic' may become more appropriate and/or unavoidable. Nevertheless, the emphasis should still be on matching teaching to the child's pattern of strengths and weaknesses. The British Dyslexia Association provides advice for teachers and parents on these matters.

4.3 Interpreting results of pupils who are outside the LASS 8-11 norms range

LASS 8-11 is normed for use with pupils in the age range 8 years 0 months to 11 years 11 months. Over the age of 11:11, LASS 8-11 raw scores will not conform to a normal distribution because many pupils will achieve a maximum or near-maximum performance (in statistical terms this is sometimes referred to as a *'ceiling effect'*). Similarly, below 8:0, most pupils will obtain very low scores on the LASS 8-11 tests, which will create a bunching of scores at the lower end of the distribution (sometimes called a *'floor effect'*). When ceiling and floor effects occur in any test, it is not a good discriminator between pupils with differing abilities.

The norms for LASS 8-11 only extend to 11:11, so it can only be used *psychometrically* (i.e. to compare a given pupil's performance with that of other pupils of the same age) up to that age. However,

over this age range it can have a certain limited value if used *clinically* (i.e. to identify pupils with particular difficulties), or *ipsatively* (i.e. to compare a given pupil's performance on one test with the same pupil's performance on another). When employed in this way with older individuals, it should always be used with *extreme caution*, and then only by experienced professionals who fully appreciate the limits within which they are working. Many older individuals with significant cognitive problems (e.g. dyslexia) are likely to experience difficulties on some LASS tests. Nevertheless, this is not *necessarily* the case. When used with older individuals, absence of any indications of difficulty on LASS tests must *never* be taken as evidence that there *are no* underlying difficulties because the tests may just not be sensitive enough. In any case, older persons typically develop strategies by which they can compensate for any cognitive limitations, and these can have a masking effect, preventing any limitations from showing up in assessments.

The preferred solution to assessment of pupils older that 11 years 11 months is to use **LASS 11-15** (11:0 – 15:11). Pupils younger that 8:0 should be assessed with **CoPS Cognitive Profiling System**. For information on these assessment products, contact Lucid or visit the website (www.lucid-research.com).

Under exceptional circumstances, age equivalent scores can be used when assessing pupils outside the norm range. An age equivalent is defined as the chronological age range of children that would be expected to achieve a given raw score. Age equivalents are designed to be used only in exceptional circumstances, e.g. for pupils in special education where centile norms are not always helpful. Age equivalents should not be used routinely in cases where centile norms are applicable, because age equivalents give only a very rough approximation of the child's ability.

Age equivalent for LASS 8-11 scores are shown in the Summary Table for each child (see Section 2.4.3.1). Note that it is not possible to provide age equivalents for the ***Single Word Reading*** test. This is because the scores for this test are not distributed in a normal curve — in fact, there is a significant negative skew — indicating strong ceiling effects. This is explained in Section 2.2.2.

Example A

Bruce, chronological age 13 years 3 months, has moderate learning difficulties. His measured IQ on WISC-III was 64, which indicates that his mental age is about eight and a half. He has Projected Scores of 84 on ***Sentence Reading*** and 29 on ***The Haunted Cave***. His centile scores for these tests shown on the LASS Graphical Profile were 50 and 49, respectively, suggesting that he is average, but of course the norms will automatically compare him with 11 year-olds. However, the Summary Table shows that on ***Sentence Reading*** Bruce's score places him within the 8:6 – 8:11 age equivalent range, i.e. about three and half years behind chronological age levels, but roughly what would be expected from his IQ. On ***The Haunted Cave*** Bruce is at the 11:0 – 11:5 age level, which is only about two years behind chronological age levels and, in fact, rather better than would be predicted from his IQ. In other words, visual memory is a *relative strength* for Bruce, and hence his teachers can make good use of that in learning and teaching.

Example B

Kayleigh is a very bright girl aged 6 years 6 months. Her reading skills are believed to be at least three years ahead of her chronological age level. However, her teacher wants to know whether the cognitive skills that underpin reading are as well developed. The teacher administers LASS, finding that Kayleigh obtains projected scores of 25 on ***The Haunted Cave***, 5 on ***Mobile***, and 16 on ***Funny Words***. The LASS Graphical Profile gives centile scores of 64, 16 and 37, respectively for these tests, which is not particularly helpful as these compare Kayleigh results with that of eight-year-olds. The age equivalent scores given in the Summary Table show that Kayleigh is at the 9:6 – 9:11 age level for ***The Haunted Cave***, and at the 8:0 – 8:5 age level for both ***Mobile*** and ***Funny Words***. From this is can be deduced that Kayleigh is probably relying heavily on visual memory when reading and that her phonic skills are not quite as good as might have been expected. A relevant factor would appear to be her auditory-verbal memory, which although above average, is probably not in step with her overall intelligence.

4.4 LASS 8-11 profiles and the SEN Code of Practice

4.4.1 The SEN Code of Practice

The current *Special Educational Needs Code of Practice* (DfES, 2001), which came into force in January 2002, replaced the previous Code (published in 1994). Under the provisions of the *Education Act 1996*, Part IV, all state schools and Local Education Authorities (LEAs) in England and Wales must have regard to the SEN Code when dealing with pupils with special educational needs. It is assumed that most teachers in England and Wales will be familiar with the SEN Code of Practice, especially if they are Special Educational Needs Co-ordinator (SENCo), and so only a brief outline will be given here.

The SEN Code proposes a staged model of identification, assessment and support for all students with special educational needs. The first two stages ('School Action' and 'School Action Plus') are under the responsibility of the school. The next stage corresponds to the point of statutory assessment, in which educational psychologists will formally assess the child and other evidence gathered concerning the child's difficulties. At the final stage a student will have a Statement of Special Educational Needs, which means that additional resources will be provided to the school by the LEA in order to address the child's difficulties. In Scotland a comparable SEN system operates, although the term 'Record of Needs' is used instead of Statement of Special Educational Needs. The assumption is that a child will proceed through these stages according to individual need, with regular reviews at which the views of the parents are taken into consideration. However, the Code avers that "…the special educational needs of the great majority of children should be met effectively with mainstream settings through …*School Action* and *School Action Plus*." [SEN Code of Practice, 2001, 7:1] An LEA may refuse to provide a statutory assessment if there is inadequate evidence that the school has already made reasonable attempts to identify a child's difficulties and deal with them using it own resources at *School Action* and *School Action Plus* stages.

The Education Act 1996, Part IV, Chapter 1 places upon LEAs and Governing Bodies of all maintained schools in England and Wales, the responsibility for identifying and assessing all students with special educational needs "…as early as possible and as quickly as is consistent with thoroughness" Although many pupils will enter secondary education having had their special educational needs already identified at the primary stage, the SEN Code points out that "Secondary schools will need to be aware that any pupil admitted to year 7 may have unidentified special educational needs." [SEN Code of Practice, 2001, 6:1] In this context, the SEN Code of Practice states:

"The continued importance at secondary level of early identification and assessment for any pupil who may have special educational needs cannot be over-emphasised. The earlier action is taken, the quicker appropriate help can be provided without unduly disrupting the organisation of the school, and the more responsive the pupil is likely to be. Schools frequently make use of appropriate screening and assessment tools to assist them in early identification. Whatever systems are in place, however, assessment should not be regarded as a single event but as a continuing process." [SEN Code of Practice, 2001, 6:10]

It further says that to help to identify pupils who may have special educational needs, schools can measure student's progress using a variety of type techniques, including "…*standardised screening or assessment tools."* [SEN Code of Practice, 2001, 6:12]. The SEN Code instructs LEAs, when deciding whether or not to make a statutory assessment, to seek evidence not only about the student's academic progress but also about other factors that could impact on learning, including "…clear, recorded evidence of clumsiness; significant difficulties of sequencing or visual perception; deficiencies in working memory; or significant delays in language functioning" [SEN Code of Practice, 2001, 7:43). It is clear, therefore, that the intentions of the *Education Act, 1996* as reflected in the SEN Code of Practice, are that all secondary schools must have in place effective procedures for identifying all special educational needs as early as possible in a student's education. The responsibility for this, in the first instance, lies with the school, its teachers and its governing body. It is also clear that LASS can play a significant role in helping schools and teachers meet their obligations under the Act and the SEN Code.

4.4.2 Guidelines on using LASS 8-11 in conjunction with the SEN Code of Practice

LASS 8-11 is designed to be incorporated within the staged SEN model proposed by the SEN Code of Practice. Table 7 illustrates how this can be accomplished. It should be noted that the SEN Stages recommended in the table are the *minimum* that should normally apply: at this age it is imperative that schools are not over-cautious in allocating SEN provision because students do not have many years remaining in formal education in which to make good any deficiencies in their literacy skills. At the *School Action* stage, the student should have an Individual Education Plan (IEP) setting out the strategies for supporting the student, learning goals and projected review dates. The IEP should only record that which is additional to or different from the provision given to all pupils (which should in any case, be differentiated according to individual learning needs). Support will normally be provided by staff from within the school. At the *School Action Plus* stage, the student will also have an IEP and support from school staff but, additionally, help will usually be sought from specialist outside agencies, such as LEA learning support services, which may provide advice and/or specialist tuition.

LASS results should not be considered in a 'vacuum'. Hence, when applying the guidelines shown in Table 7, other relevant factors should be taken fully into account, including academic progress across the curriculum, the length of time that a student has been experiencing difficulties, then extent to which the student has developed strategies which enable him or her to compensate for difficulties, the emotional impact of any difficulties, and the duration that the student has remained at a given SEN stage. Writing skills are not assessed by *LASS* but when considering results and deciding appropriate courses of action it is important that writing skills are factored in. Consistent with the SEN Code, it should also be remembered that assessment is not a one-off but rather a continuing process in which educational history should be considered and regular reviews undertaken.

Table 7. Relating LASS 8-11 results to the stages of the SEN Code of Practice (2001).

If the student has *LASS 8-11* results that:	**SEN action stage recommended**
Are below 20th centile on key literacy measures OR below 5th centile on key diagnostic measures.	**School Action**
Show a significant discrepancy (z score difference between 0.66 and 1.66) between the student's scores on key literacy measures and his/her reasoning score.	**School Action**
Are below 20th centile on key literacy measures AND below 5th centile on key diagnostic measures.	**School Action Plus**
Are below 5th centile on key literacy measures.	**School Action Plus**
Show a significant discrepancy (z score difference greater than 1.66) between the student's scores on key literacy measures and his/her reasoning score.	**School Action Plus**
Meet the above criteria for School Action but the student has already been on School Action for two years or more.	**School Action Plus**
Meet the above criteria for School Action Plus but the student has already been on School Action Plus for two years or more.	**Consider application for Statutory Assessment**

'Key literacy measures' = ***Sentence Reading, Spelling*** and ***Nonwords*** (phonic skills).
'Key diagnostic measures' = ***Cave*** (visual memory), ***Mobile*** (auditory memory), ***Segments*** (phonological processing).

The rationale for the recommendations given in Table 7 are that when a student is below the 20th centile in literacy skills s/he is clearly underperforming in relation to age-group norms and hence there is a clearly identified need for SEN support at the School Action stage. When memory and phonological skills are below the 5th centile this is likely to impact on the student's ability to learn and retain information and to tackle work involving new terminology, which also calls for SEN support at the School Action stage. If there is a significant discrepancy between the student's intelligence and their literacy attainment the student is clearly underperforming in relation to ability-group norms and so there is equally a need for SEN support at the School Action stage. However, if literacy and memory/phonological skills are significantly affected (or where literacy attainment is very poor – below 5th centile), there is a correspondingly greater SEN need, and hence the recommendation for School Action Plus. (Teachers may wonder why the corresponding recommendation is not made for memory and phonological skills below 5th centile, in the absence of any other indicator. The reason for this is that if, despite very poor memory and phonological skills, literacy measures are above the 20th centile this suggests that the student has developed some strategies that enable them to compensate for the cognitive weaknesses.) Similarly, when there a highly significant discrepancy between intelligence and literacy attainment there is a need for greater support as indicated by School Action Plus. When a student has already been on School Action for two years or more (whether in the current or previous school), and the *LASS* results suggest that School Action would be appropriate, the apparent lack of progress indicated by the *LASS* scores calls for a shift to the somewhat higher levels of support offered at the School Action Plus stage. But if a student has already been on School Action Plus for two years or more (whether in the current or previous school), and the *LASS* results suggest that School Action Plus would still be appropriate, the apparent lack of progress indicated by the *LASS* scores implies that even greater support is required and for that it may be necessary to request a statutory assessment.

5 Interpreting results from individual tests

5.1 Reasoning

The purpose of the ***Reasoning*** module is to give the assessor a reasonable estimate of the child's general intellectual ability or intelligence. This is a matrix test, in which both visual and verbal reasoning strategies may be employed. There is good evidence that such matrix reasoning tests correlate well with more extensive measures of intelligence and therefore provide a good overall indicator of general intellectual ability. Nevertheless, assessors should be aware that a *small proportion* of pupils may experience difficulties with this task, even though in other respects their intelligence levels are at least average. Hence in cases of low scoring where the assessor is puzzled by the result because it does not seem to accord with expectations, it would be wise to check the pupil's intelligence using an alternative measure, such as the *NFER-NELSON Verbal and Non-Verbal Reasoning Test Series*, or the *British Picture Vocabulary Scale (BPVS)*[4].

The ***Reasoning*** module in LASS 8-11 is not intended to be a speeded test (i.e. performed against the clock), but in the interests of avoiding excessively lengthy assessment sessions, a (fairly generous) time limit of 60 seconds has been allowed for each item. For most pupils, this should allow sufficient time for a reasonable attempt at each item. To allow greater time would not increase validity or reliability of the test, so if pupils run out of time then this must be accepted as part of the exigencies of the task.

5.2 Sentence Reading

Sentence Reading will often be the first test to be administered. Like the reasoning module, it is also an adaptive test, which makes assessment swift and efficient. ***Sentence Reading*** involves both *reading accuracy* (i.e. word recognition using phonological decoding skills and/or whole-word visual strategies) and *reading comprehension* (because in order to decide which of the words offered is the correct word to fit into the sentence, the pupil has to have some understanding of the meaning of the sentence). Hence it gives a good general estimate of the overall reading skills of pupils in this age range.

In cases where the pupil scores at least within the average range on the ***Sentence Reading*** module, and there is no significant discrepancy between this result and the score on the ***Reasoning*** module, there is usually no need to administer the other two reading-related modules (***Single Word Reading*** and ***Funny Words***). This is because the pupil's performance in reading will not give undue cause for concern. However, if the score of this module falls below centile 20, or there is a significant discrepancy between this result and the score on the ***Reasoning*** module, then there will be cause for concern. In this event it is recommended that both the ***Single Word Reading*** and ***Funny Words*** tests also be administered.

5.3 Single Word Reading

This is a test of word recognition out-of-context: i.e. reading accuracy. ***Single Word Reading*** is the only test in the LASS suite for which scores are not distributed in a normal curve. In fact, there is a significant negative skew, indicating that most pupils will achieve a maximum or near-maximum performance (in

[4] These tests are available from NFER-Nelson (see Section 9.2 for address details).

statistical terms this is sometimes referred to as a '*ceiling effect*'). The ***Single Word Reading*** test does not have sufficient sensitivity to discriminate amongst pupils within the average range, and so its use should be confined to pupils who are *significantly behind* in reading development, either to determine their attainment level or evaluate progress.

Hence there is generally little point in administering ***Single Word Reading*** unless the teacher suspects that the pupil is a poor reader, because:

- the pupil has scored below the threshold of concern (less than centile 20) on the sentence reading module; or
- a significant discrepancy between the score for the sentence reading module and the score on the reasoning module has already been detected; or
- there is other evidence to suggest deficient reading skills.

In such cases, the purpose of administering this module is to ascertain whether there is a serious deficiency in word recognition as well as reading comprehension (the latter being judged on the basis of the pupil's performance on the ***Sentence Reading*** test or some other reading comprehension test). Where the ***Single Word Reading*** test is administered, teachers should be aware that results may not correspond to those obtained from an oral single-word recognition test in which the child has to pronounce the words in the test. This is obviously a rather different (and considerably harder) task than that of identifying the target word on hearing the word spoken by the computer, as in LASS. Where the teacher is in doubt it would be prudent to check the child's oral word recognition skills using a suitable test.

5.4 Funny Words

This is a test of nonword reading. Nonwords (sometimes called 'pseudowords') are letter strings that are not recognised words in a given language (in this case English), but could be – i.e. they conform to orthographic rules of the language. For example, 'gade' or 'tiphalune' are not English words but are nevertheless pronounceable as though they were words, using phonological decoding skills (and, possibly, analogy processes, e.g. 'gade' might be rhymed with 'fade' or 'glade'). If a pupil pronounced 'gade' as 'gad´ee' (instead of applying the silent 'e' rule which changed the short 'a' to a long 'a'), or 'tiphalune' as 'tip´hall´unee' (instead of 'tif´aloon' or 'ti´farloon'), we would have good evidence that the pupil does not possess the appropriate phonological decoding rules (often referred to by teachers simply as 'phonics'). In some cases there may be other phonological problems, such as difficulties in sequencing phonemes or syllables (e.g. the pupil may pronounce 'tiphalune' as 'till´a´foon'), additional to – or instead of – failure to apply rules of phonics.

Pupils with dyslexia typically experience difficulties in reading nonwords (Snowling and Hulme, 1994). Indeed, there is evidence from a wide range of different tasks (not just nonwords) that individuals with dyslexia of all ages generally find phonological activities difficult (Bruck, 1992, Snowling et al, 1997, Snowling, 2000) and there is a school of scientific thought that regards dyslexia as essentially a phonological processing difficulty (Rack, 1994; Snowling, 1995, 2000). Hence a low score on the LASS 8-11 ***Funny Words*** module is usually a good indication of dyslexia. However, teachers should be aware that there are other possible explanations for a low score on ***Funny Words***, including:

- the pupil has never been taught phonics properly
- the pupil has insufficient experience of English
- the pupil has hearing problems

In order to resolve these possibilities, the teacher will need to consider other relevant evidence (such as medical history or information about the pupil's primary or elementary schooling) but must also take into account the pupil's performance on the other LASS modules. For example, if the pupil also performs poorly on ***Word Chopping***, then this would support conclusions of a phonological processing difficulty. However, although it is true that *most* pupils with dyslexia have phonological processing difficulties, there are some cases of dyslexia that do not display such difficulties (Beaton, McDougall and Singleton,

1997b; Rack, 1997; Turner, 1997). Hence teachers should beware of assuming that because a pupil does not have a low score on ***Funny Words*** he or she cannot therefore have dyslexia.

By inspecting the data pages for ***Funny Words***, the assessor can examine the pupil's results in detail. This will help to determine whether the problem is mainly one of hearing – in which case errors will usually be scattered throughout the test – rather than poor phonics skills, in which case errors will tend to increase as the test gets more difficult.

Lack of experience with English can limit awareness of pronunciation rules. For example, in one of the more difficult items in ***Funny Words***: 'troughilicancy' (pronounced 'troff´ill´ick´an´see'), in order to select the correct answer a pupil needs to know that '–ough' is pronounced '–off' and that 'c' followed by a vowel is usually pronounced 'k' but when followed by a 'y' is pronounced 's'). Inspection of the data pages for ***Funny Words*** will enable the assessor to determine the nature of the pupil's difficulties in these respects. Further guidelines on interpreting results obtained by pupils for whom English is an additional language may be found in Section 7.9.

5.5 Word Chopping

Word Chopping is test of general phonological processing abilities requiring deletion of segments of words. For example, 'butterfly' without the syllable 'ter' would be pronounced 'buh´fly' (strictly: not 'but´fly', unless one was using knowledge that the word was spelt with a double 't', rather than relying on the sounds of the syllables).

As children learn to talk they develop increasingly sophisticated cognitive representations for phonological aspects of speech. They become aware that words can be *segmented* into syllables (e.g. that 'wigwam' is composed of 'wig' and 'wam'), and that different words can contain similar elements (i.e. similar *onsets* like **w**-ig and **w**-am, or similar *rimes* like w-**ig** and p-**ig**). The importance of this phonological awareness for early literacy development has been very well demonstrated in research carried out all over the world in the past twenty years (for reviews and discussion of issues, see Snowling, 1995; Goswami, 1994, 1999, 2001; Goswami and Bryant, 1990; Rack, 1994; Savage, 2001). Phonological awareness in very young children is often assessed by means of an 'oddity task' in which the child has to pick out the one which is different from of list of similar sounding words, e.g. *'mop, hop, tap, lop'; 'ham, tap, had, hat'* (Bradley and Bryant, 1983; Bradley, 1980). However, phonological deletion tasks, such as ***Word Chopping***, have been found to be more sensitive measures for use with older children (Snowling, 2000).

Dyslexic children are known generally to have poor phonological skills (Rack, Snowling and Olson, 1992; Holligan and Johnston, 1988). In the *phonological deficit model of dyslexia* (Hulme and Snowling, 1991; Snowling, 1995, 2000) it has been hypothesised that the status of children's underlying phonological representations determines the ease with which they learn to read, and that the poorly developed phonological representations of dyslexic children are the fundamental cause of their literacy difficulties. In the CoPS research the *Rhymes* test was found to be a highly significant predictor of later literacy skill (Singleton, Thomas and Horne, 2000).

There is good evidence that individuals with dyslexia of all ages have persistent difficulties with phonological deletion tasks (Bruck, 1990, 1992; Gottardo, Siegel and Stanovich, 1997; Snowling, 2000; Vellutino et al, 2004). Low performance on ***Word Chopping*** is therefore a good indication of dyslexia. However, like ***Funny Words***, teachers should be aware that pupils with hearing problems may also have low scores on ***Word Chopping***. By inspecting the data pages for the module, the assessor can examine the pupil's results in detail. This will help to determine whether the problem is mainly one of hearing – in which case errors will usually be scattered throughout the test – rather than phonological processing, in which case errors will tend to increase as the test gets more difficult.

5.6 Spelling

Some teachers take the view that spelling is the least important aspect of literacy and therefore may not bother to assess it. However, many pupils with specific learning difficulty or dyslexia – especially if they have had a lot of support or special tuition during primary education – may have improved reading skills to the extent that a significant discrepancy between ***Reasoning*** and reading ability is no longer apparent. In most cases, however, spelling is much more difficult to remediate, and so it is important to assess this aspect of literacy because it can shed light on underlying problems that teachers might remain unaware of. Poor spelling (especially in pupils who are bright and have otherwise satisfactory reading skills) often signals deeper cognitive difficulties (e.g. in memory) that can create problems in many aspects of educational performance, ranging from modern languages to mathematics.

Pupils with spelling problems tend to experience difficulties with writing generally (Moseley, 1997). This is not only because they have anxieties about not being able to spell words, but also because they are so focused on the *mechanics* of the writing process (spelling, grammar, punctuation) that they have little cognitive capacity left over to monitor the meaning of the text they are producing. They easily lose track of what they want to say, miss words out and leave sentences incomplete. To resolve these difficulties, pupils may resort to a 'dumbing down' strategy: i.e. writing in a very immature fashion, using easy-to-spell words and simple sentence structures. The resultant written work may not actually contain very many errors but is far below the standard that the pupils should be capable of, given their levels of understanding. Ideally, spelling – like the other mechanical processes of writing – should be automatised, i.e. be so well practised that they operate largely at a subconscious level, which frees up conscious processes to concentrate on the meaning of what is being written.

It should be noted that poor spelling does not inevitably indicate dyslexia. Indeed, when pupils with poor spelling have no underlying cognitive difficulties that would be indicative of dyslexia, it is usually the case that they have never been taught to spell properly or have had insufficient practice in using their spelling skills so that these skills become automatised.

5.7 The Haunted Cave

The Haunted Cave is a test of visual memory, involving spatial and temporal sequences. However, since the stimulus items for ***The Haunted Cave*** can be encoded by use of verbal labels, the part played by verbal memory skills in this task is potentially as great as that played by visual memory. Although auditory-verbal memory is usually regarded as being of greatest significance where literacy skills are concerned (see next section), there is good evidence that visual memory tasks can also give good indications of dyslexia and literacy difficulties (Awaida and Beech, 1995; Beech, 1997; Singleton, Thomas and Leedale, 1996; Singleton, Thomas and Horne, 2000). Hence in cases of literacy difficulties it is important for the teacher to know whether the pupil's visual memory skills are weak or strong, as these will not only affect the diagnosis but also have implications for subsequent teaching recommendations.

Although working memory is typically conceptualised as being a phonological system subserving speech, a visual equivalent known as the 'visuo-spatial scratch pad' has been hypothesised (Baddeley, 1996). This is believed to enable us to keep small amounts of visual information in short-term memory. Such a system is important in developing visual strategies in reading, especially those used by beginning readers ('look and say'). Models of reading acquisition suggest that visual memory is particularly important in the early stages of learning to read (e.g. Ehri, 1995; Frith, 1985). Conclusions reported by Passenger, Stuart and Terrell (2000) from their study of 80 preliterate children during their first year of formal schooling lend some support for this view. Stuart, Masterson and Dixon (2000) also found that visual memory influences the acquisition of sight vocabulary in children aged 5 who displayed poor graphophonic skills (i.e. those who had not yet acquired the ability to segment words on the basis of their sounds and who displayed little or no knowledge of sound-to-letter mappings). For children with good graphophonic skills, however, no association between visual memory and word learning was found. Visual memory is also essential in rapid retrieval of visual whole-word representations from the mental lexicon by older and more fluent readers when reading text (particularly of irregular words for which a

phonic strategy would not be appropriate). Visual memory also comes into play when retrieving visual sequences of letters in the correct order for spelling (again, particularly where irregular words are concerned). Hence visual memory is a key component of literacy development.

There is also evidence that poor readers have a bias towards visual encoding of words. Johnston and Anderson (1998) reported that poor readers showed a preference for using pictorial rather than verbal information, which they suggest may arise from previous difficulties in learning to attach verbal labels to visual stimuli. Ellis, McDougall and Monk (1996) reported that dyslexics aged 10 years were significantly faster on some visual processing tasks (e.g. picture categorisation) than other groups, including reading age (RA) controls. On word recognition tasks in which the words are paired with either visually similar cues or phonologically similar cues, poor readers are known to perform *better* than RA controls on the visually similar cue items but not on the phonologically similar cue items (Holligan and Johnston, 1988; Rack, 1987). In other words, they display a less pronounced phonological similarity effect and a more pronounced visual similarity effect (Katz, 1986; Mann and Liberman, 1984).

Palmer (2000) used the *Corsi Blocks* test to measure visuospatial span in three groups of 14 year-old pupils: dyslexics, RA controls, and chronological age (CA) controls with normal reading ability. The *Corsi Blocks* test comprises a set of nine blocks fixed to a base in a predetermined pattern. The test administrator touches the blocks in a set sequence and the testee is required to recall that sequence by touching the same blocks in the same order. This has a direct parallel with ***The Haunted Cave*** in LASS 8-11. Palmer found that the dyslexic group significantly outperformed the RA controls on this test. The results also suggested that while all participants showed evidence of using phonological coding to remember pictures, only those in the dyslexic group used visual coding.

Another study by Palmer (2001) provides further evidence that it is useful for teachers to know about children's visual memory skills. In this experiment, it was found that children who maintained a visual representation of words alongside a phonological representation after age 7, were significantly worse readers than those for whom the ability to switch strategies by inhibiting the visual representation had fully developed. Children with good visual memory but poor auditory-verbal memory would not only be expected to find acquisition of an effective phonological decoding strategy in reading rather difficult, but also be inclined to rely for a longer period on visual strategies. This approach is liable to run into trouble as the child's education progresses and the number of new words with which the child is confronted steadily increases.

Some teachers and psychologists assume that problems with short-term memory are entirely verbal rather than visual. However, research suggests otherwise. Awaida and Beech (1995) found that ability to remember letter-like forms at four years of age correlated with reading skills one year later. There is a substantial literature on subtypes of dyslexia, in which visual deficits predominate (Thomson, 1993; Pumfrey and Reason, 1991). Some tests for dyslexia incorporate visual memory tests, e.g. *The Aston Index* (Newton and Thomson, 1982) and the *Coding* sub-test of WISC-III^{UK}, which is one of the key elements of the A–C–I–D profile that is often used as an indicator of dyslexic difficulties (Thomson, 1993). In the CoPS project, WISC Coding given at age 8:0 correlated 0.36 ($p<0.05$) with the *Rabbits* test (a forerunner of ***The Haunted Cave***) administered at age 5 (Singleton, Thomas and Horne, 2000). Fein, Davenport, Yingling and Galin (1988) found that visual memory is a factor which may be separated from verbal memory in some cases of dyslexia. Finally, there are a variety of other research themes focusing on more physiological aspects of 'visual dyslexia', including work on visual discomfort (e.g. Wilkins, 1991; Wilkins et al, 2001); atypical eye movements in reading (e.g. Pavlidis, 1985); ocular dominance (e.g. Stein, 1991, 1994; Stein, Talcott and Witton, 2001); and defects in the transient visual system (e.g. Lovegrove, 1991, 1993, 1994). However, perhaps with the exception of visual discomfort (sometimes referred to as the 'Irlen syndrome', after Irlen, 1991) the evidence on some of these physiological issues at the present time seems to be equivocal and more research is required before they can be of practical value in diagnosis and education (Stanley, 1994).

The Haunted Cave also requires careful concentration and good visual attentiveness, since the stimulus items are only displayed for very brief periods of time. Therefore it is possible for a pupil to perform poorly on ***The Haunted Cave*** not because of inherent memory difficulties, but because of attention deficit disorder. Where this appears to be a serious possibility, teachers should refer to other information about a pupil in order to resolve the issue, or refer the child to an educational psychologist

for further investigation. Teachers should be aware that it is possible for pupils to have attention deficit disorder (ADD) without hyperactivity (the latter usually being referred to as AD/HD). ADD (sometimes styled 'AD/HD without hyperactivity') is characterised by persistently poor concentration and attention, daydreaming and passivity. Unlike AD/HD, it is more common in girls and often goes undiagnosed, but can be a significant cause of learning difficulties (Cooper and Ideus, 1995). Pupils with AD/HD who have hyperactive patterns of behaviour may also experience difficulties with ***The Haunted Cave*** because of high impulsivity, which can disrupt the processes of memorisation and recall.

Pupils with very good scores on ***The Haunted Cave*** (or who show marked discrepancies between scores on this test and ***Mobile***) may develop over-reliance on visual strategies in reading, with a consequent neglect of phonic strategies. Although such children may develop quite a large sight vocabulary and superficially may appear to be progressing well in their reading development, this state of affairs is not satisfactory because without adequate phonic skills (that have become fluent through regular use and practice) they are highly likely to struggle in reading later on in education. The teacher can always check the child's phonic skills by using the LASS 8-11 ***Funny Words*** test, but this will not reveal whether children are actively *applying* their phonic skills in text reading. Some children (particularly if they are bright) develop the maladaptive strategy of skipping words in text that they do not recognise immediately, and using their common sense to construct the meaning of the text in the absence of the skipped words. Although they may get away with this in the primary classroom, they are likely to find that such a strategy lets them down badly when they get to secondary school, where they will be introduced to many new, often difficult, words. Teachers should therefore try to prevent this by (a) ensuring that all children have a good working knowledge of phonics, and (b) can apply those phonic skills fluently when reading text. The latter should be apparent when listening to a child read an unfamiliar piece of text aloud. A miscue analysis approach could be adopted, which will help the teacher to identify what type of reading errors the child is making. Fluency in text processing can only be achieved by proper practice in reading: teachers should beware that although children may claim to read regularly (e.g. at bedtime) this may involve reading rather unchallenging material. When reading some children's stories, for example, it is often much easier for the child to skip words that they cannot recognise and still retain a fairly high level of comprehension. By contrast, reading of non-fiction material and 'classic' children's fiction (which often contains a more sophisticated vocabulary) is more likely to encourage children to decode unfamiliar words. However, the text should not be *too* difficult for the child to tackle otherwise the activity will become excessively frustrating and counterproductive. Ideally there should be no more than about 5% of words that are unknown to the child. More than that amount will mean that the child is too frequently interrupting text reading processes in order to decode unfamiliar words, with the result that it will be difficult for them to hold the meaning of the passage in memory.

5.8 Mobile Phone

Mobile Phone (usually referred to just as '***Mobile***') is a test of auditory-verbal sequential short-term memory, based on recall of digits. It is a well established fact that individuals with dyslexia or specific learning difficulty typically experience problems with recall of digits (Beech, 1997; Thomson, 1993; Turner, 1997), and digit span is a feature of the vast majority of assessment batteries used for diagnosis of dyslexia (Reason, 1998). Although digit span is normally a spoken test, there is good evidence that the form of the test used in LASS correlates highly with traditional forms, such as those used in the Wechsler Intelligence Tests and the British Ability Scales, and is therefore a valid measure of auditory-verbal memory.

Auditory-verbal short-term memory is critical for literacy development, especially for the acquisition of phonic skills, i.e. mapping of letters (graphemes) on to sounds (phonemes), and for the storage of phonological codes in short-term memory during word recognition and processing of text. There is also a well-established connection between reading and memory (for reviews, see Baddeley, 1986; Beech, 1997; Brady, 1986; Jorm, 1983; Wagner and Torgesen, 1987). The predominant view in the research literature is that phonological processes underpin the development of a phonological recoding strategy in reading, and that working memory plays a significant role in this strategy, enabling constituent sounds and/or phonological codes to be held in the short-term store until these can be

recognised as a word and its meaning accessed in long-term memory (e.g. Gathercole and Baddeley, 1993a; Wagner et al, 1993).

Short-term auditory/verbal memory is sometimes called '*working memory*' because it is the system which we use when we have to hold information for a brief period of time while we process it. Working memory is a limited-capacity system, and unless rehearsed or transferred to longer-term storage, information in working memory is only retained for a few seconds (Baddeley, 1986). For example, in order to understand what a person is saying to us we have to hold their words in working memory until they get to the end of a sentence (or equivalent break), then we can process those words for their meaning. We cannot process each individual word for meaning as we hear it because by themselves words do not convey sufficient meaning. Furthermore, words heard later in an utterance can substantially alter the meaning of words heard earlier (e.g. "The man opened the magazine — then he carefully extracted the remaining bullets it contained"). Other examples of working memory include trying to hold a telephone number in mind while we dial it, and carrying out mental arithmetic.

The relevance of auditory/verbal working memory to literacy skills should be obvious — in the same way that it is necessary to hold spoken words in memory in conversation, the child must hold *letters and syllables* in memory when decoding words. This is very important in the development of phonic skills. The majority of dyslexic children have problems in this area of cognitive processing (Thomson, 1989). Awaida and Beech (1995) found that phonological memory at age 5 predicted nonword reading (i.e. phonics skills) at 6 years. When reading continuous text for meaning the child must also hold *words* in memory until the end of the phrase or sentence. Poor working memory will thus affect reading comprehension. Of course, *visual* memory skills will be involved in much of this cognitive activity, especially for beginning readers who have not progressed to phonics, and also for more competent readers whose capacity for rapid visual recognition of words steadily increases with age. Nevertheless, auditory/verbal working memory remains a significant factor in reading development and in writing as well. Children with weaknesses in auditory/verbal working memory also tend have difficulty in *monitoring* their written output, and are inclined to miss letters, syllables and/or words out when they are writing. (For reviews of research on the connections between verbal memory and reading see Baddeley, 1986; Brady, 1986; Jorm; 1983; Wagner and Torgeson, 1987.)

More recently, further research has suggested a very close connection between auditory memory span and articulation (speech) rate (Avons and Hanna, 1995; McDougall and Hulme, 1994). It could well be that articulation rate is an index of the efficiency with which phonological representations of words can be located in memory and activated (i.e. spoken). In turn, this could be closely related to how quickly cognitive representations of words being read can be located in the orthographic and semantic lexicons and activated (i.e. recognised and understood). The three lexicons (phonological, orthographic and semantic) are all believed to be closely related (Rayner and Polatsek, 1989).

Like the other auditory tasks in LASS, ***Mobile*** requires adequate hearing ability. Where a teacher suspects that a low score on ***Mobile*** could be due to poor hearing, inspection of the data pages should help to resolve the question. If the problem is mainly one of hearing, errors will usually be found to be scattered throughout the test results. If it is due to poor memory, errors will tend to increase as the test progresses and the memorisation load steadily increases.

6 Teaching recommendations

6.1 Introduction

As a teacher, once the LASS 8-11 tests have been used, you will want to know how to use your pupil's strengths to develop the identified areas of weakness. Many pupils tend to have a greater strength in visual, auditory or tactile cognitive areas and this influences their preferred way of learning; the pupil who has dyslexic problems will have a very uneven profile, with some cognitive areas in the low centiles and others high. Looking at the whole profile will provide you with evidence of the areas that need attention and at the same time indicate where the strengths are, so that you can use those strengths to mitigate or remediate the problem learning areas. Analysis of the problem areas may provide you with insight into the nature of the problem.

When specific areas of learning difficulty have been identified by LASS, there are a wide range of teaching strategies that can be used to build on the pupil's strengths to mitigate or remediate the weaknesses. Most schools will already have a range of spelling games, worksheets, prompt cards, teaching schemes and devices, which can now be selected and used in a more focused way. Suggestions are made in this chapter on how such materials can be put to most effective use. To supplement and extend existing support materials, there are equally — or, sometimes, more — effective ICT solutions that can be introduced to extend the range of strategies at a teacher's disposal.

Throughout this chapter, teachers will find recommendations regarding ICT solutions (hardware and software) and other resources. These materials were available at the time of printing, and addresses of suppliers are given in the Appendix, section 9.2. In the course of time these materials may become unavailable, while new materials are likely to come on to the market. Teachers should consult the Lucid website (www.lucid-research.com) for up-to-date information about current software and resources. Teaching strategies and suggested software for pupils with dyslexia and other literacy difficulties have been reviewed by Crivelli (2001), Keates (2000) and Stansfield (2000). Teachers will find many additional suggestions in these highly recommended books. For further suggestions on suitable software see the British Dyslexia Association website (www.bdadyslexia.org.uk) which is updated on a regular basis.

6.2 Key areas of learning difficulty to address

In some cases you may have some awareness of a pupil's difficulties before you use LASS. Concern about a pupil's progress will often be the stimulus to carry out an assessment. A pupil with dyslexic and/or dyspraxic tendencies will typically present with problems in all or most of these characteristic areas:

- short-term memory (auditory-verbal or visual)
- phonological processing skills
- phonic decoding skills
- poor presentation due to motor skills and/or constantly correcting errors
- arrogance and/or low self-esteem
- disorganised work and life.

Such characteristics are almost bound to create problems for teachers and are likely to become a stimulus for conflict.

It is very likely that a pupil with dyslexia will have a mismatch between high level oral skills in class discussions and the quantity and quality of any written work that is produced. Possibly, reading

skills may be underdeveloped, with lack of fluency, frequent decoding errors and poor comprehension of text. Spelling may be minimal, phonetic or bizarre and only simple words written, when much more complex words are used orally. Especially where there is some element of dyspraxia, the pupil's handwriting may be erratic, spidery, very small, very large or deeply indented into the page. These are all indicators that a great deal of physical effort is required to write by hand, which puts increased stress on a brain that is struggling to cope with sequencing and orientation difficulties. Great difficulty or inability to organise the content of written work or set a priority on tasks can manifest itself as work not completed in class in the set time, or homework not handed in. There may also be problems of staying on-task due to memory problems, where the dyslexic pupil loses track of the content of a long sentence and keeps asking the teacher or other pupils for prompts

Some pupils will have developed advanced strategies for avoiding stressful work, which may be manifested as:

- lost writing equipment/books
- regular and prolonged visits to the toilet
- acting the class clown
- distracting other pupils
- provoking dismissal from the room
- truanting
- school phobia.

None of these behaviours are likely to produce a good learning environment and if they become conduct problems, it is unlikely that the pupil will get the sympathetic support from the class teacher that is needed to address the learning difficulties.

6.3 Strategies for specific problem areas

6.3.1 Poor phonological processing ability

The evidence that training in phonological skills facilitates literacy development is extremely strong (for reviews see Bryant and Bradley, 1985; Goswami and Bryant, 1990; and Rack, 1994). Lundberg, Frost and Peterson (1988) showed that relatively short daily sessions of phonological activities (15–20 minutes) carried out with kindergarten pupils resulted in improved phonological skills and significant gains in reading and spelling (compared with a control group) through at least to their second year of schooling. In this particular study, activities progressed from simple listening and rhyming games, to segmentation of sentences into words, words into syllables and, finally, syllables into phonemes. In the Cumbria study, Hatcher, Hulme, and Ellis (1994) found that integrated sound-categorisation and letter-knowledge training produced the largest improvements in reading and spelling of a group of seven-year-olds who were failing in reading.

Phonological awareness can be developed by a variety of methods. For example:

- **Rhyming** and **alliteration** — suitable techniques range from simple rhyming songs and games to more structured activities involving making books with rhyming or alliterative themes, playing rhyming snap or 'odd-one-out' games with pictures and objects; using plastic letters to discover and create rhyming word families
- **Deletion** of the first sound (e.g. '*near–ear'*) or of the last sound (e.g. *'party–part'*), or of whole syllables (e.g. saying '*alligator'* without the '*all'*)
- **Elision** of the middle sound (e.g. snail–sail) or syllable ('*alligator'* without the '*ga'*).
- **Correspondence** — e.g. tapping out the number of syllables in a word.

Many of these activities are very suitable for playing at home, so parental involvement is strongly encouraged. Many phonological discrimination activities are also useful for phonological training. For ideas on phonological awareness activities see Goswami and Bryant (1990); Layton and Upton (1993); Layton, Deeney, Tall and Upton (1996); Buckley, James and Kerr (1994); James, Kerr and Tyler (1994); Yopp (1992). *Sound Linkage* (Hatcher; 1994) is based on the Cumbria project on phonological awareness (Hatcher, Hulme and Ellis, 1994) and includes materials for testing and training. Snowling and Stackhouse (1996) provide a useful compendium of recommendations on teaching dyslexic pupils with speech and language difficulties. Recommended computer-based activities for practising phonological skills include *Rhymes and Analogy*, *Sound Activities*, *Tizzy's Toybox* and *Talking Animated Alphabet* (Sherston); *Jemima* (Inclusive Technology); *Letterland* (Harper Collins); *Sounds and Rhymes* (Xavier); and *Talking Rhymes* (Topologika),

In general, pupils respond well to phonological training activities and skills swiftly improve. However, some dyslexic pupils may have more persistent difficulties that will require particularly careful literacy teaching. In such cases, a well-structured multisensory approach incorporating plenty of practice in phonic skills (over-learning) is recommended. Examples of suitable schemes are given later in section 6.3.3. Without phonological awareness training, many pupils with such weaknesses are liable to develop an over-reliance on visual (whole word) and contextual strategies in reading (especially if they are bright). They can easily 'slip through the net', only to re-appear as a pupil who is failing in reading and spelling later in the primary school.

6.3.2 Poor auditory/verbal working memory

It is commonly found that memory limitations are more difficult to improve by direct training, especially with younger pupils, than are weaknesses in either phonological awareness or auditory discrimination. On the other hand, older pupils can respond well to *metacognitive* approaches to memory improvement, i.e. techniques designed to promote understanding of their own memory limitations and to develop appropriate compensatory strategies (see Buzan, 1986). However, that does not mean that memory training is not worthwhile with young pupils. Indeed, it may well be the case that with improved training techniques, remediation of memory weaknesses could turn out to be a much more promising approach in the future. The emphasis should be on variety and on stretching the pupil steadily with each training session. The tasks should not be too easy for the pupil (which would be boring) nor much too difficult (which would be discouraging), but just give the right amount of *challenge* to motivate the pupil to maximum effort. Use of prizes, star charts for improvement, etc., should all be used if these will help motivation. Activities can usually be carried out at home as well as in school. Competition between pupils can be motivating for some pupils, but it can also be discouraging for the pupil with severe difficulties, because they will easily perceive and be embarrassed by the discrepancy between their performance and that of other pupils.

Auditory/verbal training activities include:

- **I went to the supermarket** — teacher says to the pupil sentences of increasing length and complexity and the pupil has to repeat these back verbatim (e.g. *"I went to the supermarket and bought three tins of beans, one loaf of bread, a carton of milk, a packet of sweets, two bars of chocolate...."* etc.)
- **Find the changed (or missing) word** — teacher says sequence of words to the pupil (e.g. *dog, cat, fish, monkey, spider*) and then repeats it changing one (or missing one out altogether), either slightly or more obviously (e.g. *dog, cat, fox, monkey, spider*) and the pupil has to identify the change.
- **What's their job?** — Teacher says to the pupil a list of name-occupation associations (e.g. *"Mr Pearce the painter, Mrs Jolly the grocer, Miss Fish the hairdresser, Mr Brown the electrician"*) and then asks for recall of one (e.g. *"Who was the grocer?"* or *"What is Mr Brown's job?"*). Occupational stereotypes can be avoided if desired.
- **Word repetition** — teacher says sequences of unrelated words to the pupil (e.g. *hat, mouse, box, cup, ladder, tree, biscuit, car, fork, carpet*) and the pupil has to repeat them in the correct

order. The length of the list can be gradually extended. If the words are semantically related it is more difficult, and if they are phonologically related (e.g. *fish, film, fog, fun, phone, finger*) it is more difficult still.

- **Phoneme repetition** — as word repetition, but with phonemes (*"oo, v, s, er, d"*). Note that phonologically similar lists will be much more difficult (e.g. *"p, b, k, d, t"*)
- **Letter name repetition** — as word repetition, but with letter names.
- **Digit repetition** — as word repetition, but with digits. About one per second is the maximum difficulty for short sequences. Slightly faster or slower rates are both easier for ordinary individuals to remember, but dyslexics tend to find a slower sequence harder (because their rehearsal processes in working memory are deficient).

Recommended computer software for developing auditory/verbal memory includes *Leaps and Bounds* (Inclusive Technology) and *Mastering Memory* (CALSC). The latter program is a very flexible tool for practising memory strategies, but does require quite a lot of teacher input. The program *Memory Booster* (Lucid Research) not only provides enjoyable memory practice but also teaches memory strategies, and does not require teacher input so it can be used at home as well as at school. Use of the phonic teaching system *AcceleRead, AcceleWrite* (Clifford and Miles, 1994; see Section 6.4) has also been found to improve working memory ability (Miles, 2000).

6.3.3 Poor phonic decoding skills

For the reasons explained above, the pupil who displays major difficulties in *auditory/verbal* memory is likely to have problems in acquiring effective phonic skills. Nevertheless, this type of pupil may make satisfactory progress in the *early* stages of reading — where the emphasis tends to be on building up simple visual word recognition skills — if visual memory skills are quite good. Because of this, it is very easy to overlook this pupil's problems and assume that because an apparently satisfactory early start has been made, everything else will follow automatically. In fact, this pupil would probably learn to rely almost exclusively on visual strategies in reading. It could be as late as nine or ten years of age before the underlying problems become noticeable, by which time so much learning opportunity has been wasted. Many dyslexics have a pattern of development like this. The recommendations here would be for an early introduction of a highly-structured *multisensory phonic approach* to literacy learning. This should not only provide ample practice to compensate for memory weakness, but should in this case also make use of the pupil's strong visual skills in order to reinforce learning and help to maintain confidence.

Examples of well-structured phonics schemes suitable for younger pupils with dyslexic difficulties include:

- *Alpha to Omega* (Hornsby and Shear, 1975) †
- *Spelling Made Easy* (Brand, 1988) †
- *The Bangor Teaching System* (Miles, 1989)
- *The Hickey Multisensory Language Course* (Augur and Briggs, 1992)
- *The Star Track Reading Scheme* (Beadle and Hampshire, 1995) †
- *The Phonics Handbook* (Lloyd, 1992) †
- *Toe by Toe* (Cowling and Cowling, 1993)
- *THRASS* (a collection of printed, audio, video and software resources to teach phonics; see www.thrass.co.uk) †

Books marked † also have worksheets.

Good computer software for practising phonic skills includes: ***Wordshark4*** (White Space); ***Talking Animated Alphabet*** and ***Rhyme and Analogy*** (Sherston); ***Clicker Phonics*** (Crick); ***Gamz*** (www.gamzuk.com); ***Soapbox*** and ***Magic E*** (Xavier Educational Software); ***Catch-Up CD ROM*** (iANSYST).

In an evaluation of *Wordshark* in 403 schools (Singleton and Simmons, 2001), teachers reported significant benefits to reading, spelling and confidence in using the program.

Use of a talking word processor is beneficial because it gives the child auditory feedback and encourages them to pay attention to the phonic components of words when writing. For example: ***Inclusive Writer***, ***Pages***, ***Write:Outloud***, **and *textHELP! Read and Write*** ; ***Clicker 4*** (Crick).

A generic structured learning scheme such as *AcceleRead, AcceleWrite* (Clifford and Miles, 1994) can be used with any good talking word processor (Miles, 1994).

Further information on techniques for teaching the dyslexic pupil can be found in Augur (1995); Cooke (1992); Crombie (1992); Hornsby (1982); Pollock and Waller (1994); Reid (1998); Thomson and Watkins (1990).

6.3.4 Poor visual memory

It is widely acknowledged that the *predominant* problems found in dyslexic pupils are phonological rather than visual (Pumfrey and Reason, 1991; Snowling and Thomson, 1994). Indeed, dyslexic individuals often have excellent visual skills (West, 1991). Nevertheless, teachers and educational psychologists are not infrequently confronted by cases of young pupils who appear to have inordinate difficulties in remembering various types of information presented visually. Such cases are undoubtedly less common than those of pupils with phonological difficulties. However, they do form a very important group because these are the pupils who are likely to fall at the very first hurdle with which they are confronted in literacy — i.e. whole-word, 'look and say' reading activities, often presented on flash cards. Of course, some teachers would presume that the pupil who cannot remember flash cards (however bright, orally fluent and well-motivated) is simply not *ready* for reading. On the other hand, if the pupil cannot begin reading in the most conventional way the most obvious solution is not to ignore the pupil's problems, but to find the way which is most appropriate for the pupil to learn.

In cases where the pupil is experiencing difficulty with visual whole word ('look and say') methods because of visual memory problems this can lead to early discouragement and frustration which can easily affect the whole of the pupil's educational activities. The pupil can swiftly become a reluctant learner. Spelling and writing are also likely to be a struggle. Visual memory training would be beneficial, but the main solution would be to make a much earlier start to structured phonics work, with ample practice (over-learning) to compensate for memory weaknesses. A multisensory approach is strongly recommended, building on any auditory and kinaesthetic strengths. A list of suitable phonics programmes and associated activities is given in Section 6.3.3.

The following are suggested training activities for pupils with poor visual memory:

- **Find the missing part** — create pictures of everyday things with parts of the pictures missing (e.g. doll with one arm, table with only three legs) and ask the pupil to identify what is missing. To do this the pupil has to recall visual images of the relevant objects.
- **What's wrong here** — use pictures of everyday things with parts of the pictures wrong (e.g. house with the door halfway up the wall; person with feet pointing backwards instead of forwards) and ask the pupil to identify what is wrong. To do this the pupil has to recall visual images of the relevant objects.
- **Kim's game** — an array of familiar objects on a tray (or picture of an array of objects). The pupil scans this for two minutes (or whatever period of time is appropriate) and then has to remember as many as possible.
- **Symbols** — show pupil a sequence of symbols, letters or shapes of increasing length, and then jumble them up and the pupil has to rearrange them in the correct order. Remember that this can become more of a verbal task than a visual task — if you want to practice *visual* skills then it is best to have stimuli which are not easily verbally coded.
- **Who lives here?** — make a set of pictures of people (these may be cut from magazines) and a set of houses of different colours, or different appearance in some way. The people are matched with the

houses, and then jumbled up. The pupil has to rearrange them in the correct relationship. If the people are given names then the task becomes more verbal.

- **Pelmanism** — remembering matching pairs of cards from a set, when cards are individually turned over and then turned back. The pupil has to remember where the other one of the pair is, and if both are located these are removed from the set, and so on.
- **Card games** — e.g. Snap, Happy Families.

Recommended computer software for developing visual memory skills includes: ***Memory Booster*** (Lucid Research); ***Mastering Memory*** (CALSC); ***Teacher's Cupboard 2000*** (www.teem.org.uk); ***Freddy Teddy*** (Topologika); and ***Blob 1 and 2*** (Inclusive Technology); ***Leaps and Bounds*** (Semerc). The program *Memory Booster* (Lucid Research) not only provides enjoyable memory practice but also teaches memory strategies, and does not require teacher input so can be used at home as well as at school.

6.3.5 Maths difficulties

Maths can cause problems in four main ways:

1. The pupil who can understand and do the maths, but makes careless errors from mis-reading the problem, or reversing digits or sequences of digits, that make nonsense of the calculations.
2. A pupil may be able to do the maths, but if s/he cannot read the maths problem, or read it sufficiently accurately, s/he will be unable to work to her/his mathematical ability level. Tapes of the maths book can often solve this problem, especially when the recorder has small headphones for privacy. A talking word processor can help with 'wordy' problem worksheets, but not when formulae are involved (see above).
3. The pupil with dyscalculia (specific mathematical difficulties) will have much more serious problems. Inspecting the detailed analysis of the LASS 8-11 diagnosis may provide some insight into the type of sequencing and spatial errors that are being made, so detailed and focussed remediation can be set in place, using programs like *NumberShark4* (White Space), *MathMania 2* (Topologika), and *Maths Circus* (4Mation).

All pupils with numeracy problems can help improve their understanding of maths by exploring maths adventure programs. This can be especially effective if there is an element of maths phobia and it is undertaken at home or in a computer club, where they learn the maths incidentally. For further suggestions regarding strategies for supporting pupils with maths difficulties, see Chinn and Ashcroft (1993), Henderson (1998) and Hillage (2000).

6.4 Computer support

Most children enjoy using a computer, so they tend to be well disposed to technology suggestions. There is often a reluctance to produce written material on paper, when it has to be re-written after spelling errors are corrected and/or great efforts still produce unattractive handwriting. Using any electronic keyboard removes much of the hassle of editing spellings and punctuation and the final printed product looks smart. For pupils who need more support, a computer with sound and a Windows environment, facilitates the writing process even more, as spoken prompts of errors come instantly and on-screen word banks provide access to a richer range of vocabulary.

For details of software mentioned in this section, see Section 6.5.

6.4.1 Developing reading skills

Talking books, which use digitised speech to accompany story texts are very useful classroom resources. They enable poor readers independently to practice reading skills at text level, and develop confidence, fluency and comprehension. These programs allow the reader to click on individual words and hear these

read aloud, so enabling reading to continue and understanding to be maintained. Recommended programs include the *Oxford Reading Tree Talking Stories* (Sherston).

If pupils have problems with phonic decoding then training programs such as *Wordshark4* (White Space); *Lexia Basic Reading* (LexiaUK); *THRASS* (www.thrass.co.uk) ; or ***Gamz*** (www.gamzuk.com) can be used. In an evaluation of *Wordshark* in 403 schools by Singleton and Simmons (2001), teachers reported significant benefits to reading, spelling and confidence in using the program.

6.4.2 Keyboard skills

Some pupils become fast typists once they have regular access to a keyboard, but if there are spatial awareness or other dyspraxic difficulties, it is essential for the pupil to use a keyboard training program. All pupils will get going faster and become more comfortable about using a keyboard, if they spend some intensive time mastering keyboard skills. This is an activity that should be undertaken for short, daily sessions, so is ideal for doing at home or in lunchtime or homework club sessions. Sometimes typing programs are bundled with the introduction package of software for a home computer and can be used to get started. Other useful computer programs for developing typing skills are:

- *Type to Learn* (Scholastic) – a program aimed at the education market.
- *First Keys To Literacy* (Widgit) – useful for pupils with low reading skills.
- *Kaz* (Gotham New Media Limited) – a 'quick-fix' sentence approach which is effective for some.

Developing touch typing is purely a matter of practice – preferably daily – so there is little point in undertaking it unless the child is prepared to devote the necessary time. It is often a good idea to do this at home during a school holiday, and if more than one member of the family can be involved, so much the better. A reward system for achievement might be adopted. Many children like nothing better than having a competition with siblings or even with Mum and Dad, to see who has achieved the most accurate and fastest typing after a specified number of weeks. The outcome of such competitions is by no means a foregone conclusion; it is often the case that younger children in the family can do much better than older ones or adults. This is probably because – up to a point – the brain of younger children seems to be better geared to acquiring new motor skills.

6.4.3 Developing writing skills

A talking word processor is probably the single most effective support for writing. Use of a talking word processor is beneficial because it gives the pupil auditory feedback and encourages them to pay attention to the phonic components of words when writing. For example: *Write:Outloud6* (Inclusive Technology); *Clicker 4* (Crick); *Ginger Software*; *Talking First Word 4.2* (RM); *textHELP! Read & Write GOLD* (textHELP Systems). A generic structured learning scheme such as *AcceleRead, AcceleWrite* (www.dyslexic.com) can be used with any good talking word processor (Miles, 1994).

Many pupils with dyslexia have strong visualisation skills and are helped by the speech plus rebus word processing in *Inclusive Writer* (Widgit), where rebuses (small symbols and images) can be seen above or below the text in traditional orthography. Younger, less confident readers can have a rebus for every correctly spelt word; as their skills and confidence increase, the use of rebus support can be decreased, until it is only used to check the odd word. At any time, the rebuses can be removed from the final printing, so the essay looks like any other piece of word processed work.

Some dyspraxic pupils, who have ill-formed handwriting, lose many of their spelling errors once they see the words clearly displayed in word processed text. Others who have neat, clear handwriting may use excessive pressure, shown by marked indentations through several pages. They may be called lazy, when they appear to produce too short pieces of work, but can be liberated by using a word processor to create work more suited to their apparent ability.

AcceleRead, AcceleWrite (www.dyslexic.com) is not a computer program, but it is a structured teaching programme which uses sentences related to a spelling pattern, in conjunction with a talking word processor. The child is required to type in the sentence from memory and use the speech in the

word processor to help identify errors. This activity is undertaken, preferably daily, for a period of at least 20 sessions. This programme has proved helpful in developing spelling, typing and reading skills, but especially in improving short-term memory and the ability to stay on task, including work away from the computer.

6.4.4 Spelling

Computer spell checkers can be a mixed blessing for children with spelling difficulties, as the list of suggestions can be daunting, especially for children who also have reading difficulties. The algorithms are usually based on likely *typing* errors, rather than *spelling* errors, so these programs will rarely be helpful in dealing with phonic spelling errors (e.g. 'city' spelled 'siti'; 'elephant' spelled 'lyfunt'). Homophones (e.g. 'there' – 'their') are a major problem for many children (particularly those with dyslexia). *textHELP! Read & Write GOLD Primary School* is designed to deal with phonic spelling errors as well as homophones, and includes a talking dictionary and thesaurus. Other software offering some or all of these features includes *Write:Outloud SOLO Edition* and *Kurzweil 3000.* For more similar resources see also section 6.5

Some individuals with dyslexia find that when the word is identified as incorrect, using a *Franklin Literacy Word Bank* to try and help can solve the problem, especially with the *Elementary Spellmaster*, where the page reference to the dictionary gives the meaning of the word.

When someone finds it hard to remember how to spell words, it is usually easier to recognise a specific word than recall its spelling. There is specialised word processing software that provides access to word banks and there are utility programs that will run alongside mute word processors, databases or spreadsheets (for suggested software see Section 6.5.3). Most of these allow the words to be spoken before selection and some can also contain picture or rebus prompts. This is a more positive approach to spelling than spell checking for a weak speller, as correctly spelt words will be seen more regularly, which helps the brain to remember them. Where the utility allows phrases to be stored, it can be an effective prompt for organising ideas and reduces the likelihood of the pupil not 'getting started', when faced by a blank page.

The best simple support for a poor speller is a word processor that provides speech feedback and an error indicator (highlighting or underlining) to indicate inappropriate spellings. However, especially as they get older, pupils with dyslexia may feel the need to try and improve their spelling skills. There are many titles of spelling software, which address spelling in different ways. In a school, it is a good idea to have several programs, partly to provide a variety of approaches to cater for different learning styles, but also to enable the pupil to tackle the tedious activity of learning spelling rules, in as many ways as possible.

Most spelling programs can be customised to cater for the word/phonic patterns that are being currently taught; all have some files that come with the programs and many now have the primary Literacy Hour words and/or lists from recognised teaching schemes like ***Alpha to Omega***, ***Gamz*** and ***THRASS***. Regular, daily access to a customised spelling program (e.g. ***Wordshark4, Starspell***) does build confidence and spelling skills. In an evaluation of ***Wordshark*** by Singleton and Simmons (2001) in 403 schools, teachers reported significant benefits to reading, spelling and confidence in using the program.

6.4.5 Predictive typing

Most poor spellers can recognise more words than they can recall, so predictive typing can be much more helpful. Suitable programs include ***Penfriend, textHELP! Read&Write, WriteOnline*** and ***Co:Writer6***. Choosing the first letter of the proposed word generates a list of possible words in the prediction window; if one of those words is the correct one, then that word can be selected; if not, typing in a second letter produces a new list of possibilities and so on; the more frequently a word is used, the more likely it is to come up in the first window. Where the prediction program has speech, the word can be heard before selection, there is an even greater chance of prediction succeeding.

6.5 List of principle resources and publishers

The following software is available from the publisher (in brackets after each item) or from REM (see Section 9.2, for address details).

6.5.1 Talking books

Electronic Library (Carron)

Living Books (Broderbund)

Matti Mole (Sherston)

Oxford Reading Tree (Sherston)

Rusty Dreamer (Sherston)

Sherlock (Sherston)

6.5.2 Keyboard software

Type to Learn (TAG)

First Keys to Literacy (Widgit)

Kaz (Kaz Learning Systems)

6.5.3 Word bank and predictive utilities

Clicker 4 (Crick Computing)

Co:Writer6 (iANSYST)

Penfriend (Concept Design)

Read&Write (textHELP Systems)

WriteOnline (Crick Computing)

6.5.4 Talking word processors

ClaroRead (Claro Software)

Ginger (Ginger Software)

Kurzweil 3000 (Kurzweil Educational Systems)

Pages (Granada Learning)

Read & Write GOLD (textHELP Systems)

Talking First Word 4.2 (www.RM.com)

Talking TextEase (SoftEase)

Write Away (Black Cat)

Write:Outloud6 (Inclusive Technology)

6.5.5 Spelling and phonics software

Ginger (Ginger Software)

GAMZ2 (Inclusive Technology)

Magic-e **(Xavier)**

PhonicsTutor (PhonicsTutor.com)

Soapbox (Xavier)

Sounds and Rhymes (Xavier)

Starspell (Fisher Marriott)

THRASS (THRASS)

WordShark4 (White Space)

6.5.6 Organisation software

Inspiration v9 (iANSYST)

IDONS (IDON Software)

Thinksheet (Fisher Marriott)

6.5.7 Maths software

Amazing Maths (Iona)
Logical Journey of the Zoombinis (Broderbund)
Mad about Maths (Dorling Kindersley)
MathsBook (Topologika)
Maths Circus (4Mation)
Maths Quest (Disney)
NumberShark4 (White Space)

6.5.8 Other resources

AcceleRead, AcceleWrite (iANSYST) – book.

Handwriting for Windows (KBER) – software for creating handwriting sheets in your school's style.

The Literacy File (John Bald) – reference file for literacy resources.

A–Z of Reading Schemes (NASEN) – book and CD-ROM.

7 Case studies

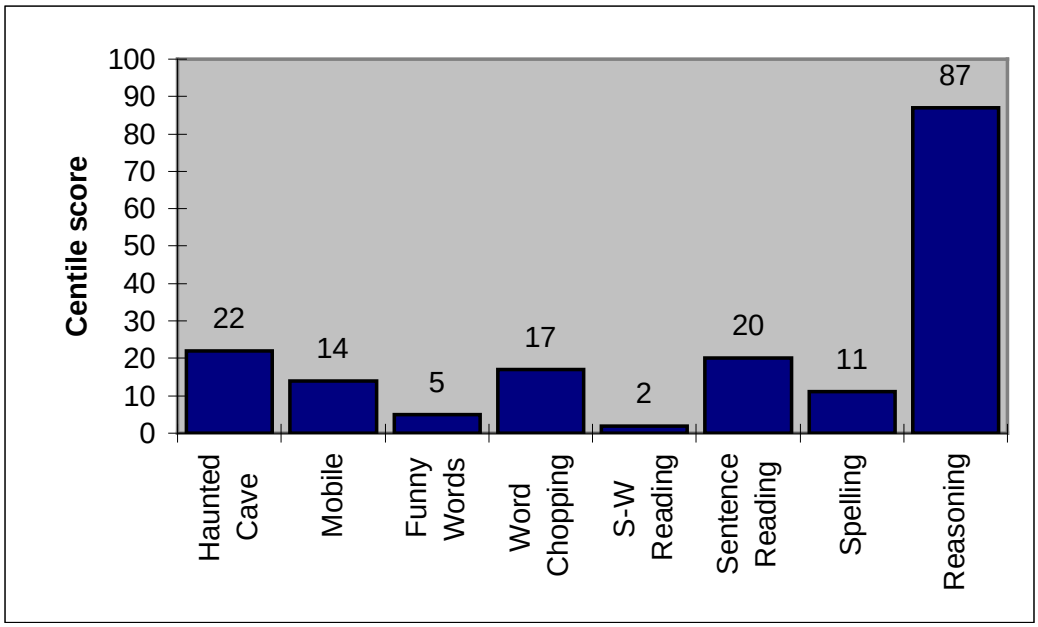
7.1 Introduction

The following case studies provide an illustrative range of profiles obtained from LASS 8-11. Many other types of profile are possible, of course, but by studying these particular case studies, teachers should gain insights into interpreting LASS results and deciding on appropriate strategies for learning and teaching. For further details regarding any specific resources suggested, please see Chapter 6.

7.2 Classic dyslexia

Tim, a boy aged 8 years 7 months, was assessed on LASS 8-11 because his teachers felt that he was not performing up to standard. He was regarded as average in general ability, but his written work was very poor. Tim also had a tendency to be disruptive in the classroom and was frequently on report for misbehaviour, failure to complete work or to hand in homework. He was clumsy, forgetful and slightly hyperactive. Tim's LASS results are shown in Figure 6.

Figure 6. Tim – a case of classic dyslexia.



The results show that Tim is clearly a very bright pupil (***Reasoning***: centile 87), with poor reading (***Sentence Reading***: centile 20; ***Single Word Reading***: centile 2) and very poor ***Spelling*** (centile 11). There is a highly significant discrepancy between his literacy skills and his intellectual ability, which warrants use of the label 'specific learning difficulties'. It is likely that teachers have underestimated his intelligence because of his poor literacy skills and failure to display his talents in writing.

Tim has virtually no phonic decoding skills (***Funny Words***: centile 5), and so he is obviously relying on visual strategies to recognise words. Because he is bright he is able to apply intelligent guessing and use of context when reading for meaning, which is why his ***Sentence Reading*** module result (centile 20) is rather better than might be expected from his ***Single Word Reading*** score (centile 2).

Tim also displays a clear cognitive weakness in auditory memory (***Mobile***: centile 14) and his visual memory is also low in comparison with his intellectual ability (***The Haunted Cave***: centile 22).

Phonological abilities are also relatively low (***Word Chopping***: centile 17). These findings of cognitive impairment justify the use of the term 'dyslexia' to describe his difficulties. In fact, his problems are fairly severe. Tim's dyslexia was subsequently confirmed by full psychological assessment. It then transpired that his father also had literacy difficulties and only a few months later (triggered by these revelations) his older brother (age 12½) was also identified as having dyslexia. Tim had a very unhappy time in the infant department, and it appears that his disruptive behaviour may have been an effect of his undiagnosed learning difficulties. The school immediately put Tim on the Special Educational Needs Register at Stage 3 and arranged for him to receive specialist tuition for his dyslexia twice a week, with daily practice activities.

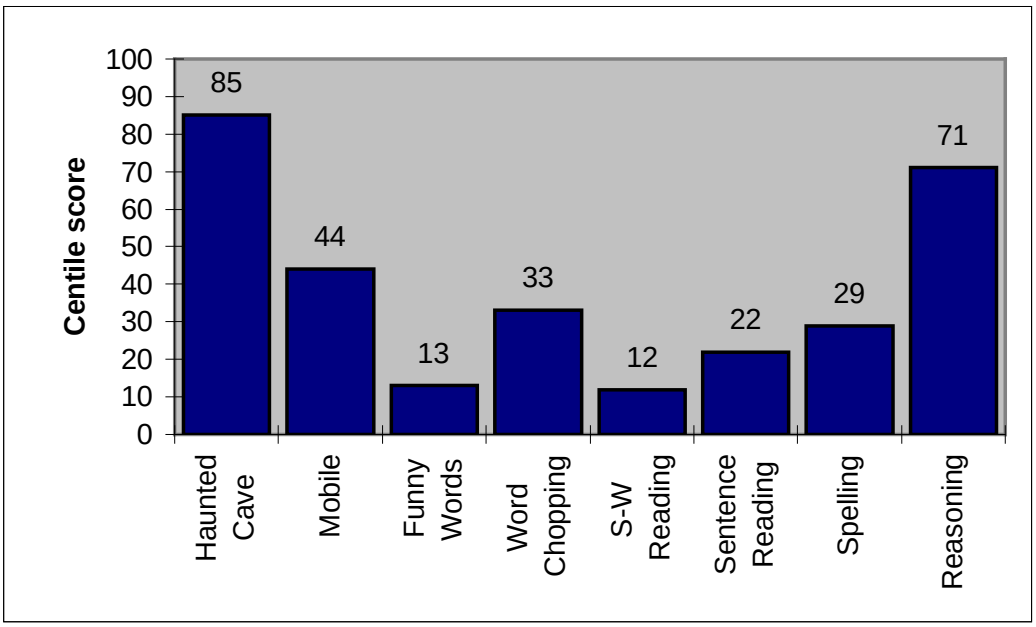
As Tim is bright but has poor reading skills, a short but intensive use of ***Clicker4*** would develop his confidence and skills. He could progress to ***Wordbar*** (Crick) and ***Inclusive Writer*** (Widgit), which would use his visual strengths to develop reading and spelling skills. ***Wordshark4*** could be used at home or homework club to help develop his spelling skills.

7.3 Specific learning difficulties without dyslexia

Sian is a girl aged 10 years 4 months who recently transferred schools. There were no indications from her records of literacy or learning difficulties, and she was generally described in previous school reports as performing at an 'average' level. Her LASS 8-11 results are shown in Figure 7.

Sian is a girl of average intellectual ability (***Reasoning***: centile 71), but she clearly has weaknesses in literacy skills (***Sentence Reading***: centile 22; ***Single Word Reading***: centile 12; ***Spelling***: centile 29). In fact, all the discrepancies between the literacy measures and ***Reasoning*** are statistically significant, so the term 'specific learning difficulty' would be justified. However, Sian's visual memory is strong (***The Haunted Cave***: centile 85) and her auditory memory (***Mobile***: centile 44) and phonological abilities (***Word Chopping***: centile 33) are both within the average range so there do not appear to be any cognitive indications of dyslexia. Examination of Sian's ***Funny Words*** result (centile 13) shows that she has poor phonic skills, so it is most likely that she has failed to acquire adequate phonic decoding skills and so has become over-dependent on visual strategies in reading, relying on her good visual memory.

Figure 7. Sian – a case of specific learning difficulties without dyslexia



Further investigation revealed that Sian had suffered from persistent glue ear from early childhood, leading to phonological discrimination difficulties. This impeded her acquisition of effective phonic skills and so she became increasingly reliant on visual and contextual strategies in reading. When confronted by unfamiliar words (or, in LASS, nonwords) she had few decoding strategies that she could use, and so tended to guess. However, she managed to cope on this basis during primary school and

hence her teachers did not have cause to regard her as having any special educational needs. Already the visual approach is failing her and will continue to do so in the face of the more demanding secondary school curriculum. Sian therefore needs attention to her phonic decoding skills as a matter of urgency. The school immediately placed Sian on the Special Educational Needs Register at Stage 2 and arranged for her to attend a phonics tuition group once a week, with daily practice activities.

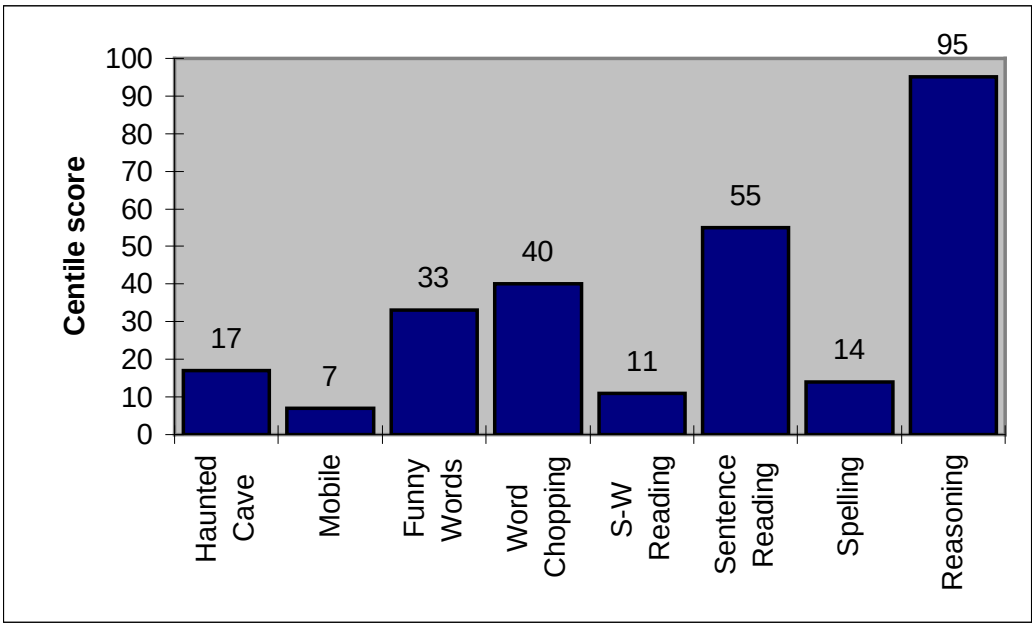
Sian missed a lot of early language development due to glue ear, but has strong visual skills. If she uses ***Inclusive Writer*** for written work, relating the rebus to words could speed the flow of her writing. A course of daily sessions on ***Starspell*** to develop her phonic skills, supplemented by some sessions on ***Wordshark4*** for variety in spelling practice, would be beneficial. ***Franklin Spellmaster*** could be used when she is not near a computer.

7.4 Partially compensated dyslexia

Rory is a boy of 9 years 5 months, who was referred for assessment with LASS 8-11 because of persistent spelling difficulties. His results (shown in Figure 8) indicate that he is obviously very bright (***Reasoning***: centile 95), with average reading skills in context (***Sentence Reading***: centile 55) but poor ***Single Word Reading*** (centile 11) and ***Spelling*** (centile 14). This discrepancy clearly justifies the label 'specific learning difficulties'. His phonological skills are satisfactory (***Word Chopping***: centile 40) and he can cope fairly well with ***Funny Words*** (centile 33), suggesting that he has absorbed some phonics knowledge. Nevertheless, the clear evidence of memory weaknesses (***The Haunted Cave***: centile 17; ***Mobile***: centile 7) strongly suggests quite serious dyslexia. His high intelligence enables him to compensate for his difficulties to a certain extent (e.g. in prose reading) but he will definitely require further support otherwise he is likely to under perform in many areas of the curriculum.

Subsequent enquiries with Rory's parents revealed that he had received some specialist tuition, focusing on phonic skills, when he was 6–7 years old. However, since this was from a private tutor, it had not appeared on his school records. The school immediately placed Rory on the Special Educational Needs Register at Stage 2 and arranged for him to receive weekly support in spelling from the special needs coordinator, with daily practice activities using computer programs designed for this purpose.

Figure 8. Rory – a case of partially compensated dyslexia.



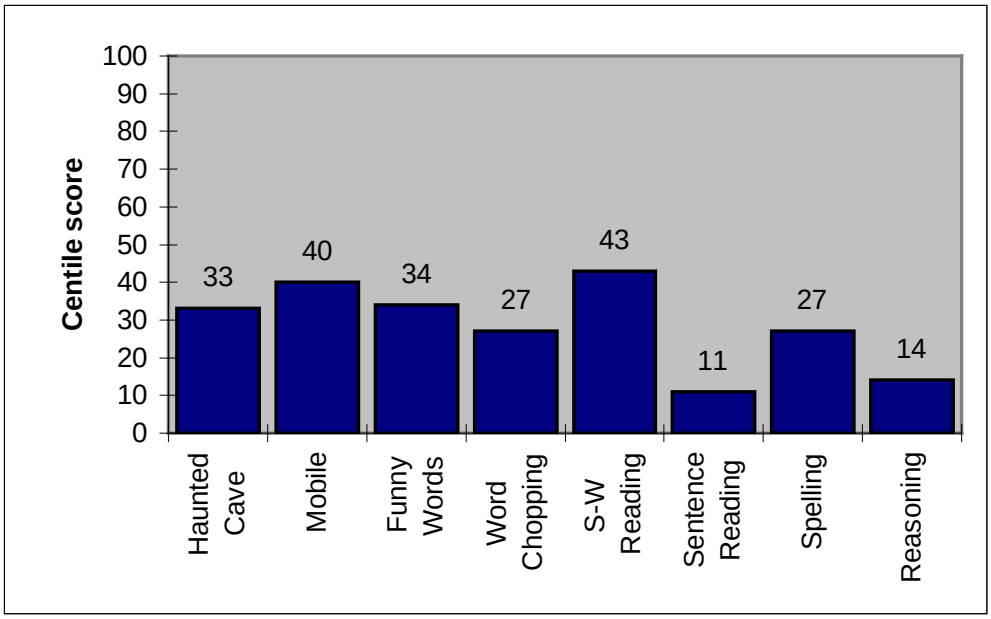
Rory is bright and can read words in context, but not isolated and has severe spelling difficulties. LASS 8-11 indicated memory problems, so he should have a course of ***AcceleRead, AcceleWrite***, supplemented by using ***Wordbar.*** At home he should have daily sessions on ***Starspell***, using files suggested by the SENCo. He should be taught how to use ***Penfriend, Co:Writer*** or ***textHELP! Read&Write*** to develop predictive typing skills, and to increase his independence in spelling.

7.5 Low general ability

Dani is a girl aged 10 years 2 months. Her teachers have regarded her as a pupil of somewhat below average general ability, and in particular it had been noted that she had immature language skills. She was not on the school's SEN register. However, her parents have raised the question of whether Dani has dyslexia and so LASS 8-11 was administered by her class teacher. The results are shown in Figure 9. With the score on ***Reasoning*** at the 14th centile it is clear that Dani is rather below average, although it should be remembered that this only assesses non-verbal intelligence. To check Dani's verbal intelligence, a test such as the British Picture Vocabulary Scale (BPVS) could be given.

It is notable that Dani appears to be holding her own in some areas, such as reading accuracy (***Single Word Reading***) and ***Spelling***, since these are higher than might have been predicted from her intelligence. Her phonic skills (***Funny Words***) are also in the average range, suggesting that decoding has been well taught. Her main problem is with ***Sentence Reading*** (centile 11), which suggests problems of comprehending text. It is also likely that her poor vocabulary knowledge is affecting her text reading ability. But her diagnostic test results are all in the average range, so it is rather unlikely that she has dyslexia.

Figure 9. Dani – a case of low general ability.



The special educational needs coordinator felt that the level of Dani's difficulties, when considered in the context of her intellectual ability, did not justify a significant amount of additional support. However, she was put on the SEN register at Stage 1, and arrangements were made for her to participate in regular shared reading work with pupils from the local college who visited the school to support literacy work every week as part of their community education programme, with the objective of developing her text comprehension ability.

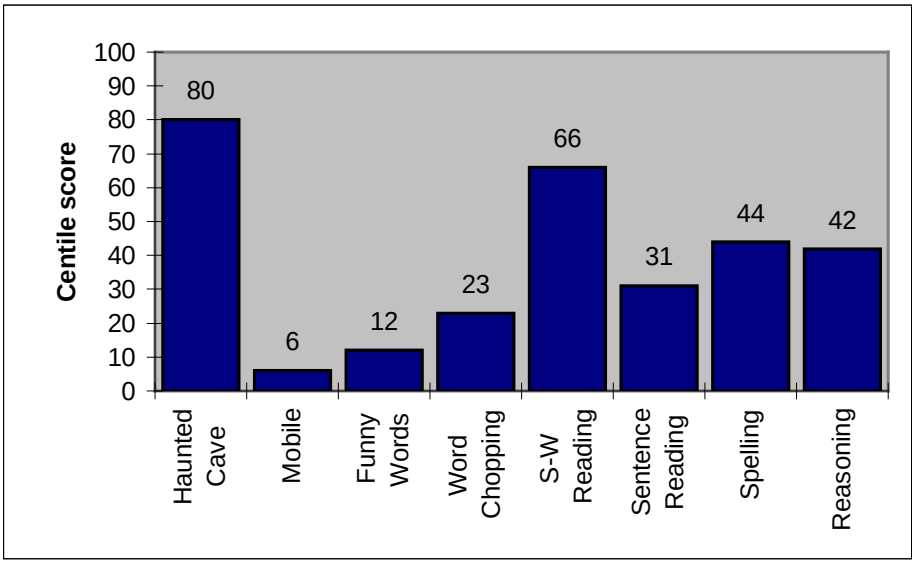
Although Dani is of low intelligence, she has learned to read words, but she has problems with sentences and a limited vocabulary. If she used ***Clicker4*** as her writing tool, she could have grids of words supplemented by pictures, if needed, for new curriculum words. She could have her own talking word book and banks of phrases to stimulate better sentence construction.

7.6 Poor auditory-verbal memory

Megan is 8 years 5 months. She had been coping reasonably well in her literacy development to date, but her teacher noted that she had particular difficulty in decoding new or unfamiliar words. She was not on the school's SEN register. She was tested with LASS 8-11, with the results shown in Figure 10.

The scores show that Megan is of average ability and is in the average range for reading and spelling. However, what is really striking about her profile is the very good visual memory (***The Haunted Cave***; centile 80) and very poor auditory-verbal memory (***Mobile***; centile 6). Not surprisingly, she has had difficulty in acquiring phonic skills, which shows in her poor ***Funny Words*** score of centile 12. In fact, her profile is consistent with a diagnosis of dyslexia. Her visual memory strengths have obviously been compensating for lack of phonic skills, and she has tended to use whole-word visual strategies when reading. Until recently, that approach has been fairly successful, but of late she has begun to fall behind. Further decline in reading ability and school performance would be predicted unless specific help is provided to enable her to develop better phonic skills.

Figure 10. Megan – a case of poor auditory-verbal memory.



Megan should benefit from an of ***AcceleRead, AcceleWrite*** course, supplemented by using a talking word processor or screen reader to read back what she had already written. This would also help develop her auditory memory. She could use ***Inclusive Writer*** to enable her good visual skills support her writing. ***Starspell*** and ***Wordshark4*** would improve her spelling.

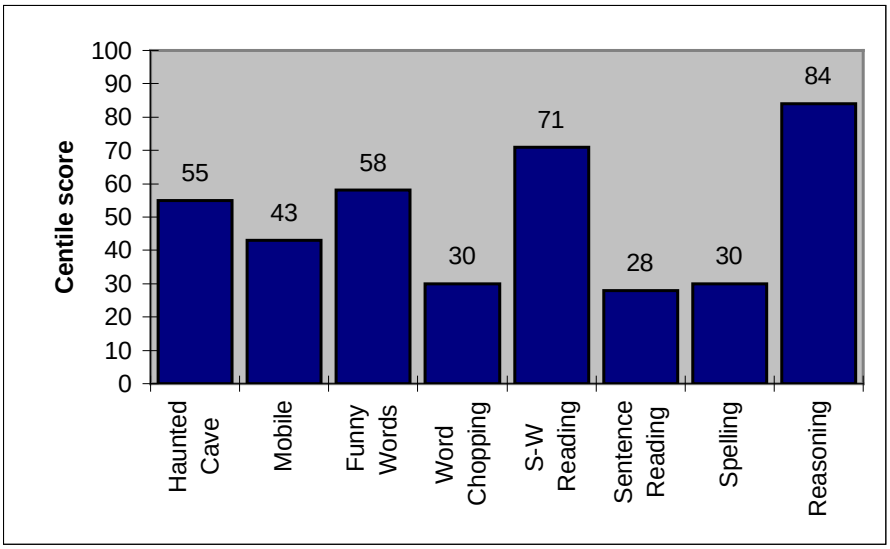
7.7 Poor fluency in reading and spelling

Tom was assessed on LASS 8-11 at age 11:5 because of underperformance in school. His teachers felt that he was a bright boy who had a good grasp of concepts but was weak at using text-based resource materials and in his written work did not come up to expected standards. A query had been made regarding whether Tom might be dyslexic, although he was not on the SEN register.

His test results, which are shown in Figure 11, reveal no evidence of dyslexia, but ***Word Chopping***, ***Sentence Reading*** and ***Spelling*** are below expected levels for such a bright boy. Further investigation suggested that the most probable cause was lack of reading and writing experience, resulting in poor fluency and lack of automaticity of literacy skills. His parents reported that Tom 'Hates reading and writing and never reads unless forced to'. He was obsessed with sports and computer games.

Clearly, Tom requires more practice in both reading and writing. As his parents were keen to participate in this, they were encouraged to read with him every evening (something they had not done since he was seven), and also to support him in regular writing activities at home using a word processor. He likes computers, so using a CE laptop with ***Wordbar*** could motivate him to write more; the words, phrases and sentence starters would reduce the 'blank page phobia', so that he gets started and has some success. A talking word processor or screen reader would enable him to hear his work for reviewing, editing and organising his ideas.

Figure 11. Tom – a case of poor fluency in reading and spelling.



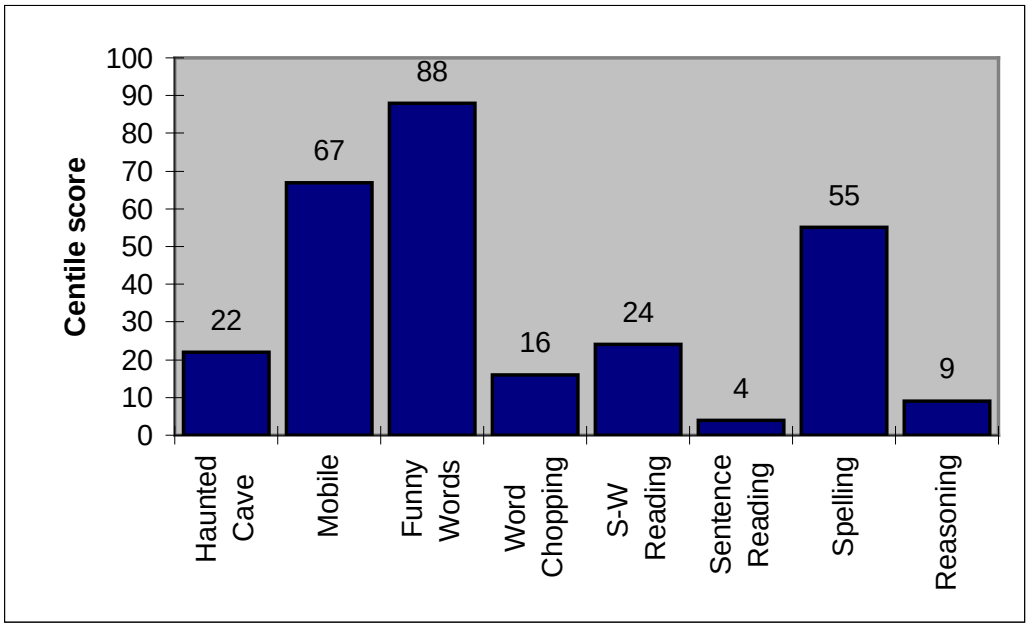
7.8 Hyperlexia

Harvey was a 9 year-old boy with high grade autistic spectrum disorder (Asperger's syndrome), who attends a Special School. The Local Education Authority is implementing an inclusion policy for children with disabilities and special needs, and the education officers are in discussion with his teachers and his parents about whether he should be moved to a mainstream school. To assist in these deliberations, Harvey was assessed on LASS. The results are shown in Figure 12.

Harvey is clearly of low ability (***Reasoning***; centile 9) but his rote memory (***Mobile***) is good and his ability to read nonwords is quite astounding (***Funny Words***; centile 88). However, his profile conforms to that of a hyperlexic reader, i.e. Harvey can decode text, read aloud superficially well and can recognise words within his rather limited vocabulary, but he understands very little of what he is reading. This is shown by the very poor ***Sentence Reading*** score (centile 4). Harvey's good rote memory also helps him to spell fairly well, but he cannot use those words in a meaningful context when writing.

It was decided to try Harvey in a mainstream primary school, providing him with a support assistant in the classroom to help him deal with the work, and a number of computer support techniques were also put in place. The rebuses and speech in ***Inclusive Writer*** could help to keep his mind on track, especially if linked with prompt grids from ***Inclusive Writer*** or ***Wordbar***. If he has good story ideas, as many Asperger's pupils do, he could be encouraged to relate his story onto tape and then transcribe it into ***Inclusive Writer*** later.

Figure 12. Harvey – a case of hyperlexia.



7.9 English as an additional language

Mena, a girl aged 8 years 2 months, and Rajid, a boy aged 9 years 1 month, are both pupils for whom English is an additional language. Despite several years in school neither had acquired a particularly good standard of spoken English and their literacy skills were poor. The teachers are divided regarding the likely cause of their problems. Some believe that their difficulties were those of the typical child for whom English is an additional language, and that a greater amount of language stimulation was needed. Other teachers wondered whether Mena and Rajid were perhaps not as bright as they had first imagined, and that consequently educational expectations were being set too high. Finally, some thought that there might be more serious underlying problems that were impeding these children's progress. To help understand these cases, LASS 8-11 was administered to both pupils and the results are shown in Figure 13 and Figure 14.

Figure 13. Mena – a girl with limited English.

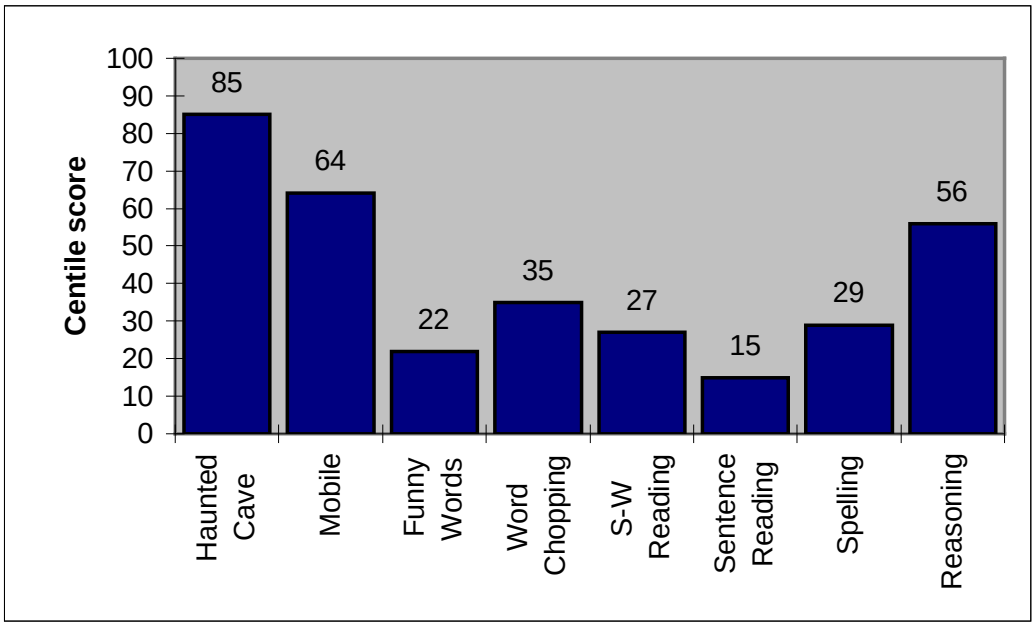
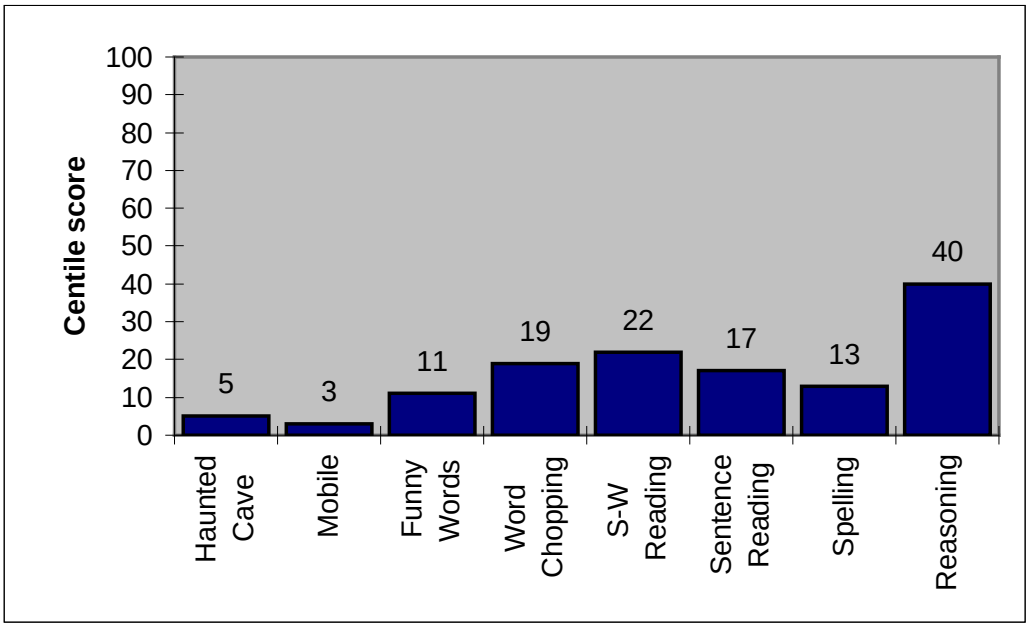


Figure 14. Rajid – a boy with limited English.



Of the two, Mena is clearly the brighter (at least as far as non-verbal reasoning is concerned) and in neither case could low ability be taken to be the cause of their problems. But they differ markedly in their diagnostic test results. Mena has good memory skills while Rajid has poor memory skills — in fact, his profile is that of dyslexia. Mena, on the other hand, appears to be making some progress in reading and spelling, suggesting that the teaching methods that had been adopted were working, albeit rather more slowly that her teachers would have expected. Both of these pupils require continuing support in English, but Rajid needs a more highly structured multisensory programme directed at his dyslexic difficulties (see Section 6.3.3), together with daily practice using a program such as ***Wordshark4.*** Mena, on the other hand, should be able to cope with ordinary classroom literacy activities supplemented by some additional practice to help her increase her fluency.

8 Implementing LASS in two different schools

8.1 Introduction

This Chapter has been written by **Anita Keates**, a specialist dyslexia teacher and educational consultant who has many years' experience of working with SEN students of all types. At the time of writing (2001), she was chair of the computer committee of the *British Dyslexia Association.* Anita works in two schools: Foxhills Technology School, a comprehensive in Scunthorpe, North Lincolnshire; and St. Hugh's School, an independent school at Woodhall Spa in rural Lincolnshire. The former caters for pupils aged 11–16 years and the latter for pupils aged 3–13 years. Anita has incorporated the LASS programs into the SEN assessment processes in both these schools and here describes how LASS has been applied in these different settings.

8.2 St Hugh's School

St. Hugh's school wished to have a continual assessment system that would screen and assess all pupils, from their entry into Kindergarten through to their leaving at the end of Y8. Having already successfully introduced ***CoPS Cognitive Profiling System*** for the younger pupils, we found we needed an assessment system that offered the same benefits to the school that CoPS did. CoPS had made the school aware of the advantages of a quick, objective and easy to administer assessment tool.

In the meantime, the teachers at St. Hugh's were quickly becoming aware of all different kinds of SEN issues and were presenting the Deputy Head, who is also the SENCo, with numerous names of pupils in Year 3 – Year 8, for further diagnostic testing. For me to test these pupils using paper-based systems meant that we were constantly facing a back-log of assessments needing to be done. It soon became apparent that there was an immediate need for a computerised assessment tool that would cater for pupils aged between 7 – 14 years. LASS 11-15 fitted the bill perfectly for those aged 11 –14, and LASS 8-11 caters for the younger pupils.

Whilst I worked with one pupil, it was possible, by using LASS, to have another pupil being assessed at the same time. Headphones meant that the pupil working on LASS was able to work undisturbed and the process caused no disruption to my usual lesson. The resultant data provided me with valuable information and from that, I was quickly able to determine whether the pupil was likely to be dyslexic, or have different SEN difficulties.

The staff of St. Hugh's were impressed with LASS and are now using it for all pupils aged 11 years and over. At the time of writing this, they were eagerly awaiting the 8-11 version of LASS to complete their assessment suite of programs.

8.3 Foxhills Technology School

Concurrently, I also introduced LASS at Foxhills Technology School, where I appreciated the potential of its use in assessing many pupils in a relatively short period of time. Coincidentally, it was at this time that I was asked to organise and run a Summer Literacy Scheme for Foxhills. The Government criteria for this scheme was that the pupils selected should be at least one grade lower in their SATs results at KS2 for English, than they were for their SATs results in Mathematics. It also stated that they should be level 3-4 in Mathematics and level 2-3 in English. These criteria meant that I was likely to get many dyslexic pupils attending the scheme.

This group of pupils provided a perfect target group to screen using LASS. There were some 30 pupils in all and when tested, I found that I was presented with 20 printouts that suggested those particular pupils were dyslexic. We were particularly interested in the Reasoning results LASS presented us with, especially when compared to the behaviour profiles of some of the pupils. Many of the pupils with dyslexic profiles had somewhat 'challenging' behaviour.

The Summer Literacy Scheme was designed specifically for dyslexic pupils, but also aimed at catering for non-dyslexic students. The teachers delivering the scheme were fantastically dedicated and talented, They viewed my use of LASS as interesting and innovative. I appreciated their skills, abilities and professionalism in using the data to influence their teaching and delivery of the scheme of work. The result of this very successful two-week course was that the pupils really had a fantastic time; learned a great deal; never stopped working, including in the evenings according to parents; and were keen and eager to start at Foxhills Technology School in the September. The Scheme had also resulted in the teaching staff being made aware of the benefits of LASS.

Both schools very quickly became aware of the potential of using LASS and wished to extend its usage accordingly. For St. Hugh's this was relatively easy, as it is a small school. For Foxhills Technology School, which had assessment arrangements already in place, the story was a rather different one. A greater number of pupils gave bigger practical problems.

Foxhills Technology School assessed its pupils on entry by giving them the Cognitive Abilities Tests (CAT), as well as by using National Curriculum data, SATs results and information from the 'feeder schools'. The CAT is a means of assessing pupils' verbal, non-verbal and quantitative reasoning and is done via a paper-based system. The administration is carried out under examination conditions and the papers have to be sent away for marking. The results are usually returned some 4–6 weeks later. Although this was not a particularly easy method of assessing the pupils, the school had found it worthwhile and had operated this system for quite a few years.

A particular disadvantage of the CATs tests at Foxhills Technology School was that the school hall had to be booked for a few days whilst all of a particular year group were tested. This caused some inconvenience, which was compounded by the teaching staff having to be released from their normal timetables to cover the adjudication of the CATs. Cover-lists for supervision were the outcome, with resultant disruption, although good organisation kept this to a minimum. The tests were delayed in being sent away for marking as it usually takes about one term for the Year 7 population to 'settle' and any late arrivals to the school were tested throughout the term. When the school felt that the pupil population was stabilised, then the tests were sent away for marking and the results eagerly awaited.

LASS was soon appreciated as an assessment tool that was both useful and speedy. Indeed, the teachers quickly recognised how good it was for its job and its usage was extended, with the result that any pupil, who was causing concern in any way, was duly assessed using LASS. The advantages were obvious for, within an hour, I could assess a pupil accurately, and provide a print out that would be clear and easy to interpret. One could recognise at a glance the potential of the individual pupil. Not only did LASS give a good estimate of IQ, but it also gave us the reading centile, spelling centile and other diagnostic results. From this battery of data, one can quickly identify if the pupil is likely to be dyslexic or have other learning difficulties.

LASS was used for pupils who:

1. arrived in the school with no documentation and the Year Heads were unsure as to which set to put them in.
2. arrived in school on any stage of the SEN Code of Practice.
3. were a concern to a teacher, e.g. by not appearing to work at a level equivalent to the peer group or setting group, or whose behaviour was a little challenging.
4. had parents who requested a test or screening for dyslexia.
5. requested that they be tested for dyslexia.
6. were not achieving similar grades for literacy as they were for numeracy.
7. appeared to be assigned to wrong sets.

Our response to the pupil's needs could be implemented within minutes of the completion of the LASS assessments; including responding to parents and consulting them. These advantages were discussed and the school, which is often at the leading edge in using ICT, decided to network LASS, so that whole classes and year groups could be assessed.

8.3.1 Implementing LASS at Foxhills

Although LASS is a relatively new and quite different form of assessment, for specialist teachers who are used to assessing pupils, its usage is easy to assimilate. However, for classroom and subject teachers, LASS presents a new approach and concept. Many classroom teachers are not involved with diagnostic assessments or administering them. Indeed, many might not be aware of the advantages of, or need for, this type of screening.

It is therefore very important to have initial awareness training sessions for all staff. The second stage is for those members of staff who are likely to administer LASS to be trained on how to carry out the assessment. The third stage is training in interpreting and using the data. This training enables the teachers to have ownership of the system, as well as empowerment, so that they can have greater involvement in using the information. This data can help them in being aware of the pupils' needs, learning styles and through this knowledge, help determine their lesson content and delivery. By taking this approach, the school is using LASS to the benefit of everyone, the staff, the pupils and, through the latter, the parents.

The staff at Foxhills were already aware that for pupils who had barely left a Year 6 primary classroom environment, being placed under examination conditions, which are known to cause stress even to accustomed Year 11 pupils, was not necessarily the best approach to take. Some pupils were so overawed that they just froze in their chairs. Some looked totally lost, with their feet swinging away, as their legs were too short to reach the floor. Some, who possibly felt they had already failed at a paper-based system, were disengaged from the first sentence. Some pupils also had a phonological processing deficit and did not clearly understand the instructions, even when repeated slowly. This was possibly compounded by the use of the large hall, with resultant acoustic problems. Therefore, for a significant number of pupils, the tests were not reliable. This is not to criticise the tests in themselves, but the environment in which they had to be administered. Indeed, within the limitations of conventional assessments the CAT tests are very good and were deemed by the school to be the best option at that point in time.

Many schools are looking to increase examination results and thus to identify a source of pupils who are possibly not achieving their true potential. Dyslexic pupils are unable to access the curriculum within the classroom as well as their peers, with consequent lower examination results. By using LASS the school can quickly identify the dyslexic pupils. Following this, the school can target the provision of appropriate support for those students to enable better access to the curriculum. This will result in those pupils achieving subsequent higher grades in their examinations, and benefits all concerned.

8.3.2 The advantages of LASS for screening at secondary level

The following list gives some of the main advantages of LASS that were noted by the staff at Foxhills:

- LASS is easy to administer.
- LASS takes about one hour to administer (indeed, all we had to do was ask the teacher who was responsible for the ICT lesson with a particular class, to spend one double lesson, about one hour, in doing the LASS testing; this caused no disruption).
- At the end of the hour, the school can have the results instantly.
- The results are not only for reasoning ability (IQ), but also for reading ability and spelling.
- The results also contained extra diagnostic information, which the school finds particularly useful.

- The battery of information provided is very useful to all staff.
- The pupils enjoy the testing immensely.
- The pupils find it a non-stressful environment — indeed, often laughing and enjoying the session.
- In trial testing, no pupil was disengaged by the LASS assessment tool, so the school had a reliable set of data for every pupil.
- If a pupil is absent, it is easy for the school to arrange for the assessment to be done on return.
- Late arrivals at the school can be tested at the earliest convenient opportunity.
- The teachers preferred LASS stating how much easier it is to administer. They also found it interesting.
- The SENCo soon realised the potential of LASS, as did other senior staff within the school.

8.3.3 Practical issues

When implementing any new system of screening or assessment, especially when this is being applied to large groups of children, there are inevitable practical problems that must be addressed.

1. There is a training implication for the staff and possible costs attached to this.
2. Time constraints on staff when trying to fit in the necessary training. Without this the staff will not be aware of the potential of the program and its advantages might not be fully realised.
3. For the training to occur, senior managers within the school have to be aware of the advantages of LASS as its implementation needs to come from the top. Without that support LASS usage will be limited, possibly to the SEN department. However, even then it will prove very useful.
4. The printing out of the LASS profiles for every pupil can be a time-consuming task. This can be solved by:
   a) printing only the summary data per pupil, or
   b) by providing a network machine with a local printer, which can be left running. In any year group there can be many printouts to do, and this can take as long as one minute per printout. A dedicated printer must be located where the pupils cannot access the hard copies as they are being printed, as this is private and confidential information which pupils will not wish their peers to see and know about. The solution at Foxhills is that in my office one of the computers is due to be networked and the printer will be designated to do the printing. I oversee this process and ensure that privacy is maintained, along with also ensuring that the printer does not run out of paper or ink cartridges.
5. Headphones are required for the LASS program and so it is essential to that these are available. It is necessary to have enough headphones for one set per machine, and if there are three or more networks in the school, locating the headphones, or obtaining enough of them, can be problematic.
6. It is also essential that there is technical support available, so that the technician can ensure that the sound is working on each computer and that everything is operating as it should.
7. The previous point implies that technical staff also need to be aware of the importance of LASS. It would be preferable for the technical staff to attend the training given to the teachers, so that they can share the knowledge and thus understand what the school is doing.
8. A printed guide should be provided for the staff, setting out the way to access the LASS program, and how to go through the various screens, including the passwords. I also included which tests to do and in what order.
9. The staff, in their training, need to be aware that LASS is an important assessment tool and that the lesson must follow examination standard rules.

10. The latter point means that the use of supply staff who have not been trained, is not really advisable for administering LASS.

8.4 Case Studies

In each of the following three cases of pupils at Foxhills, a quick diagnosis using LASS has assisted the school in being able to identify and target support for these pupils. Their success is a testament as to how important that initial screening and diagnosis is, so that support can be provided at the earliest stage.

8.4.1 John

John arrived at Foxhills School at the start of Year 8. We were informed that he had an IQ of 53 (WISC–III). As a result, and coupled with the fact that he had an EBD Statement, John was placed in a low banding. I tested this boy using LASS. John's Reasoning centile was over 80, although his reading and spelling centiles were quite low. When all of the tests on LASS were completed John, had a dyslexic profile. I also knew that he had a diagnosis of dyspraxia, so I added dyslexia to that. However, LASS was giving a very different reasoning level of ability than any other tests had given this boy.

I worked with John for a few lessons and noted other problems as well. He was later confirmed as also having Asperger's Syndrome. By using the information provided by LASS, I immediately put into place a support structure appropriate for this pupil. As a result, some 15 months' later he has been moved into Set 2 out of 8, which is an A band class, and he is quite able to cope with the lessons. He has already completed for music, over half the GCSE course and played a solo on his electronic keyboard at the Christmas Concert, gaining a standing ovation. His knowledge and ability with ICT is phenomenal and he is a delight to work with. His parents are overjoyed. He is currently expected to achieve at least 7–8 GCSEs grades A–C.

8.4.2 Malcolm

This pupil was on the Summer Literacy Scheme in Year 8 and we were immediately aware that he was a pupil who might have challenging behaviour. However, when tested using LASS, he had a dyslexic profile and a Reasoning centile of 82. Our immediate task was to encourage this pupil to enjoy an academic environment and when I spoke to him and noted his good intelligence, he was rather surprised, although very pleased. He worked very hard over the two weeks; indeed, he even spent three hours one evening making a mediaeval hovel out of wood. It was impressive and the local museum service displayed it, along with the work done by the pupils during the Scheme, in local museums.

With this level of immediate co-operation, we put into place a 'fast track' support programme aimed at raising Malcolm's confidence and self esteem, as well as his ability to read, write and access the curriculum with appropriate study skills and usage of ICT. Malcolm responded well. Some 15 months' later, he has recently won a Bronze Medal in the World Championships for Karate; been given a gold medal by Kris Akabusi; been chosen by Leeds United Football Club to play in their under 14s and is due to meet their Chairman. Malcolm can now read at a level equivalent to his chronological age and is currently in an A band class. He is likely to exceed 6+ GCSEs with grades A-C, and is talking excitedly about going to university.

8.4.3 Jane

Jane arrived at Foxhills Technology School at the end of Year 10. She had previously attempted suicide and suffered from depression. I tested her using LASS and obtained a dyslexic profile. This pupil was in urgent need of help and support and a programme was immediately put into place. That programme included specialist teaching from me for 35 minutes per week, as part of a small group of three pupils, and a teacher's aide to help in some lessons in order to gain access to the curriculum. ICT was part of the support and the school makes available its resources for pupils during the school day and in the evenings.

Jane made full use of these and we managed to increase her reading age by some five years in 15 months. She enjoyed the progress she was making and soon gained in confidence and self-esteem. Indeed, when she left school, her examination results were six GCSEs all with good grades. As a result, she was able to start work with disabled adults in a specialist residential home, which was her chosen career path. She has since obtained, in only 18 months, an NVQ level 1 and 2. She is currently taking NVQ level 3 and enjoying the work tremendously.

9 Appendices

9.1 References

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9.3 LASS 8-11 Comments Sheet

Name of child ..... Date of Birth .....

Class..... Supervisor .....

School or Centre .....

Test	Date	Testing room	Health	Attention	Other comments	Initials of tester
The Haunted Cave						
Mobile						
Funny Words						
Word Chopping						
Sentence Reading						
Single Word Reading						
Spelling						
Reasoning						

General comments .....

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This sheet may be freely photocopied for use in conjunction with LASS 8-11 testing.

