Learning Dissonance

Assuming that a cohort of students find two courses:-

- to be equally difficulty.
- are assessed to an equal standard.
- are taught to the same standard.

then you would expect that the results from these two courses to form a straight line with a=0 and b=1, i.e. the students would get exactly the same results in both.

The actual regression line will be different - and that needs assessing before the introduction of any new materials or methods. The data for as many previous years as possible should be examined across as many courses as possible. A data group could be formed for each course combination of those students who completed both. The correlation and regression line could then be calculated for each course pairing for each academic year.

Changes in teaching method or changes in teaching staff would show up as changes to the slope, b, between years since student preference for the two courses could be altered. However, a complicating factor would be that the introduction of new materials or teaching methods could also alter student preferences. A longitudinal study would be expected to show up each of these factors as changes between year groups which are static and those which are dynamic are examined.

Student perception aside, the introduction of new materials would be expected to keep the slope of the line the same (the brighter and more dedicated will continue to achieve better than those less able and less motivated). Therefore the intercept could be expected to show the effect.

If the changes to a are statistically significant then the new materials would have had an effect. The degree of that effect (or not) could be shown by its distance from the expected value of a.

Another measure could be the effect on the correlation coefficient. In an ideal world, it would be found that r = 1. For that to happen all the students would have to achieve the same normalised score (taking the regression line into account) for each course – and that would be suspicious since students vary.

These differences in performance for students between units (learning dissonance) should diminish if the new materials or teaching methods have a positive effect. It will not affect those below the regression line as much since these students are performing better in comparison course. However, those who have more difficulty with the altered course will have access to new materials and/or alternative learning modes and would therefore be expected to improve. The degree of improvement in $r^2 \times 100$ (or not) would be another test of the effectiveness of changes in the teaching environment.

Finally, the degree of learning dissonance between courses:-

$$\left(\prod_{i=1}^{n} a_i\right)^{1/n} = \sqrt[n]{a_1 a_2 \cdots a_n}.$$ [1]

where *a* is the difference between the actual and expected score for each student taking both courses. This would be expected to reduce as standard of teaching becomes more uniform. Statistically large discrepancies (a term that would need to be quantified) might be an area of concern.

The Learning Dissonance Course Pair Scores (2011/12)

ld (Learning dissonance)

	COMP1152	COMP1587	MATH1110	MATH1111	COMP1588	COMP1589
COMP1148	6.060	8.287	8.422	7.011	8.518	7.671
COMP1152		7.965	6.668	6.670	9.179	7.864
COMP1587			9.770	9.538	7.367	9.913
MATH1110				*****	7.957	7.110
MATH1111					8.556	8.014
COMP1588						6.190

The table above shows the geometric mean of the differences between the predicted and actual scores for each pair of courses. The same could

also work for students. The geometric mean of the differences between their expected scores could also be calculated. It would be interesting to see whether these are normally distributed or, more likely, form a Poisson curve. Remedial measures could then be put in place to help those whose learning dissonance is high – maybe extra e-learning materials or a one week intensive summer school. Creating that table will be the next task.