Measuring progress

Stephen Wells shows you how to use spreadsheets to gather data for assessment in education.

If my inbox is anything to go by, there's a growing interest among teachers to provide more information to parents on the progress of their children in school. The new buzzword is 'ipsative' assessment or measuring improvement against past achievement. Apparently some authorities view this as 'value added' like a manufactured product. Inevitably, assessment is bound to become more computerised, with fewer individual comments like 'could do better' and more tables and charts measuring progress numerically and graphically.

Many valuable personal qualities are impossible to quantify numerically. But let's review some of the tools that spreadsheets in general and Excel in particular can offer to help, with generalised examples that can be extrapolated by other professions.

Typically there will be a list, with records of pupils (the rows) and comparable information in fields (the columns), as in screenshot 1. We will name this whole block of cells from A13 to F28, FORM1. There are six fields and 15 records in our example. To see how the class is doing overall, you could use the DCOUNTA function which counts all the specified non-blank cells in a database. First you need to set up a criteria table, which would look like the block F1:J8 in screenshot 2, for our example.

	A	B	C	D	E	F
13	PUPIL	MATH	ENGLISH	FRENCH	PHYSICS	CHEM.
14	Anna	A	C	B	A	B
15	Caroline	B	A	B	C	D
16	Dave	B	B	A	C	B
17	Deborah	D	D	D	D	D
18	Liza	A	A	A	C	B
19	Lynda	B	A	A	B	B
20	Mike	C	A	B	C	B
21	Paul	B	A	A	B	B
22	Philip	A	A	B	B	B
23	Ronnie	B	A	A	B	B
24	Simon	C	B	A	A	C
25	Toby	B	A	A	B	B
26	Victoria	A	A	A	A	A
27	Warren	B	B	A	C	B
28	Xania	B	B	B		

Screenshot 1: A simple database recording the results of a sample of students in five subjects in one exam

Screenshot 2: A table of the number of A and B results gained in each subject and the criteria data needed by the DCOUNTA function

=DCOUNTA(FORM1,"CHEM.",J3:J4)

	B	C	D	E	F	G	H	I	J
1		Total			MATH	ENGLISH	FRENCH	PHYSICS	CHEM.
2		A's	B's		A	A	A	A	A
3	MATH	4	8		MATH	ENGLISH	FRENCH	PHYSICS	CHEM.
4	ENGLISH	9	4		B	B	B	B	B
5	FRENCH	9	5		MATH	ENGLISH	FRENCH	PHYSICS	CHEM.
6	PHYSICS	3	6		C	C	C	C	C
7	CHEM.	1	11		MATH	ENGLISH	FRENCH	PHYSICS	CHEM.
8					D	D	D	D	D

To count all the A results the class has gained in mathematics, enter =DCOUNTA(in C3. Then press function key F3 and pick the name FORM1. The second argument is a field so type in "MATH" including the quotes. Then type F1:F2 which is the criteria. Add a couple of commas to separate the arguments. Similarly, to count all the Bs earned in chemistry, in cell D7, enter =DCOUNTA(FORM1,"CHEM.",J3:J4).

You can quickly create a table, as shown in the block B1:D7 in screenshot 2, which shows the number of A and B results gained by the class in each subject.

Using AutoFilter

To quickly highlight the top students in the class, click on the row number 13 and choose data, AutoFilter. Then click on the arrow that appears by each subject and choose the A option. If you want to find the students who gained an A in English and an A or B in the other subjects, choose the Custom option and fill out the dialog box as in screenshot 3. In the example given, there are six students who met this criteria.

You could give a value to each grade (say, five for an A, four for a B, two for a C, and one for a D) and then compare a student's progress between exams taken at the start of a term and at the end. You could even give a weighting to subjects – say 10 for Maths and English, and seven for Physics and Chemistry. So an A in Maths would be worth 50 points and a C in Physics, 14.

Set up a table as partially shown in screenshot 4. The weightings for each subject are in row 34. The ascribed values for each grade in B35:B38. The formula in cell C35 is =$B35*$C$34 and you can drag that down to C38 (which will become =$B38*$C$34). Below that, you can create a Lookup Table where ChemA is the label next to cell B40 which holds the reference G35, and the resulting value of 35 in this example. Name this Lookup Table, Values.

Copy the list of pupil's names into the range A63:A77. Copy the original six field names, Pupil to Chem into A62:G62. Then create a conversion table. Enter in cell B63 =B13&$B14 (which will display MATHA in this example) and drag this down to B77 (which will display here MATHB). Now complete the table

Hints for Excel users

■ **The F3 function key**
This can be the most useful key in Excel. You can use it to insert a Name (or, with the Shift key, a function) into a formula. With Ctrl & F3 you can quickly define a Name; and with Ctrl & Shift & F3 you can define a row or column label as a Name.

■ **Finding a worksheet**
Somewhere on your hard drive is a worksheet and you can't remember which workbook it is in, let alone which directory. You can't even remember its name. But you do recall that one cell had 'Victoria' in it. No problem. Right-click on Start and choose Find. Under Look In, choose C: (if that's your main hard drive). Click on the Advanced tab and the Of Type down arrow. Choose Microsoft Excel Worksheet. In the Containing Text box enter Victoria. Click the Find Now button or press OK. When the file name appears in the box below you can right-click and open it.

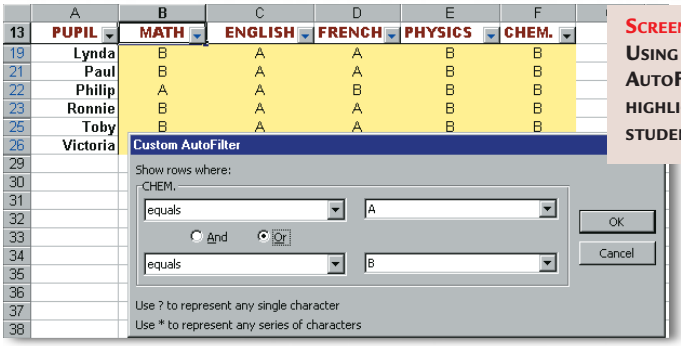
■ **To find something on a worksheet** press Shift & F5. This displays the same dialog box as using Ctrl & F.

■ **You can display** the available Names in a dialog box in Excel 97 and 2000 using Alt & F8.

■ **You can select** the current region around the active cell using Ctrl & Shift & 8 (which is Ctrl & *). The current region is any occupied area enclosed by blank rows and blank columns.

■ **You can jump** to the next occupied cell in a row or column using Ctrl & the arrow key.

■ **You can enter** the same thing in a range of cells by highlighting the range, typing in the contents and then pressing Ctrl & Enter.



SCREENSHOT 3: USING EXCEL'S AUTOFILTER TO HIGHLIGHT THE TOP STUDENTS IN THE CLASS

out to cell F77. Now you can use the Lookup Table. Copy the fields again into row 80 and the pupils' names into the range A81 to A95. You can use the VLOOKUP function and enter in cell B81 =VLOOKUP (B63,Values,2,FALSE). This phrase means display the contents of column 2 in the Lookup Table named Values when the contents of cell B63 is found in column 1. The third argument, FALSE, means it has to be an exact match, not just the closest.

You could now create totals in column G. So cell G81 holds =SUM(B81:F81). This provides a total assessment (numerically, at least) for each student, based on your weightings in the table in A33:G38. It is this total that could be used for comparison in tests at the start and end of a term.

To compare the results of tests you could use frequency analysis

■ **Frequency analysis**
To compare the results of tests from one term to another you could use frequency analysis. In its Analysis ToolPak, Excel provides a tool which shows the number of occurrences of a value in a data set.

Copy the pupils' names again and paste in A100:A114. Copy the assessment totals (from G81:G95) and, using Paste Special, paste the values into B100 to B114. Click any cell in this range, A100:B114 and choose Data, Sort by Column B, Ascending. In cells D101 to D104 enter the stepped values 100, 140, 170, 200. Then choose Tools, Data Analysis, Histogram.

In the resulting dialog box enter B100:B114 as the Input Range and D101:D104 as the Bin Range, and E101 for the Output Range. In this example of exam results from screenshot 1, weighted as in screenshot 4, cells F101 to F105 will then show that six students scored in the range 171 to 200, five in the range 141 to 170, three in the range 101 to 140 and one scored less than 100. A number is counted in a particular bin if it is equal to or less than the bin number, down to the last bin mark. All values below the smallest bin value are counted together, as are the values above the largest bin mark.

Excel's Histogram tool can optionally provide outputs that are percentages and display as a chart.

SCREENSHOT 4: PART OF A TABLE THAT GIVES A NUMERICAL VALUE TO A GRADE, WEIGHTED BY SUBJECT

	A	B	
33	Grade	Value	
34			
35	A	5	50
36	B	4	40
37	C	2	20
38	D	1	10
39			
40	ChemA	35	
41	ChemB	28	
42	ChemC	14	

PCW CONTACTS

Stephen Wells welcomes your comments on the Spreadsheets column. Contact him via the PCW editorial office or email spreadsheets@pcw.co.uk
◆ *Please do not send attached files unless they have been requested.*