$$\text{MEAN SCORE} = \sum_{i=1}^{N} P_i - \frac{Q_i}{A_i - 1}$$

$$\text{VARIANCE} = \text{VAR}_I Y + 2 \sum_{i=1}^{N} \sum_{\substack{i \neq j \\ j=1}}^{N} R_{ij} \sqrt{\text{VARX}_i \times \text{VARX}_j}$$

$$\text{where } \text{VAR}_I Y = \sum_{i=1}^{N} \text{VARX}_i = \sum_{i=1}^{N} P_i (1-P_i) + \frac{2P_i Q_i}{A_i - 1} + \frac{Q_i (1-Q_i)}{(A_i-1)^2}$$

where i or j = question number
N = total number of questions
P = probability of occurrence of correct answer
Q = probability of occurrence of incorrect answer
A = number of answer options
R = correlation coefficient

Figure 1

(2) that R_{ij} can be estimated from an average of the correlation coefficients between the scores on every question and those on every other question obtained in previous examinations.

(3) that the distribution of candidates' scores on the whole examination can be estimated by a normal distribution. The current tests of the validity of these assumptions will be presented together with examples of comparisons between predicted and attained distributions.

Standardization from year to year would involve substitution of certain questions in the proposed examination until a prediction indicating the required difficulty emerged.

Comparisons of performance in pharmacology examinations using multiple choice and essay questions

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Multiple choice questions (MCQ) have established a place alongside traditional essay questions in examinations in preclinical and clinical medicine. Ideally, the MCQ examination should be used to complement rather than to replace essay question papers, since the use of both types of examination explores a wider range of qualities of the candidates than if a single examining technique is used. Thus, a fairer and more comprehensive evaluation of the candidates may be made.

The automated marking and assessment methods used in our MCQ examinations have been demonstrated previously to the Society (Hoult, 1974) and the data presented here concern the results of six pharmacology examinations taken by preclinical medical students. Each examination comprises essay and MCQ sections. The essays are marked on a 'close-marking' scale (pass mark = 50) and the MCQ scores are adjusted to give a pass mark of 50. Individual candidate scores and the results of the whole group for the MCQ and essay sections have been compared to see if the two types of examination provide similar information about the abilities of the candidate.

The twelve frequency histograms of the scores of

Table 1 Scores in multiple choice questions (MCQ) and essay sections of six preclinical pharmacology examinations

Examination	Number of Candidates	Essay scores* %	MCQ scores* %	% candidates with similar scores in each section†
A	119	57.9 ± 0.6	59.5 ± 1.0	71.4
B	103	52.0 ± 1.0	59.3 ± 0.9	71.8
C	109	52.4 ± 1.1	61.7 ± 0.9	57.8
D	114	55.0 ± 0.7	56.0 ± 0.8	83.3
E	122	55.0 ± 0.6	59.2 ± 0.8	74.6
F	115	56.9 ± 0.8	58.9 ± 0.9	56.5

* Results expressed as mean ± s.e.
† Scores on MCQ and essay sections differing by less than 10%.

the whole group for both sections of the six examinations all show scores which are normally distributed about a mean approximately one standard deviation above the pass mark. In each examination, the mean MCQ score of the whole group is slightly higher than the mean essay score (Table 1). Inspection of the histograms shows that the distribution of essay scores is slightly skewed, covering a wider range of scores at the lower end and a smaller range at the top end of the scale. Table 1 shows that, although most candidates obtained scores for the two sections of the examination which differed by less than 10%, there is a large goup of candidates with poor score correlations in the two tests.

These data show that the MCQ and essay sections of the examinations yield essentially similar information about the overall range of abilities of the candidates, and that many candidates achieve similar scores in both sections. However, there is an important group of candidates who score very differently in the two types of examinations. The existence of this group justifies the use of both types of assessment.

Reference

HOULT, J.R.S. (1974). Fully automated multiple choice question marking. *Br. J. Pharmac.*, **52**, 154P.

Learning from and attitudes to routine tape-slide teaching

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The use of slides in the teaching of medical and allied subjects is of very long standing. Linking audio-tape with slides to provide a single educational unit is of more recent origin although in some institutions the method has been in use for about a decade (Amos, Duncan, Gilder, Hall & Smart, 1969; Holloway, 1964). Furthermore, the Medical Recording Service Foundation of the Royal College of General Practitioners has developed a large catalogue of recordings illustrated by slides which is extensively used and covers a wide range of subjects (Graves, 1971). This illustrates that even at the postgraduate level, where a helpful source of information exists, demand for it will be forthcoming, although research information on the efficacy of the service is lacking. Nevertheless, the use of tape-slide presentations in pharmacology teaching programmes, although accelerating, has not yet become routine in most courses perhaps because of the effort involved in preparation but also because of doubts regarding effectiveness and student acceptability once the novelty of the method has diminished. Indeed, most of the investigation into the efficacy of information retention have taken place in circumstances where the tape-slide method has been singled out for special attention either because the class was divided into special groups (Harden, Dunn, Holroyd, Lever, Lindsay & Wilson, 1969), or because special tests were administered (Birn & Christophersen, 1973).

Although not used very extensively tape-slide instruction has been a routine part of pharmacology teaching at Bradford for a number of years. The method of preparation and presentation of the tape-slides will be outlined. The results from computer marked objective tests given during the course reveal that compared with lecture based topics, answers