Using Lucid software in special education

A guide to screening and assessing students with low general ability

Lucid's screening and assessment software is *normed*, i.e. the raw scores are automatically converted to standard scores based on large representative samples of students. This enables valid comparison of a given student's performance with that of his or her peers, independent of age, and identification of both *relative* and *absolute* strengths and weaknesses.[1] For the majority of teachers working in mainstream schools, this approach provides the information needed to determine the nature and severity of students' learning problems and to formulate solutions for improvement.

For teachers in special education, however, whether they are in a special school or in a special unit within a mainstream school, things are rather different. Their students, who are typically well below the average range in general ability, tend to score within the lower ranges on most, if not all, standardised tests of cognitive ability and educational attainment. This can make identification of relative weaknesses very tricky, while at the same time all scores can be classed as absolute weaknesses, which tells the teacher nothing that they didn't know already!

This is not a problem confined to Lucid's software – it arises whatever tests are used with special education students. Nevertheless, teachers in special education recognise that their students are not necessarily all the same: there can often be strengths hidden within their general learning difficulties that can be utilised for more effective learning as well as unidentified weaknesses that are hindering learning and which call for individually tailored solutions. But until those strengths and weaknesses can be *properly quantified* it can be a major challenge for teachers to turn their hunches into effective strategies for boosting learning.

Mental age

One way of looking at the general ability of special education students is in terms of *mental age*. Although this may be regarded by some as an old-fashioned concept, superseded by modern usage of standardised scores, in fact mental age can prove very useful when analysing the performance of students whose general ability is well below average. Mental age is defined as the average general ability of students of a given chronological age; e.g. the average 7-year-old will have a mental age of 7, the average 10-year-old will have a mental age of 10, and so on. This concept has been extended to other areas of cognitive functioning and educational attainment; e.g. reading (or spelling) age is defined as the average

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[1] In this context a *relative* strength or weakness refers to a difference between scores obtained by an individual student across separate areas of cognitive functioning or educational attainment; e.g. a student may have a standard score of 120 on reasoning but only 90 on reading, indicating a weakness in reading *relative to* their general intellectual ability. However, a standard score of 90 on reading does not constitute an *absolute* weakness, because it is within the average range for the population as a whole. But if the reading score was less than 85, this would be an *absolute* weakness because it lies below the population average range of 85–115.

reading (or spelling) ability of students of a given chronological age. These measures are known generically as *age equivalents.*

The IQ, or intelligence quotient, is the ratio of mental age to chronological age multiplied by 100; e.g. a 7-year-old with mental age of 10 will have an IQ of 10/7 x 100 = 143, while a 10-year-old with mental age of 7 will have an IQ of 7/10 x 100 = 70. IQ scores are distributed in exactly the same way as standardised scores, i.e. in a bell-shaped curve with a mean (average) of 100. This means that standard scores can easily be converted into mental age (or any other type of age equivalent) and *vice versa*. The general formulas are:

Standard score (or IQ) = age equivalent/chronological age x 100

Age equivalent = standard score/100 x chronological age

Thus a child aged 9 years 0 months with a reading standard score of 75 will have a reading age of 75/100 x 9.0 = 6.75 (6 years 9 months), i.e. is over two years behind the average of their chronological age group.

Students in special education have often been assessed by an educational psychologist and IQs noted in the records. However, this is not always the case, in which event *Lucid Ability* can be used to determine a student's IQ. This computerised test has particular advantages when assessing the intelligence of special education students because it has been specifically designed to be used by non-readers and those who can be difficult to assess by conventional means.

Using mental age to determine which tests to administer

When administering Lucid tests you have to enter the student's date of birth so that the program can calculate their chronological age, which in turn determines which norms table is used to provide standard scores. This ensures that a student's performance is compared with that of other students of the same chronological age group.

But when attempting to diagnose problems of students in special education, whose mental age is well below the average of their chronological age group, it is more useful to compare them with students of the same *mental age* group. This can be achieved in two ways.

1. By selecting a form of the test designed for, and normed on, younger students, e.g. using *LASS 8-11* when the student's chronological age actually places them in the range where *LASS 11-15* would normally be used.

2. By entering an adjusted date of birth into the software based on mental age rather than chronological age, e.g. if the student with a chronological age of 15 has a mental age of 12, then add three years to their data of birth, so that the program compares them with 12-year-olds rather than 15-year-olds. If taking this course of action it is essential to make a record that an adjustment to the date of birth has been made.

There are some limitations to these solutions, however. Since the youngest norm group for *LASS 11-15* is age 11, this effectively places a lower limit on the degree of adjustment that can be made to date of birth. Although the software will accept

dates of birth outside the norm range (and will give a warning that this is occurring), the program can only apply the norms for nearest age group in its data bank, e.g. the results of a 10-year-old tested on LASS 11-15 will be based on the norms for age 11. However, if *LASS 8-11* is used instead of *LASS 11-15*, this extends the lower date of birth limit by up to a further three years, and if *Lucid CoPS* (age range 4–8) is used, by up to an additional four more years.

By using adjusted dates of birth and mental age-appropriate tests, the Lucid software range can accommodate the assessment of children with exceptionally low general ability; e.g. a student aged 12 with a very low IQ of 54 can be assessed on *Lucid CoPS* as their mental age will be 55/100 x 12 = 6 years 6 months, well within the normative range of the program.

Screening tests

LASS and *CoPS* are both diagnostic assessment tests that generate standard scores across a range of cognitive and literacy measures. They can be used for a range of assessment purposes and also for screening – e.g. administered to large groups of children in order to determine which of them are dyslexic – but this judgment is based on the teacher's interpretation of the results. By contrast, *Lucid Rapid Dyslexia Screening* is explicitly designed for quick screening and it generates an automatically interpreted result that includes the probability of the child having dyslexia.

However, although *Lucid Rapid* is a different type of test to *LASS* and *CoPS,* the technique of adjusting the date of birth can still be used when testing children who have very low general ability. In fact, it is more important to do this with *Lucid Rapid* than with the other two products, because Rapid comprises three short tests that assess cognitive skills which are affected by IQ. By adjusting the date of birth the program is able to compare the child's performance with that of peers of similar mental age, which makes the screening more sensitive and reduces incidence of false positives.

Lucid produces two other screening tests: LADS Plus, designed to screen for dyslexia in adults (age 15+), and Lucid ViSS, designed to screen for visual stress (Meares-Irlen syndrome). Since both of these products incorporate systems that effectively control for intelligence, the sensitivity of screening is not altered by adjusting the date of birth and therefore nothing is to be gained from doing this when using these two programs.

Lucid Recall

Lucid Recall is a product that assesses working memory (WM) and speed of processing in the age range 7 to 14 years. Since both of these cognitive skills are highly affected by intelligence one would expect children with low IQ to have low scores on tests of working memory and speed of processing. In theory, therefore, it would be appropriate to adjust the date of birth when using *Lucid Recall* to assessing children with low IQ. In practice, however, this may not be so helpful to the special education teacher if the purpose of the assessment is to determine whether a child has weak WM and/or slow speed of processing, so that appropriate classroom strategies can be put in place to minimise the effects of

deficits in these skills on learning. On the other hand, if the teacher wants to know whether a student in special education has WM skills and speed of processing better or worse than would be expected from their intelligence, then the easiest way to do this is to use *Lucid Recall* and adjust the date of birth as described above. When WM skills and speed of processing are better than expected then this will be encouraging news as far as learning potential and rehabilitation are concerned.

Reporting results

When using adjusted dates of birth and tests outside the norm range for the chronological age of the student being tested, it is essential that great care is taken when reporting and interpreting results.

The first thing to be sure about is: what is the age range of the norm group with which this student is being compared? This will be the chronological age that the software has calculated based on the date of birth you have entered **unless** this chronological age is outside the norm range for the software you are using. If the latter is the case the preferred course of action is to use a test suitable for younger children, but if this is not possible, then you must be aware that the program will apply the norms for nearest age group that is in its data bank (see the Teacher's Manual for details of this). In this event, it can often be easier to work with *age equivalents* rather than centile scores or standard scores; age equivalents for LASS 11-15 are provided down to age 8:0 and for LASS 8-11 down to age 6:0 (see separate Fact Sheets on '*Using Age Equivalents*' and '*LASS 8-11 and 11-15 Age Equivalents Table*').

It is essential to write on any print-out or report the age range of the norm group used for calculating scores. Note that the chronological age shown on the report will be incorrect: you should correct this to the true chronological age, with a note explaining the alteration. All such annotations and alterations to the printed report should be signed or initialled so that the professional responsible can be identified.

Interpreting results

A particular benefit of this approach is that it tends to *amplify differences* between strengths and weaknesses, making them much easier to interpret. If, for example, you give LASS 11-15 to a student age 14 who has a very low IQ of about 65, it is likely that the centile scores shown on the graphical table will all be bunched right at the bottom of the scale, well below centile 5. All this seems to say is: '*This student is poor at everything',* which is not at all helpful for the teacher. But if the same student is tested on LASS 8-11 entering an adjusted date of birth that is 4 years later than their actual date of birth the software will compare them with 9-year-olds (14 x 65/100 = 9 years 1 month), they are likely to have centile scores ranging from 25 to 75, making it much easier to see their relative strengths and weaknesses, and identify specific problems such as dyslexia.

The Teacher's Manuals for these products make no mention of adjustment of date of birth and, in fact, discourage use of tests outside the norm range. This is because these techniques are 'non-standard', not generally advocated and usually inappropriate in mainstream education. In special education it is a different story,

nevertheless care needs to be exercised when using the Manuals for guidance on interpretation of results, as all the case studies and examples in the Manuals relate to children whose date of birth has not be adjusted.

Sharing findings with other stakeholders

Provided you make it clear that the results are based on comparison with a mental age peer group rather than a chronological age peer group, the graphical profile generated can also be very helpful when sharing results with parents and other teachers (and even with the student themselves), helping all stakeholders to better appreciate the student's individuality and ways in which knowledge of their strengths and weaknesses can be used to further their development.

For more information about Lucid or the developments or research please visit the Lucid web site www.lucid-research.com.   The Lucid staff can be contacted by email info@lucid-research.com, telephone +44 (0)1482 882121 or fax +44 (0)1482 882911.

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