

## HOW TO...

# Assess Students: An Overview

R.M. HARDEN

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Important decisions are often taken about students as a result of the scores they achieve in examinations. It should be possible to make important decisions in relation to student counselling and course development on the basis of evaluation results, but often this is not done. All teachers are involved directly or indirectly with assessing students' competencies and should be familiar with some of the current thinking on assessment. They should ask (and answer) five questions: (1) What should be assessed? (2) How should it be assessed? (3) Why should it be assessed? (4) When should it be assessed? (5) Who should carry out the assessment?

### The Problem in Perspective

The following letter was written by a medical student to her mother and father.

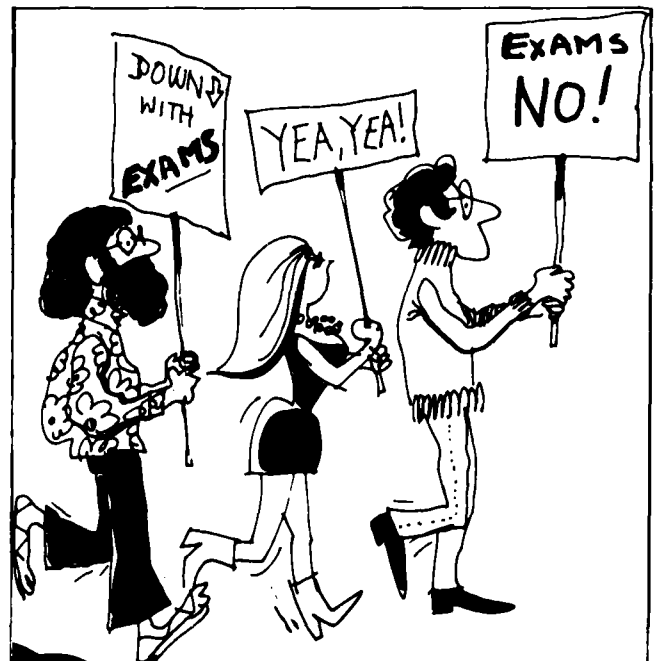
"Dear Mum and Dad,  
I am sorry for the delay in writing to you. I'll bring you up-to-date now, but before you read on please sit down. I am getting on pretty well now — the skull fracture and concussion I got when I jumped out of the window of my flat when it caught fire has pretty well healed. I only spent two weeks in hospital and can now see almost normally. Fortunately, the fire and my jump were witnessed by an attendant at the petrol station. He visited me in hospital and since I have nowhere to live now he was kind enough to invite me to share his apartment with him. It is really only a basement room, but it's kind of cute. He is a very fine boy. We have fallen deeply in love and hope to get married. We haven't set the exact date yet, but it will be before my pregnancy begins to show. Although he is of a different race and religion than ours, your often expressed tolerance will not permit you to be bothered by this fact.

"Now that I have brought you up-to-date, I want to tell you that there was no flat fire, I did not have concussion, I was not in hospital and I am not engaged. However, I *have* failed my anatomy examination and I wanted you to see this in proper perspective."

Students and staff alike have criticized assessment procedures as they are currently used by our universities and colleges. Much of this criticism is justified. Teachers have given insufficient time to consideration of the assessment methods in their institution, in the light of current thinking on the subject (Figure 1). It is claimed that an examination is like playing a game of tennis blindfolded—your opponent being also the umpire, who is the only person to know the rules and who changes them every game. Many of the criticisms levelled at examinations, however, are applicable not to examinations as such, but to examinations of poor quality which fail to fulfil their proper function or aim to fulfil functions for which they are inappropriate.

In an attempt to help the medical teacher tackle this

Figure 1. Students and staff alike have criticized assessment procedures as they are currently used by our universities and colleges.



problem, a number of articles in this series will deal with some of the more important issues in assessment.

### The Aim of this Paper

Can you select tests most suitable for your purpose? Can you judge and evaluate the quality of the test? Can you interpret the test results? This first article on assessment cannot provide all the answers. What it aims to do is to give an account of the five questions which should be asked and answered by medical teachers in relation to assessment. The questions are:

1. What should be assessed?
2. How should it be assessed?
3. Why should it be assessed?
4. When should it be assessed?
5. Who should carry out the assessment?

The article makes no claim to being comprehensive and many of the issues raised will be dealt with in other articles on assessment. What it does do is to provide a framework within which the individual issues can be seen in perspective.

The field of testing and assessment is changing rapidly, and I have tried to emphasize in this article areas where most change is taking place. The medical teacher, if he is to fulfil his role adequately, should be familiar with these changes.

### What Should be Assessed?

This is the first and most important question to be asked. It is an obvious one, and most teachers would claim that it is one about which they have thought. However, experience has shown that many of the problems encountered in assessment arise from inadequate consideration of what it is one is trying to assess. In the absence of detailed objectives for a course, the content of the assessment will become in reality the course objectives. For example, if it becomes widely known that topic 'A' is never included in any examination, it is difficult, if not impossible, to persuade students that mastery of it should be an objective for their studies.

#### *Knowledge, Skills and Attitudes*

In a widely used classification, educational objectives are allocated to three domains—knowledge, skills and attitudes, i.e. what we know, what we do and what we feel. It is convenient to use a similar classification to consider the content of examinations. Under *knowledge* we include all the cognitive processes from the mere recall of facts through comprehension and understanding to an ability to solve problems. Under *skills*, we include the various psychomotor skills that are required of the efficient clinician. Under *attitudes* we include the personal qualities of our students and their attitudes towards medicine, their patients and their peers.

The extent to which each of these attributes is considered important varies considerably from department

to department. Problems arise when the examiner's expectations and aims are not reflected in the content of the formal examination system. Thus, analysis of the content of examinations in medicine has shown that much of it is dominated by the knowledge domain, and within the knowledge domain much of it is concerned with the mere recall of facts. More neglected is assessment of attitudes such as 'acceptance of responsibility for patient welfare', 'regular observation of appropriate safeguards', and concern and consideration for the patient and the patient's family'. This problem was highlighted in a recent court case in North America. It involved a woman student with a brilliant academic record who had been expelled from medical school on the verge of graduation because it appeared that she was fat, ugly, unkempt and rather dirty. She also did not get on well with those around her. The university decided that she would not make a suitable doctor and a few weeks before she would have completed her course she was told to leave. They alleged that she lacked rapport with patients and did not attend to personal hygiene. Despite this she had the best record in the school and her examination scores were amongst the highest.

An important aspect of assessment is assessment of clinical skills. Various groups have looked at new approaches to the task. You will be helped in your choice of technique if you first answer the question 'What precisely is it you wish to assess?'. You cannot expect, for example, paper and pencil simulations, no matter how sophisticated, to assess a student's ability to elicit an ankle jerk.

#### *Nice to Know or Need to Know?*

In addition to looking at what should be assessed in terms of knowledge, skills and attitudes, it is useful to think of what is to be assessed in terms of whether it is something that it is essential for the student to know or whether it is something that it would be nice, rather than essential for him to know. Decisions about this may affect the content of the examination, the marking scheme and the interpretation of scores obtained by the students.

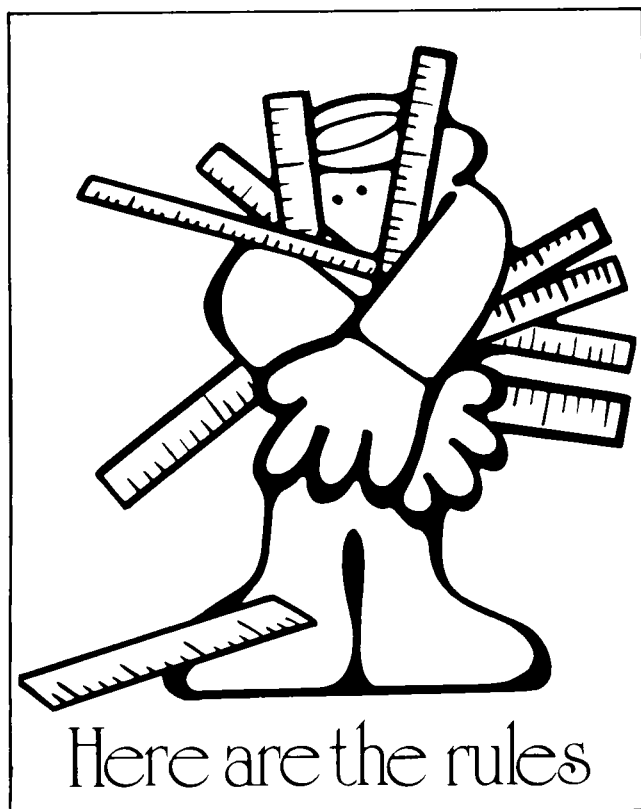
### How Should it be Assessed?

The method of examining should be closely related to what it is we are trying to examine. Examples are noted in Figure 2. Essays, for example, can allow a candidate to give in his own words a free, extended response to a problem and help convey the student's thought process. Practical and clinical examinations reveal what the candidate can do as distinct from what he says he can do. More objective methods have been introduced into written assessments, and the advantages of multiple choice questions have achieved wide recognition. More objective approaches to assessment of clinical and practical skills have also been developed. A technique which has come to be called the objective structured clinical examination (OSCE) is being introduced in a number of medical schools. Methods recorded in the General Medical Council Survey of Basic Medical

*Medical Teacher Vol 1 No 2 1979*

OBJECTIVES	FORM OF EXAM
Knowledge	Essay Short answer M.C.Q.
Reference techniques	Open book exam
Problem solving ability	M.E.Q.
Ability to seek information	Projects
Skills	Clinical

**Figure 2.** The examination method should be closely related to what one is trying to examine.



**Figure 3.** There are three rules in selecting an assessment procedure. The method should be valid, reliable or feasible.

Education (1977) used by students in the early years of the course included objective questions, essay questions, short answer questions, prepared written work, projects, practical course work, tutors' reports and orals.

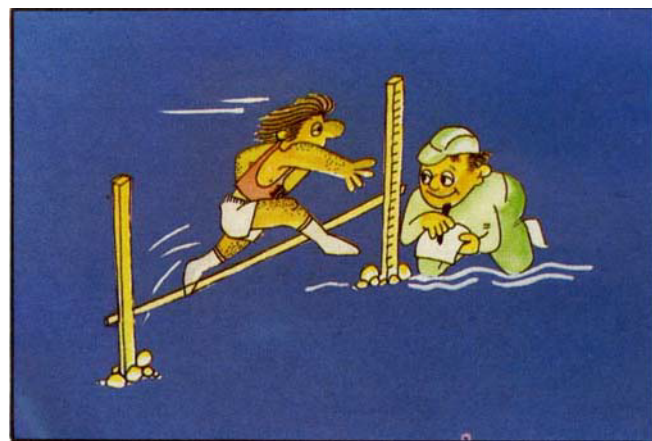
There are three rules that apply to selecting an assessment procedure (Figure 3):

1. The method should be valid, i.e. it should measure what you wish it to measure.
2. The method should be reliable and consistent.

*Medical Teacher Vol 1 No 2 1979*



**Figure 4.** Reliable, but not valid, estimate of a person's long-jumping ability.



**Figure 5.** More valid, but less reliable, measure of a person's long-jumping ability.

3. The method should be practical in terms of resources available and numbers of students to be examined.

The important concepts of validity and reliability are discussed in the Self Assessment section on page 101. A further example may illustrate the concepts. Let us look at the problem of assessing a person's ability in the long jump. If all one has is a measurement of the height he attained at the high jump, then this measurement itself may be reliable (i.e. if made on a number of occasions, a similar value would be obtained), but it is not a valid test of his long-jumping ability (Figure 4). A measurement of his long-jumping ability, if based on an estimate from a distance, may be more valid but less reliable (Figure 5). Where reliability is low, however, one cannot expect a valid test. On the other hand, high reliability is no guarantee of validity. It is always necessary to keep the need for validity in mind and to effect, if necessary, a compromise in favour of validity even if the level of reliability should fall.

There are many things we would like to measure, but it is difficult or impossible to do so. It is important that we recognize this fact and do not deceive ourselves as to the validity of our tests.

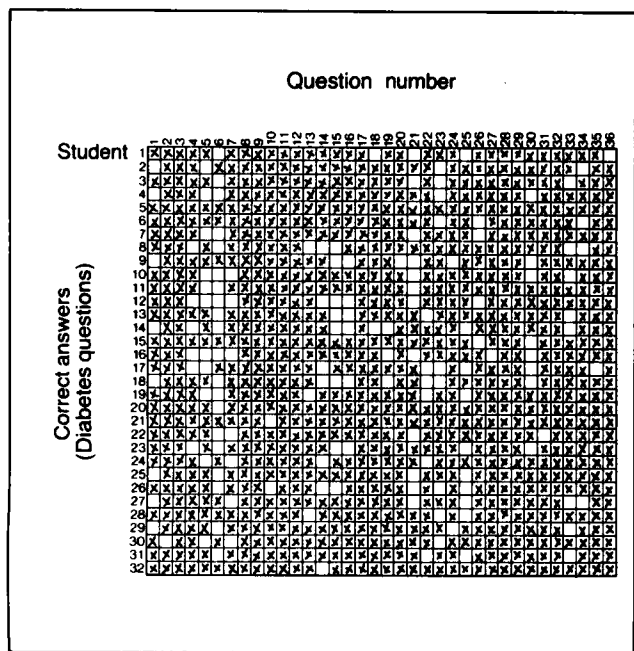


Figure 6. Student scores in objective examination. An 'X' indicates a correct answer.

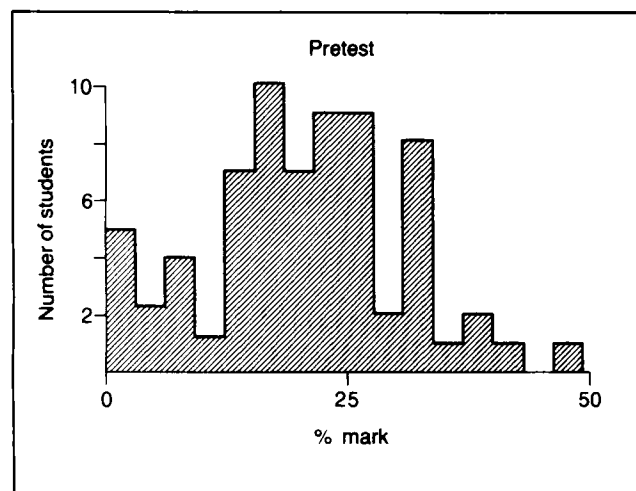


Figure 7. A pre-test of students' knowledge of endocrinology before they started a course on the topic.

### Why are we Assessing?

Assessment procedures can serve a number of purposes:

1. To pass or fail the student.
2. To grade or rank the student.
3. To provide feedback to the student.
4. To provide feedback to the teachers.
5. To motivate the student

Frequently, the first two aims are confused, and an examination set to cover both ends up inappropriate for either. Is our aim to find out the best students (or the

'poorest'), or is our aim to assess whether students have reached a predetermined standard or not? Concepts that are helpful in thinking about these issues are the concepts of criterion-referenced and norm-referenced assessments (Harden 1979). The aim in criterion-referenced assessment is to determine whether the students have achieved a specific standard of competence or not—the criterion—i.e. the aim is to separate the sheep from the goats. In norm-referenced assessment, the purpose is to distinguish between individuals—to rank those sitting the examination into some sort of order.

In addition to passing, failing or grading the students, assessment can reveal much useful information which will benefit both student and teacher. This rich well of information all too often remains untapped. Assessment should be more than just a barrier through which the student must pass. It should be used as a guide to the student's future studies and work. It should reinforce for the student those areas where he has the necessary requirements and identify those areas where further work is required. Figure 6 is an example of a simple form of feedback for the teacher. The performance of 32 students is recorded in 36 objective questions covering diabetes. A cross indicates a correct answer, and a blank an incorrect answer. It is obvious that all or most of the students answered some questions correctly and while the general performance (as indicated by the number of crosses) was high, in the case of a few questions (for example number 6) the majority of the class got the wrong answer. How can this be explained? One explanation would be an unsatisfactory question, either because it was inappropriate in that it did not reflect the aims of the course, or because it was too difficult. Another explanation, and the actual reason in this case, was that the poor performance in the question is a reflection on the teaching and indicates that the point had not been taught satisfactorily to the students during the course.

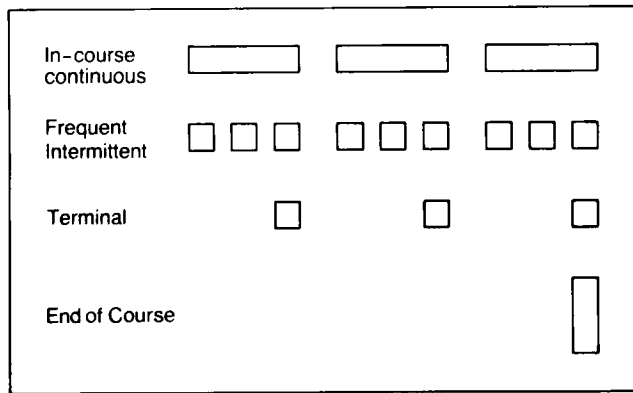
### When Should the Student be Assessed?

Students may be assessed:

1. Before the teaching—pre-test.
2. During the teaching—in-course, continuous or progressive assessment.
3. At the end of the course—end-of-course assessment.

Seldom do we take the opportunity in medicine to test the student's knowledge of a subject at the beginning of a course of study. If we did, we might get some surprises. Figure 7 shows the marks in an objective question paper in endocrinology achieved by students before starting the three-week course on this topic. It is clear that there is a marked range in performance, with some students not distinguishable from having no knowledge of the topic and some students almost achieving a pass mark of 50 per cent. Pre-tests can be used to indicate whether a student has the prerequisites necessary to study the course, e.g. can the lecturer assume that the students have the necessary vocabulary and understanding of basic principles? Alternatively, a pre-test may indicate which aspects of the topic the students have already grasped.





**Figure 8.** The continuum between a single end-of-course assessment and true continuous assessment.

Much debate has taken place as to the concept of continuous assessment. Between the two extremes of a large examination at the end of the course and truly continuous assessment, there is a continuum of daily, weekly, monthly, end-of-term and end-of-year assessment (Figure 8). Because in-course assessment emphasizes this continuum I prefer this term to 'continuous assessment'. In practice, most schools have adopted (and correctly so) a mixture of in-course and end-of-course assessment. The facts reported in the GMC Survey of Basic Medical Education are noted in Table 1.

### Who Should Assess the Student?

The following groups or individuals may be concerned with the assessment procedure:

1. The Government or health authorities.
2. Other national bodies.
3. Other universities or institutions.
4. A university committee.
5. The head of the department whose subject is being assessed.
6. Other teachers in the department.
7. The students.

**Table 1.** Nature of assessment in British medical schools.

Pattern	No. of schools
<i>Basic medical sciences</i>	
End-of-course only	3
Mainly end-of-course	14
End-of-course and in-course	13
Mainly in-course	1
In-course only	3
<i>Clinical subjects (theory)</i>	
End-of-course only	14
Mainly end-of-course	13
End-of-course and in-course	6
Mainly in-course	1
In-course only	1

The days when a head of department had the sole responsibility for assessing whether or not a student achieved a satisfactory level of performance in his subject are now past. With the increasing emphasis on accountability, it is likely that governments or national bodies will more closely monitor assessment procedures. This has already happened in some countries, such as Germany. The role of external examiners has been the subject of much debate, and the use of integrated examinations and multiple choice question papers has caused many schools to look again at the functions of an external assessor within schools. Assessment committees are taking on some of the functions that were previously the responsibility of the head of department. While the head of a department, e.g. physiology, clearly has a function in assessing students' grasp of physiological principles, other clinical departments should surely have a say in an assessment which is designed at least in part to determine whether students have a knowledge of physiology that is sufficient to let them complete a course on medicine and surgery. The increased work involved in devising multiple choice and other objective examinations has resulted in more of the work in relation to assessment being delegated to other members of staff.

Finally, the student himself should not be ignored. One of the objectives of an undergraduate course should be that the student, after qualification, will continue assessing and monitoring his own competence. If this is so, then it follows that self assessment has to be encouraged in the undergraduate course. New approaches to self assessment in continuing medical education have been developed over the past few years and many of these are equally appropriate in the undergraduate context.

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### Further Reading

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- Thyne, J. M., *Principles of Examining*, University of London Press, London, 1974, 278 pages.
- Tuckman, B. W., *Measuring Educational Outcomes: Fundamentals of Testing*, Harcourt Brace Jovanovich, New York, 1975, 527 pages.

#### Books relating to assessment in medicine

- Charvat, J., McGuire, C. and Parsons, V., *A Review of the Nature and Uses of Examinations in Medical Education*, World Health Organization, Geneva, 1968, 74 pages.
- Duckworth, D. and Hoste, R., *Question Banking: An Approach Through Biology*, Richard Clay (The Chaucer Press) Bungay, 1976, 116 pages.

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Knox, J. D. E., *The Modified Essay Question*, Association for the Study of Medical Education, Dundee, 1976, 25 pages.

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## **Nurse Education in China**

Nursing schools are re-opening in China. And nursing is a re-emerging profession, as a result of changing political views of the role of the professional. So reports a member of the Socialist Medical Association/Society for Anglo-Chinese Understanding group which visited China in 1978.

Writing in *China Now* (Mathews 1978), Ms Florence Mathews says nursing education had almost come to a complete stop following changes made during the Cultural Revolution. During this period there was considerable re-evaluation of the role of 'professionalism', including the role of training and examinations, which had a marked impact on nursing schools.

The effect of the decline in nursing education was to create a shortage of trained staff, which, Ms Mathews reports, is still apparent in some areas. To some extent, however, the shortage was counterbalanced by relatives of the sick often helping in caring, and by the enormous numbers of barefoot doctors and medical workers of the factories and residential committees, who deliver primary care to people at work or at home.

At the Friendship Hospital in Peking, the two-year training course has been extended to three years. The syllabus consists of basic medical knowledge, anatomy and physiology, pathology, pharmacy, and basic nursing care and skills in the first year; clinical nursing care with practical experience and Chinese traditional medicine in the second year; and specialization in one branch of nursing, e.g. theatre work, in the third year. Most of the larger city hospitals adopt a similar syllabus.

Examinations have been re-established and students have to pass them at the end of each six-month term.

Students are taught by nurse tutors, who have themselves received a three-year training, of which one year is spent in a medical school and two in a university.

Mathews, Florence, Nursing education, *China Now*, No. 81, 1978.

*Medical Teacher* Vol 1 No 2 1979