

# Further Education Reasoning Test (FERT)

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# Further Education Reasoning Test (FERT)

Details of how to use the online version of FERT using Testwise are given in Section 1. A description of the key features of the test is provided in Section 2.

## 1. Using FERT

### 1.1. Minimum technical requirements

- Internet Explorer 6.0 or later as a web browser, or Mozilla Firefox.
- Pentium processor or equivalent (we recommend Pentium processor 1 Ghz or higher)
- Broadband internet connection (minimum 2mb)
- At least 256 megabytes RAM available
- Flash 9.0.124 or higher from Adobe. You can check your Flash version by visiting the following URL: -

<http://www.adobe.com/software/flash/about/>

- Minimum screen display 800x600 (we recommend 1024x768 High Colour 16 bit mode - 65536 colours in Windows NT or higher)
- Keyboard and mouse
- Students will need to use headphones
- Please disable any pop-up blockers on your computer.
- Confirm the checks and also ensure that all proxy filters at LAN and WAN levels are set to allow all files from **\*.testingforschools.com**

## 1.2. Who can use FERT

FERT is a reasoning assessment primarily aimed at students aged 15 to 17 years old. It can also give a good indication of reasoning abilities for those over 17 years old as reasoning abilities do not increase substantially above this age.

## 1.3. Test timings

Each subtest is precisely timed and the timing is controlled by the computer. A countdown clock is shown throughout each test. If a student finishes the test before the allotted time is up, he or she is invited to check the answers given.

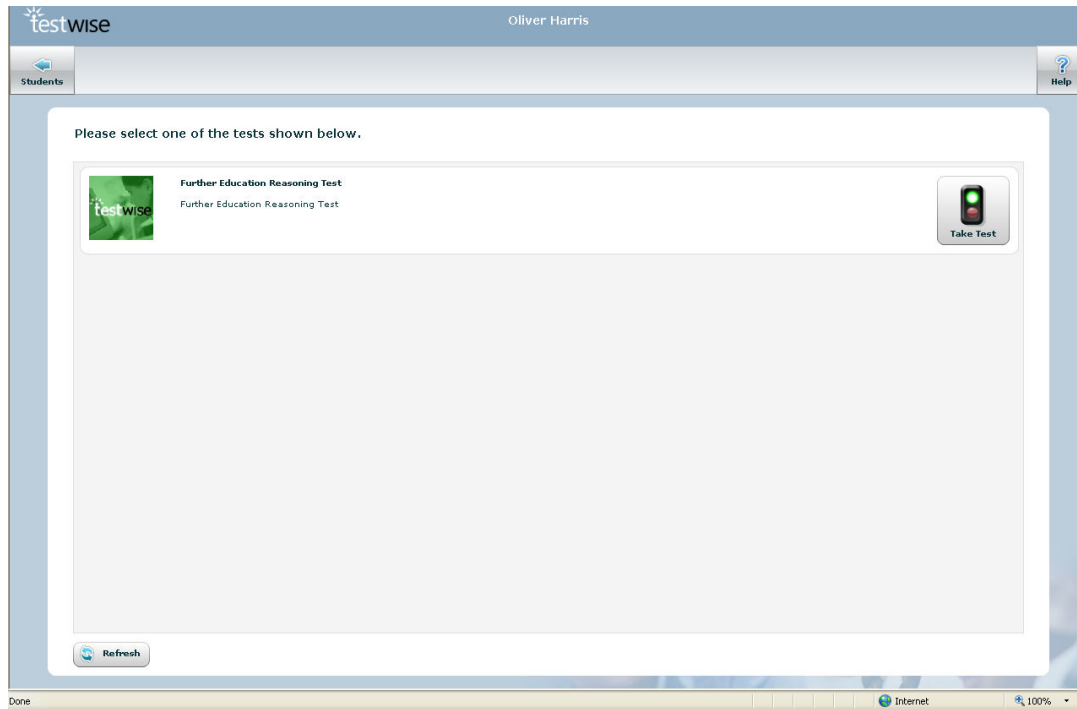
Each of the subtests are timed as follows:

Section	Subtest	Time in minutes
Verbal reasoning	Sentence Completion	10
	Verbal Analogies	10
Quantitative reasoning	Number Analogies	12
	Number Series	10
Non-Verbal reasoning	Figure Analogies	10
	Figure Analysis	10

The above timings exclude time to do the practice questions so **allow for 80 to 90 minutes** for the whole assessment.

## 1.4. Scheduling and running the tests

Once students have been added to a register, students can log on using the Register ID.



Students should click on “Take Test” next to the exercise they intend to take.

Once the student has entered the test of his or her choice, there is an introduction that is spoken as well as appearing on screen. This explains the nature of the test and how the student is to answer them. It includes how a student can change an answer if he or she has second thoughts. Then two or three practice questions are presented to familiarise students with the type of question in the test and to give them practice in how to answer. Then, when the student is ready, he or she can start the test and the strict timing begins. Every question in the test is in the multiple-choice format with five responses.

When the student has finished the subtest, the timer continues until time runs out. The student is invited to check his or her answers, and simple-to-use buttons allow him or her to navigate through the test as he or she wishes. When one subtest is completed, the introduction and practice questions for the next sub-test begin immediately.

When the student has finished the final subtest, a “Sending results” message appears announcing that the responses are being sent off for processing.

**It is important to complete all six subtests as the data is sent to back to the server at the end of the sixth subtest. Do not switch off the machine until the screen changes to “Continue”.**

### **1.5. Students with Special Assessment Needs**

No students should be automatically excluded from taking FERT since it is designed to measure students’ reasoning ability across the whole range. The only possible exceptions may be students with poor reading skills, whether this arises from dyslexia, generally poor academic attainment or not being native speakers of English.

Such students would be expected to get low scores in the Verbal Reasoning section compared to the Quantitative and Non-Verbal sections. Indeed, a low relative Verbal Reasoning score might be the first indication that a student does have reading difficulty of some sort. In these cases the average of the Quantitative and Non-Verbal scores may be regarded as a better indication of the student’s all-round reasoning ability.

### **1.6. Unexpected Incidents during a Test Session**

As with the paper test, should anything unexpected occur during the test session, the incident should be recorded and appended to the group report for the specific group of students. This will allow the incident to be taken into account when scores are being compiled.

If there is a failure in your computer system while students are taking an exercise, it will not be possible to re-enter the test at the point at which the failure occurred. In this instance, students will need to re-take the complete tests. If students complete a test and the results are stored and then the system fails, it may be possible to retrieve results, and therefore reports, from the GL Assessment back-up server.

Should this happen, the teacher should contact Customer Services on 0845 606 1937.

## **1.7. FERT reports**

There are a number of different reports – individual student and group – available and all of them can be ordered on screen. Reports can be sorted by student name, standardised score or by gender.

1. Standard FERT reports
2. Subtest reports
3. Cognitive Strengths and Weaknesses Profile
4. Export FERT CSV results

Each report is briefly described in turn.

### ***The Standard FERT Report***

This report includes

- Mean test standardised scores for males, females and all students;
- Graphs of distributions of scores for males, females and all students;
- Group list of scores for each student by battery
- An individual, full-page report for each student.

### ***Sub-test scores Report***

This shows every student's scores for the nine subtests that comprise the FERT test.

### ***Cognitive Strengths and Weaknesses Report***

These reports highlight differences between students' test battery scores which may reveal something about the student's preferred, or stronger, way of reasoning. Where such differences are detected, a simple code conveys the strengths and weaknesses shown by the scores. A graphical display of the group's verbal and non-verbal test performances reveals at a glance any general tendency in the group to prefer one or the other way of reasoning. More information is given in Section 3.

### ***Export FERT CSV results***

The FERT student scores are exported to a Comma Separated Variable (CSV) file. You can view the student scores in a spreadsheet.

## 1.8. Summary checklist for teachers

### ***Before the test session***

- Allow 90 minutes in the computer suite.
- Check with your IT person that all the machines have been checked and the correct version of Shockwave and Flash are installed on each machine. Disable any pop-up blockers on the computers.
- It is useful to have a shortcut link created on the desktop so that students can click on it to go to the Testwise website
- All machines should have sound and headphones.
- Student need to use a mouse to click on the answers. Ensure that left-handed students are provided for.
- Use a whiteboard to guide your students through the instruction screens (optional).
- Inform students which test they are taking during the session and therefore where they need to click on 'Sit Test'.
- At the login screen, inform students that they need to scroll down the organisation list and select the name of their school or college.
- Obtain a list of the student usernames and passwords. You may need to help students who have difficulty with the login process.
- A pencil and paper for working out should be provided when students take the quantitative subtests only. Do not provide these for the verbal subtests and ensure they are removed before the non-verbal subtests are started.
- Tell students not to click on 'Start Test' until everyone is clear about what they are doing.

### ***During the test session***

- Allow 90 minutes in the computer suite. The test is divided into six sub-tests. Students will need to wait until the time allowance has elapsed before they move to the next sub-test.

### ***After the test is completed***

- The screen will show 'Sending results'. Do not switch off the machine until the screen changes to 'Continue'.

## 2. What is the FERT?

The FERT assesses an individual's ability to reason with and manipulate different types of symbols. Three main types of symbol play a substantial role in human thought. These symbols represent:

- words;
- quantities;
- spatial, geometric or figural patterns.

In the *FERT*, separate batteries of subtests are provided to assess competence in working with each of these three types of symbol:

- Verbal Battery;
- Quantitative Battery;
- Non-verbal Battery.

Where possible, parallel question types have been incorporated in two or all three batteries, so that the influence of the different media can be identified more clearly. For example, tests of reasoning through analogies are included in all three batteries. The set of three scores will give a profile showing the level and pattern of each student's abilities. Knowledge of areas of relative strength and weakness should help both the individual and the school or college to use strengths most effectively, and to compensate for areas of weakness.

### Perceiving relationships

*FERT* emphasises *relational thinking* – the perceiving of relationships among elements. Throughout each of the subtests the basic elements have been kept relatively simple, clear, familiar and appropriate to the ages of the students who will take the test. All students exposed to modern cultural influences should have had an opportunity to acquire the background knowledge needed to answer the questions. All questions in the subtests were pre-trialled with random samples of students of different ages, and only those questions that were of the desired difficulty and clarity were included in the final test. Questions were also evaluated to minimise or eliminate sex or ethnic bias. Thus questions that proved to be exceptionally difficult or easy for either males or females or for one of the ethnic groups were omitted or counterbalanced in the final test.

### Developed abilities

The FERT measures *developed* rather than *innate* abilities. The development of these abilities begins at birth and continues through early adulthood. It is influenced by both in-school and out-of-school experiences. Although test scores are based on experience, this does not negate the value of the test in helping to understand the individual as he or she is at the present time. Because these abilities are closely related to an individual's success in school in virtually all subjects, FERT scores, together with other relevant information, can be used to devise the types of learning experiences that will help students to improve their current levels of performance.

## 2.1. The three FERT test batteries

### Verbal Battery – thinking with words

The Verbal Battery comprises two subtests:

- Sentence Completion;
- Verbal Analogies.

Although performance in these subtests depends upon the student's store of verbal concepts, the questions included in the Verbal Battery have been written with a view to making demands primarily upon the individual's flexibility in using his or her concepts.

The Verbal Battery is designed to assess relational thinking when the relationships are formulated in verbal terms. Since the greater part of education is presented through verbal symbols, the relevance of a verbal test for educational prognosis and diagnosis is clear. Tests of verbal reasoning have always been among the best ways of predicting educational progress.

### Quantitative Battery – thinking with numbers

The Quantitative Battery comprises two subtests:

- Number Analogies;
- Number Series;

The solution of the problems in each question requires that the student has a basic store of quantitative concepts, but all the questions call for *perception of relationships* among concepts and for *flexibility in using* quantitative concepts. None of the questions in the subtests require reading, so reading skills will not affect performance.

Next to verbal reasoning, the ability to reason with quantitative symbols is the one most frequently required in an educational setting. Subjects such as mathematics, science, geography and economics make heavy demands on quantitative abilities. Quantitative reasoning together with verbal reasoning constitutes what some theorists have called 'academic ability'.

### Non-verbal Battery – thinking with shape and space

The Non-verbal Battery comprises two subtests:

- Figure Analogies;
- Figure Analysis.

The questions in this battery involve neither words nor numbers, and the shapes or figures used bear little direct relationship to the formal school curriculum. The first subtest assesses the ability to identify relationships between designs and then mentally manipulate new designs using these relationships. The second subtest, Figure Analysis, assesses 'spatial ability': that is, the ability to create, maintain and manipulate visual-spatial images.

Despite the apparent lack of overlap with formal schooling, non-verbal reasoning tests have been found to relate significantly to school achievement, providing a useful addition to verbal tests. Among students with levels of verbal ability above a threshold of adequacy, the level of non-verbal ability may well identify those with the greater aptitude for the visual-spatial academic disciplines, such as mathematics, physics, art and design and technology. Tests of spatial ability are used in employment settings to identify those with aptitude for such careers as design, construction, engineering and architecture.

The Non-verbal Battery measures what has been termed 'fluid intelligence': that is, an ability to reason that is not strongly influenced by cultural and educational background. Where performance on this battery is superior to that on the other two batteries, it may suggest potential that is not fully expressed in performance on school-related tasks, for one reason or another. Scores on this

battery may be particularly valuable in assessing the reasoning ability of students with poor English language skills, students with specific problems in language-based work, or disaffected students who may have failed to achieve in academic work for motivational reasons.

**Examples of the types of questions** are given below:

**Verbal Reasoning: Sentence Completion.**

*Each question has a sentence with one word left out. Look at the answer choices and choose the word that completes the sentence. Look at the example.*

Apples \_\_\_\_\_ on trees.

Answer Options: fall grow show bloom spread

Students are required to select the one word from the five options presented that sensibly fills a gap in the sentence.

**Verbal Reasoning: Verbal Analogies.**

*For each question there are three words in dark type. The first two words go together. The third word goes together with one of the answer choices. Choose the word from the answer choices that goes with the third word. Look at the example.*

**new** → **old** : **wet** → ?

Answer Options: rain drip hot sun dry

Students have to work out the relationship between the given pair of words, and then choose the option to complete the analogy for the given single word.

**Quantitative Reasoning: Number Analogies.**

*The question starts with two numbers that are linked together in some way. Next there are two more numbers that are linked in exactly the same way. You have to work out how the numbers are linked and then finish off the third pair. Look at the example.*

[2 → 3][9 → 10][6 → ?]

Answer Options: 3 4 5 6 7

Students work out how the two given pairs of numbers are related and then choose the third number that has the same relationship from among the five options presented.

**Quantitative Reasoning: Number Series.**

*Each question shows a series of numbers. You have to work out the rule or rules used to arrange the numbers. Then decide what number should come next in the series. Look at the example.*

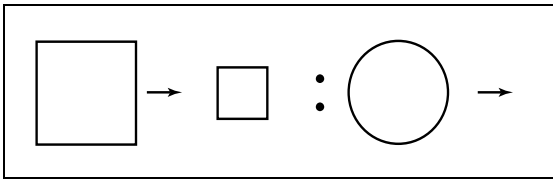
15 14 13 12 ?

Answer Options: 9 10 11 13 14

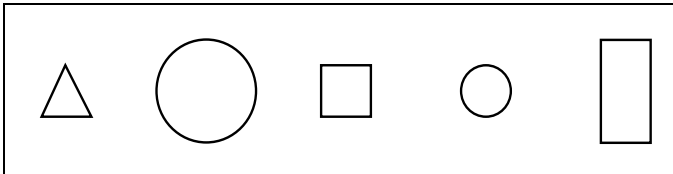
From among the five options, students choose the number that continues the given sequence.

**Non-Verbal Reasoning: Figure Analogies**

In each question there are three figures. The first two figures go together. The third figure goes with one of the answer choices. Choose the answer choice that goes with the third figure. Look at the example below.



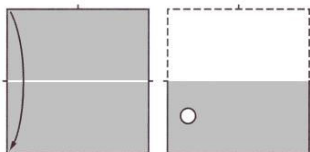
Answer Options:



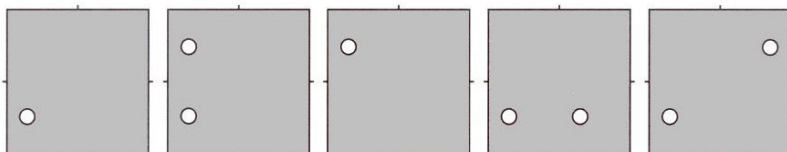
Students identify the relationship between two figures and find the option that has the same relationship to the third figure given.

**Non-Verbal Reasoning: Figure Analysis**

The first line below shows how a square piece of dark paper is folded and where holes are punched in it. You must select an image from the answer options which shows how the paper will look when it is unfolded.



Answer Options:



## 2.2. Using FERT scores

The main uses of FERT scores are:

- to identify an *individual student's cognitive strengths and weaknesses* in order to inform teaching and learning;
- to *compare the performance of groups* of students, in order to identify needs and to target resources better;
- to *identify students, or groups of students, who may be underachieving*;
- to monitor *trends or changes* in the ability profile of the intake over time.

FERT scores provide a useful source of information about students' reasoning abilities, relatively independent of their classroom experience and learning to date. No test can ever be completely independent of a student's experience prior to taking it: quantitative reasoning ability can be influenced by the student's basic arithmetic attainment, for instance.

Because of this relative independence, FERT scores make a better basis for predicting student's future attainment than do any attainment tests already taken. Thus FERT scores can be used to indicate likely future exam performance.

You may also find FERT scores useful in describing the overall calibre of groups of students: whole intakes to a school; classes within a school; ethnic groups of students; girls and boys. It may happen, for instance, that one year's intake has a much higher average FERT score than previous years'. This would lead to higher expectations of the group's exam performances.

The progress of groups of students – teaching groups, ethnic groups, boys and girls – can similarly be monitored against the stable baseline of their reasoning ability, as shown by their FERT scores.

### 2.3. Understanding the scores from the FERT

#### Raw score

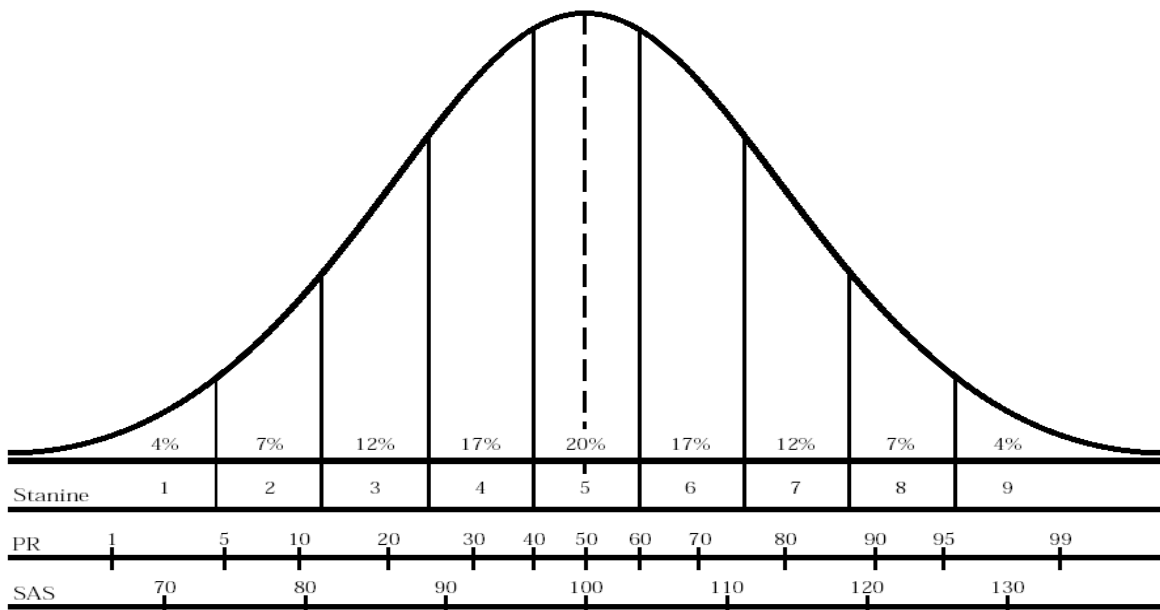
The raw score is simply the total number of correct answers obtained by the student. The raw score is calculated for each battery. These raw scores can be converted to three types of normative scores called standard age scores (SAS), stanines and percentiles. These scores are described below.

#### Standard age score (SAS)

One way to make a raw score more readily understandable would be to convert it to a percentage: for example, '33 out of 50' becomes 66 per cent. However, the percentage on its own does *not* tell us the average score of all the students or how 'spread out' the scores are, whereas standard age scores do relate to these statistics.

In order to provide a standard age (or standard score) scale, some tests are standardised so that the average standard age score for any age group is always 100: this makes it easy to tell whether a student is above or below the national average. The spread of scores (the 'standard deviation') is also set to plus or minus 15 points, so that for any age group about two-thirds of the students in the national sample will have a standardised score of between 85 and 115. FERT was nationally standardized in the first half of 2003 with a representative sample of 5035 students aged 15 to 17 years in 61 schools and colleges in England, Scotland, Wales and Northern Ireland. Raw scores are converted to standard age scores that allow you to compare the level of cognitive development of an individual with the levels of other students in the same age group. The properties of standard age scores mean that approximately two-thirds of students in the age group score between 85 and 115, approximately 95 per cent score between 70 and 130, and over 99 per cent score between 60 and 140. Figure 1.1 shows the frequency distribution, known as the normal distribution, for standard age scores, stanines and percentiles.

**Figure 1.1: The normal curve of distribution showing the relationships of stanines, national percentile ranks (PR) and standard age scores (SAS)**



Standard age scores have three particular benefits, as described below.

- *They place a student's performance on a readily understandable scale.* As we have seen above, standard age scores allow a student's performance to be readily interpreted. It is immediately deducible from the score itself that a verbal reasoning score of 95 indicates a level of performance just below the national average, but well within the average range.
- *An allowance can be made for the different ages of the students.* In a typical class the oldest students are very nearly 12 months older than the youngest. Almost invariably, older students achieve slightly higher raw scores in tests and examinations than younger students. However, standard age scores are derived in such a way that the ages of the students are taken into account by comparing a student *only* with others of the *same age*. An older student may in fact gain a higher raw score than a younger student, but have a lower standardised score. This is because the older student is being compared with other older students in the norm group. Students of different ages who gain the same standard age score have done equally well, with each being judged in relation to their standing among students of their own age.
- *Scores from different tests can be meaningfully added or compared.* Standardised scores for most tests cover the same range, from 60- to 140+. Hence a student's standing in, say, mathematics and English can be compared directly using standardised scores. It is not meaningful to add together raw scores from tests of different length or difficulty. However, should you wish to add *standardised* scores from more than one test – for example, in order to obtain a single overall measure of attainment – they can be meaningfully combined.

### ***National percentile rank (NPR)***

This indicates the percentage of students in the national sample who obtain a standard age score at or below a particular score. For example, a student with a standard age score of 108 has a National Percentile Rank (NPR) of 70: he or she has performed as well as, or better than, 70 per cent of students of his or her age group. An NPR of 50 is average for an age group.

## Stanines

Standard scores run from 60- to 140+ and give differentiated, finely-graded information on the performance of each student. However, sometimes a shorthand summary is more useful. Stanines, short for 'standard nines', are just nine summary score bands calculated directly from the standard scores, as shown in Table 1.1. Based on the national standardisation, we can say what proportion of students are expected within each stanine, and these are also given in the table. The broad nature of stanines minimises over-interpretation of small, insignificant differences among test scores. Stanines are therefore particularly useful in reporting test information to students and to parents, as they are relatively easy to understand and interpret.

**Table 1.1: Stanines score bands for FERT**

Description	Stanine	Percentage of students	Corresponding percentiles (NPR)	Corresponding SAS
<i>Very high</i>	9	4	97 and above	127 and above
<i>Above average</i>	8	7	90-96	119-126
	7	12	78-89	112-118
<i>Average</i>	6	17	59-77	104-111
	5	20	41-58	97-103
	4	17	23-40	89-96
<i>Below average</i>	3	12	12-22	82-88
	2	7	5-11	74-81
<i>Very low</i>	1	4	4 and below	73 and below

### 3. Relative Cognitive Strength and Weakness report

#### 3.1. The Classification of Profiles

The Relative Cognitive Strengths and Weaknesses reports show the category code and sub-profile for each student in the class or group.

For each student with a complete profile, i.e. a Standard Age Score for each of the three batteries, a description of that profile can be given that shows relative strengths and weaknesses among the batteries, and that may shed light on students' preferred ways of reasoning. (Students who are missing one or two battery scores cannot be included in this analysis.)

The batteries are denoted V for Verbal reasoning, Q for quantitative reasoning and N for Non-verbal reasoning. There are thus three differences between them: V – Q, V – N, and Q – N.

If any of these differences is of ten or more SAS points it is said to be significant, and will be taken as signifying a real difference in the reasoning abilities of the student. The students' profiles are categorised by how many of the three differences are significant, as follows:

Number of significant differences	Code	Description
0	<b>E</b>	An "even" profile. No preferred reasoning style apparent.
1	<b>C</b>	The profile exhibits a "Contrast". There is a single significant difference which must be between the highest and lowest SASs. The largest is shown as a strength, the lowest as a weakness.
2	<b>D</b>	"Distinct" profile. One battery score is different from the other two, which are not different from each other. Depending on whether the contrasting score is greater than or less than the other two, the profile can show whether it is a strength or a weakness.
3	<b>CC</b>	A "Complete Contrast" All differences are significant. The largest is shown as a strength, the smallest as a weakness.

Sub-profiles then show the batteries that exhibit these strengths and weaknesses, by means of “+” and “-” signs. The table below gives some examples.

<b>Label</b>	<b>Description and Examples</b>
<b>E</b>	<p>“Even profile”. No significant differences between the three scores.</p> <p>Example: V: 112 Q: 109 N: 107</p> <p>All three SAS are encompassed by five points in this example.</p>
<b>C</b>	<p>“Contrasting profile”. There is just one significant difference among the three SASs. The largest and smallest may then be characterised respectively as the strongest and weakest abilities.</p> <p>Example: V: 119 Q: 115 N: 109</p> <p>V is significantly greater than N, but not than Q; nor is Q significantly greater than N. This may be characterised as V+ N-.</p>
<b>D</b>	<p>“Distinct profile”. One score is significantly different from the other two, which are not significantly different from each other.</p> <p>Example: V: 107 Q: 93 N: 97</p> <p>V is significantly larger than both Q and N. Q and N do not differ significantly from each other. This can be taken as showing a strength in verbal reasoning, characterised as “V+”.</p> <p>Another example: V: 117 Q: 122 N: 104</p> <p>N is significantly smaller than V and Q. V and Q do not differ significantly from each other. This is therefore characterised as N-.</p>
<b>CC</b>	<p>“Complete Contrast” All three differences are significant. One SAS will be smallest, another largest. So CC profiles can be further categorised by strength and weakness profile.</p> <p>Example: V: 97 Q: 84 N: 72.</p> <p>Each of the three differences is greater than nine:  <math>V - Q = 13</math>, <math>V - N = 25</math>, <math>Q - N = 12</math>.</p> <p>V largest, N smallest, so this profile can be categorised as N- V+.</p>

### **3.2. Group profile of relative cognitive strengths/weaknesses**

Considerable insight into a student's learning style can be gained through examination of the individual pupil profile. Some students might be consistent in their ability to reason across different modalities, but that others might show distinct strengths (V+, Q+, N+) or weaknesses (V-, Q-, N-) in different areas. Still others might show a combination of strengths/weaknesses (e.g. V+/N-).

However, in addition to looking in detail at individual students, you may want to get a broad feel for the composition or spread of abilities in working with different symbol systems across a group of students. Is there a means of quickly and easily generating such profiles, maybe as a means of encouraging colleagues to engage with the more detailed information contained in the individual student profiles?

### **3.3. Visual – Verbal Preferences**

One of the most consistent dimensions highlighted in learning styles research is the visualiser-verbalizer dimension. The roots can be traced back to Francis Galton in 1883 and his 'breakfast table' questionnaire, which inquired into the quality of images elicited by individuals when visualising certain scenes (e.g., the breakfast they ate that morning). While some authors have focussed on the three physical sensory modalities (visual, auditory and kinaesthetic), factor analytic studies have consistently emphasised the dominance of visual or verbal processes in learning<sup>1</sup>.

How should such visual-verbal preferences be assessed? There are two key issues.

First, many authors have attempted to assess visual-verbal preferences via introspective, self-report measures such as questionnaires. This approach has the weakness that students may not be able to accurately introspect on and report their behaviour, or may tend to give responses perceived as more socially positive or desirable. In contrast, FERT measures reasoning abilities, and arguably these are the most important aspects in relation to school learning. For example, it may not be the ability to generate visual images that matters for effective learning, but the ability to reason with and about those images. Similarly, it may not be the ability to remember words or to speak fluently that matters, but rather the ability to reason about the concepts the words signify (Lohman & Hagen, 2001).

Second, should we consider verbaliser and visualiser as opposite poles on a single dimension? The best known scales (Pavio, 1971; Richardson, 1977) are scored on a single dimension, assuming that students with a strength in visual learning will necessarily be weaker in verbal learning. However, it would seem reasonable to assume that some students may be strong in both areas; they may be good at learning

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<sup>1</sup> . For example see Pavio (1971).

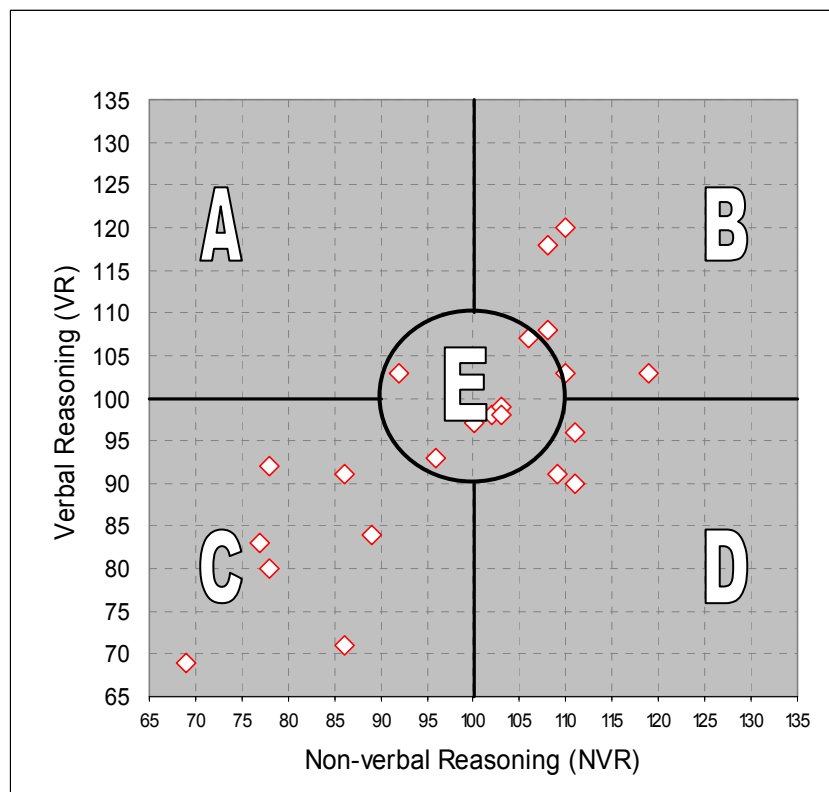
verbally (in words, by reading or listening) and visually (in processing images, graphs, diagrams, pictures), or indeed they may be weak in both domains.

For these reasons, a specific contrast between the FERT Verbal and Non Verbal Reasoning batteries, contrasting students' ability to reason with verbal or visual-spatial information, may be particularly well placed to illustrate the range of abilities and the balance of visual / verbal preferences within a group of students.

### 3.4. Group Visual-Verbal Learning Profile

A simple way to show the spread and balance of visual-verbal abilities for a group is to plot the Non Verbal scores of the students in the group along the x-axis and their Verbal scores along the y-axis. To get a sense of the distribution against national averages, we draw in the national average lines at the mean standard age score of 100 for both VR and NVR. Finally, we draw an ellipse to contain the central area where score are average and broadly balanced to create a chart with five cells. We label these cells A, B, C and D for the top left, top right, bottom left and bottom right cells respectively, and E for the central area. Figure 1 shows a scatter chart of the cells.

**FIGURE 1: Group Visual-Verbal Learning Profile**

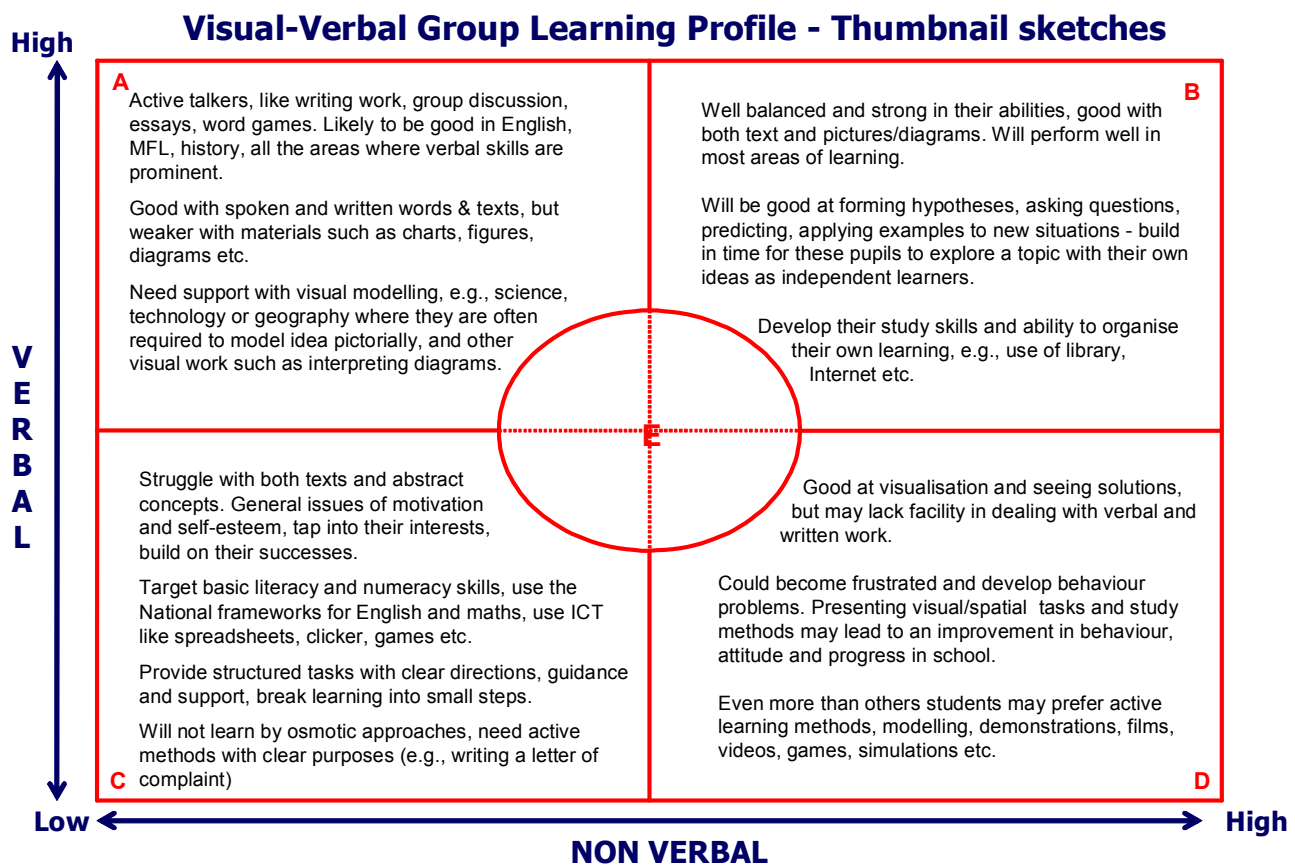


Students included in Cell E represent the reference or average group against which the other cells are compared. Their reasoning abilities are typical of their age and they are broadly balanced in their visual-

verbal strengths. The students in Cells A to D may be contrasted with this average group. Those in Cell B are above average in both Verbal and Non Verbal reasoning, while those in Cell C are below average in both Verbal and Non Verbal reasoning. Those in Cell A are above average in Verbal but below average in Non Verbal reasoning, while those in cell D are above average in Non Verbal but below average in Verbal reasoning.

This is not to suggest as a categorisation system, that is we do not want to start labelling students as 'Cell A learners' or 'Cell B learners'. Rather this graphical layout is useful to identify the broad range of abilities that might be represented within any particular class or teaching group. To support this aim, Figure 2 gives a 'thumbnail sketch' of some of the attributes that might be typical of students in each of cells A through to D, in terms of their reasoning abilities and relative visual-verbal strengths.

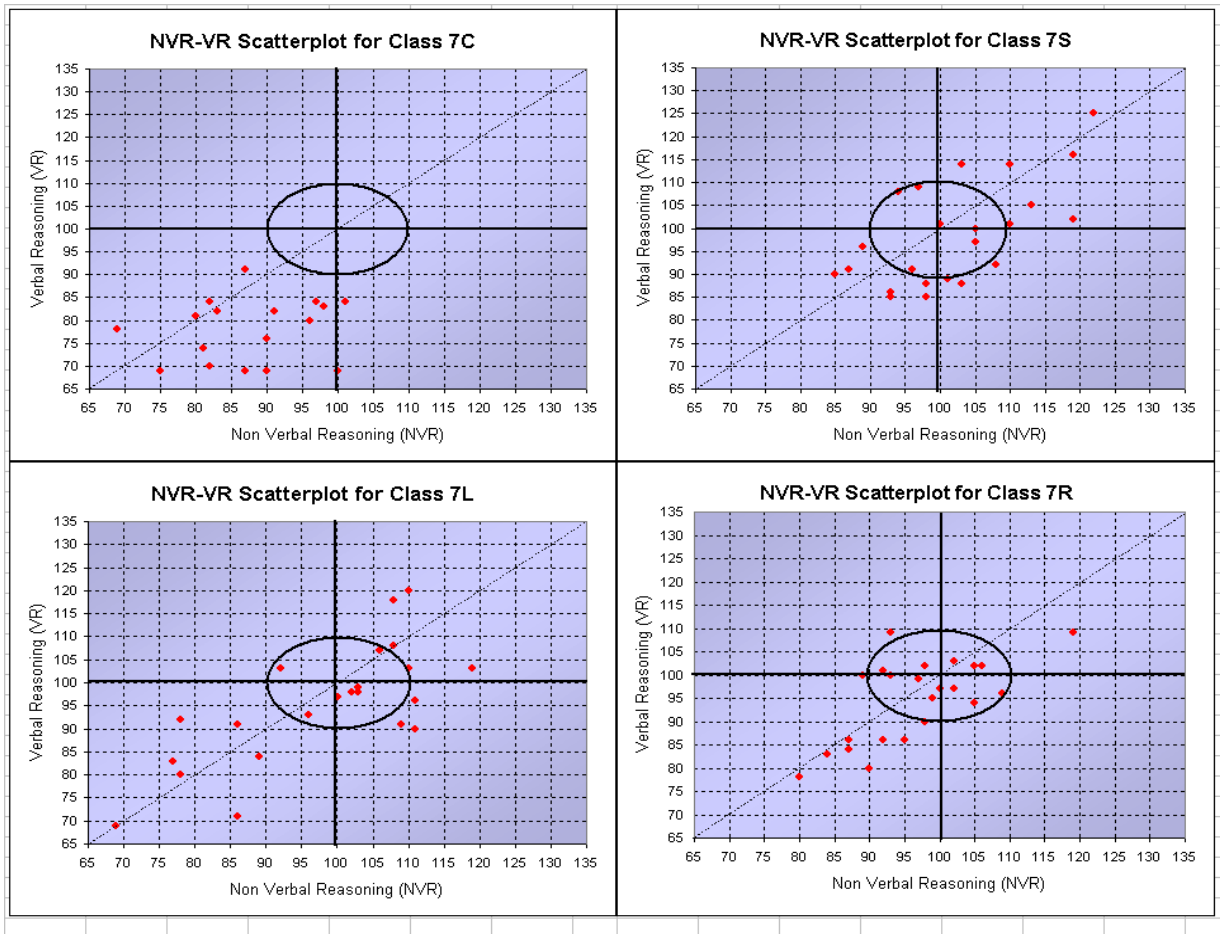
**FIGURE 2: Thumbnail sketch of 'typical' learners in the Group Learning Profile**



## A practical example of using the Group Visual-Verbal Learning Profile

Let us consider some practical examples of the use of the profiles. Figure 3 shows the Group Visual-Verbal Learning Profiles for four tutor groups. What might these group profiles tell us about the learning needs of each group?

**FIGURE 3: Group Visual-Verbal Learning Profiles for four form/tutor groups**



**CLASS 7C:** The majority of students in the class are likely to need a high level of additional support. This did not surprise the school, since the group had been formed with a view to addressing additional educational needs. For example, action to address low motivation, direct guidance and coaching strategies, clearly focussed activities of practical relevance and a focus on key literacy and numeracy skills are likely to be central. However the profile also shows that almost one third of the group, those towards the right hand side of Cell C, have VR scores 10 or more points below their NVR scores. The teacher should consider whether some of the poor verbal performance might represent underachievement relative to Non Verbal ability, and how she can build on the student's relative strengths in working with visual symbols.

**CLASS 7S:** This class shows a moderate spread of abilities, but with the majority of students either within Cell E or closely clustered around it. Early in academic year it may pay dividends to pay particular attention to motivating and engaging the students just below Cell E, who verbal scores are just below the national average range. Planning will need to include extension work for the group of students in Cell B who will require more stretching and demanding work.

**CLASS 7L:** This is a very wide ranging and heterogeneous group in terms of their reasoning abilities. There are many students within 7L who would not be out of place in 7C in terms of their VR-NVR scores. At the same time there are also some students in Cell B. There are also three students in Cell D whose VR scores are significantly lower than would be expected from their NVR scores. This class will require careful differentiation to address the wide range of needs.

**CLASS 7R:** A relatively restricted range of scores for this group, which primarily divides into two distinct clusters. Most students are grouped in Cell E with abilities in the average range and no discernable visual-verbal preference. However a sizeable minority fall in Cell C. When forming groups for discussion and other activities it may be beneficial to mix students from cells C and E, so there are opportunities for modelling and learning by observation and association. The student in Cell A has a VR score over 15 points above her NVR score. She may cope well with text and written work, but may need particular support with visual material such as graphs, figures, diagrams etc.

### **Health Warning on using the Group Visual-Verbal Learning Profile**

The Group Visual-Verbal Learning Profile is a useful device for planning. The purpose is to illustrate the wide range of abilities in working with visual or verbal symbols that are likely to be represented by the students in your class. However there is a substantial difference between a planning or illustrative device and a classification system. **Readers are strongly cautioned against** using the results as a classification system, for example to talk about “Cell A learners” or “Cell B learners”. A few examples will demonstrate the reasons for this.

First, most readers will probably understand intuitively that while Cell E may be small in terms of absolute size in the scatter chart, it will contain a disproportionately large percentage of students. This is because Cell E includes the typical or most frequent range of scores, and indeed Cell E contains around 27% of all students. However, because Cells A to D are of equal physical size in the scatter chart, it may be falsely assumed that an equal proportion of students would be found in each of these four cells. This is not the case because Verbal and Non Verbal scores are positively correlated. This is illustrated by the diagonal ‘line of equity’ running from the bottom left to the top right of the scatter charts. The majority of students will have Verbal scores that lie within nine standard score points above or below this line. As a consequence of this correlation, the majority of students who are not in Cell E are found in Cells B or C

(about 30% in each), and only a much smaller proportion (around 7%) in each of Cells A and D respectively.

Second, some students will be misdiagnosed in terms of their Verbal and Non Verbal strengths or weaknesses. A student with an NVR score of 102 and a VR score of 130 will be in Cell B (which is characterised as both scores high), where in reality it would be more accurate to interpret the student's scores as NVR average-VR high. Similarly, a student with an NVR of 115 and VR of 102 would fall in Cell B, while a student with the same NVR score of 115 but a VR score of 98 would fall in Cell D. While they may fall in different cells, in reality both students are most accurately described as NVR high - VR average. Again, it is important to consider the line of equity here. Students whose scores are 10 or more points above or below the diagonal line have a significant difference between their Verbal and Non Verbal scores, regardless of the cell in which they fall.

Third, the interpretation of the profile is partial because it does not include all the information on the students' reasoning abilities provided by the CAT. Suppose a student has an NVR score of 110 and a VR score of 95 placing them in Cell D. In this case the difference is 10 or more SAS points, meaning the Cell D characterisation (NVR high, VR low) is probably accurate. However, if the Quantitative score is nearer 95, matching the Verbal score, then we are looking predominantly at a Non Verbal strength (N+). Alternatively, if the Quantitative score is nearer to 110, matching more closely the NVR score, then we are looking predominantly at a Verbal weakness (V-). These two interpretations are different, in that in the first we are looking at building on a strength, while in the latter we are looking at support for a relative weakness.

It will be clear from the above that you must look at the scores themselves, and consider the size of the actual score difference as evidence of the strength of any cognitive or modality bias. While the group profile is helpful, the temptation to apply cell labels should be resisted.

## 4. Background to FERT and References

FERT is derived from the Cognitive Abilities Test (CAT) and a fuller description, together with a lot more about using CAT can be found in the book "Getting the Best from CAT" by Dr Steve Strand, which is available through the GL Assessment website <http://www.gl-assessment.co.uk>

### References

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