CHAPTER 1

How do students learn?

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Introduction

One definition of teaching is that it is the facilitation of learning. Regardless of whether you teach in a ward, a clinical skills centre, an out-patient clinic or a lecture theatre, it is helpful for you as a teacher to understand how people learn in order to enable you to facilitate their learning.

We shall describe the domains of learning: cognitive (knowledge); psychomotor (skills); and affective (attitudes). For many of you, your teaching will be in all three domains. There are different levels of learning for each domain; for instance, Bloom's taxonomy of learning in the cognitive domain describes six levels of learning (Bloom, 1956). Bloom's taxonomy is not new, but it provides a particularly useful tool to help you to identify whether you are teaching or assessing facts that need to be memorised or the application of facts, or judgement, which require higher-order thinking.

Medical students tackle their learning in different ways and these will be outlined. Many medical students have been called strategic learners (Entwistle & Ramsden, 1982) as there is evidence that they approach their learning in a way that will give them the best chance of passing their examinations. You can help your students learn more effectively by the way that you teach. We shall describe a number of theories about how people learn and present some principles of learning drawn from these theories that you can use in your everyday teaching to facilitate your students' learning. These are called the FAIR principles of effective learning (Hesketh & Laidlaw, 2002*b*).

A good facilitator of learning has certain knowledge, skills, attitudes and personal attributes that we shall identify here to improve your abilities as a facilitator of learning.

Domains of learning

Student learning takes place in three domains: cognitive; psychomotor; and affective (Bloom, 1956). The *cognitive domain* includes intellectual

abilities and the learning of content knowledge. You, as a teacher, facilitate the acquisition of knowledge and assess students' ability to memorise facts, apply their learning to clinical situations and make judgements. The *psychomotor domain* encompasses the learning of motor skills such as physical movement and coordination (Gronlund, 1976). Development of these skills requires demonstration by teachers and time and opportunities for students to practise. Usually the psychomotor domain is assessed in terms of speed, precision and performance of procedures or techniques and is less central to psychiatry than to several other medical specialties. Learning of attitudes, feelings, values, appreciations, interests and modes of adjustment constitute the *affective domain* (Gronlund, 1976). Although the areas of learning under this domain can be taught, much of the time they are 'caught': the teaching of attitudes is often implicit as opposed to explicit, and the medical teacher acting as a role-model is particularly important in facilitating learning in this domain. The aspects of this domain are essentially assessed by whether the individual conforms to professional and societal norms, and appropriate attitudes in one culture may be inappropriate in another.

The domains of learning have important implications for assessment. If the examination at the end of the course comprises multiple-choice questions that can be answered by memorising facts, students will learn by rote. If the end-of-course assessment is an objective structured clinical examination, they will focus on learning relevant clinical skills (Malik *et al*, 1988). If it emphasises professional behaviours, as do workplace-based assessment tools such as multi-source feedback or the Professionalism Mini-Evaluation Exercise (PMEX) (Cruess *et al*, 2006), students will ensure that their behaviour is professionally appropriate.

Learning in each of these domains has a hierarchy; that is, it is 'taxonomically tiered'. The taxonomical levels in the cognitive domain will be described below, as they provide a useful framework for educational activities and have been used widely for decades. The taxonomic levels described for the psychomotor and affective domains, however, have been found to be less useful and are infrequently employed.

Levels of learning in the cognitive domain

Bloom (1956) introduced six hierarchical levels, commonly referred to as Bloom's taxonomy, in describing intellectual ability. The levels are recall, comprehension, application, analysis, synthesis and evaluation. The complexity of the thinking process increases across the six levels from recall to evaluation.

The level of your teaching in Bloom's taxonomy conveys a distinct educational message to students. If your teaching is set at the level of *recall* (e.g. 'list the symptoms of depression'), students are encouraged to memorise facts and data. If your teaching is focused on *comprehension*, you expect students to demonstrate their understanding of the meaning of what they have learned (e.g. 'explain the term "depression"'). If you encourage

your students to use or apply their learning in new situations, contexts and clinical situations, your teaching and learning is focused at the level of *application* (e.g. relate the genetic basis to bipolar disorders). At the level of *analysis*, the students are expected to categorise, classify or separate the components of a concept (e.g. 'arrive at differential diagnoses of a patient presenting with sleep disturbance'). At the level of *synthesis*, they are expected to formulate a concept or recognise a pattern by assembling diverse elements (e.g. 'arrive at a diagnosis of patients who present with a particular set of symptoms and signs'). If you encourage your students to make argued or evidence-based judgements (e.g. 'decide a particular management plan for a particular patient'), your teaching is at the level of *evaluation*.

These levels need to be considered in your teaching, for example in formulating learning objectives for a course or a session, and can be used to analyse students' answers in written examinations. If the course objectives emphasise higher-order thinking and the examination tests factual recall, then there is a disparity between the teaching and the assessment.

Memorising facts is useful, indeed essential, in medicine, as factual knowledge is a prerequisite for effectively tackling clinical problems (Hager & Gonczi, 1996). However, 'in real professional practice, factual knowledge is mostly not a goal itself, but only a single aspect of solving professional problems' (Schuwrith & van der Vleuten, 2004). Therefore, a focus on the higher levels of Bloom's taxonomy, especially in the assessment of students, is recommended.

Students' approaches to learning

By observing students or reflecting upon your own learning, you may be able to recognise differences in the way that individuals approach their learning. Marton & Saljo (1976) identified three approaches: surface, deep and strategic. The learning approach of an individual is not a fixed personal attribute, but depends on the context and the subject, and may vary over time.

- Surface learners. Certain students like learning words and terms without bothering much about understanding meanings, interconnections, implications or concepts. Their primary intention is the achievement of a minimum standard (in terms of marks, grades or qualifications) for getting through courses, mostly by rote learning the 'most important items' (Biggs, 1987). Surface learning is motivated by external consequences, either positive (e.g. progressing through the course by passing examinations) or, more commonly, negative (e.g. dropping out by failing examinations), and not by intrinsic interest in the subject (Biggs, 1987). In the process of learning, surface learners restrict their learning largely to what might be asked in the examinations, in which they expect simply to repeat what they have learned, and they usually fail to distinguish principles from examples (Biggs, 1987).

- *Deep learners*. Other students attempt to understand or explore meaning, relationships, interconnections and concepts behind words and terms in the process of learning rather than memorising words or terms in isolation. These learners are using a 'deep' approach to learning, which is driven by their interest in or curiosity about the subject (Biggs, 1987). In contrast to surface learners, deep learners: interact with the content; read around the topic; use evidence, experience and prior learning to understand the new learning; and attempt to apply what is learned in everyday practice (Biggs, 1987).
- *Strategic learners*. The distinctive feature of strategic learners is that their motivation is to take the approach that delivers the maximum positive outcomes to themselves (Biggs, 1987). Therefore this approach to learning is also referred to as the 'achieving approach'. Strategic learners are not actually mutually exclusive from surface or deep learners. The motivation of strategic learners may be the achievement of the highest grade, as in the surface approach, but, like deep learners, they may be actively involved in the learning process in achieving their goal. In the process of learning, these learners: effectively manage time and effort; carefully select proper conditions and appropriate material for studying; and actively seek past questions and marking criteria before examinations (Biggs, 1987).

The choice of learning approach seems to be largely determined by time allocation, content load and assessments (Biggs, 1987). Time pressure and content overload can be related to either teachers or students, or both. For example, students who postpone studying might struggle with limited time and excessive amounts of work towards the end of the course. On the other hand, students may struggle against time if demands of the curriculum are exhaustive (curriculum overload). In both these situations, students tend to use a surface approach rather than a deep approach to learning. Assessments, however, are designed and conducted by teachers. As 'assessment drives learning' (Schuwrith & van der Vleuten, 2004), it could be regarded as the main determinant of the choice of learning approach. Examinations that assess higher-order thinking inevitably encourage students to choose a deep approach to learning. Where medical education is concerned, strategic learning inclined towards deep learning will result in both the desired intellectual involvement and the achievement of standards with regard to the learning outcomes.

Theories of learning

Learning is not a passive process but requires effort on the part of learners to actively construct meaning from what they are being taught. There are five main theories about how people learn:

1 The *behaviourists* focus on tasks to be learned (Phillips & Soltis, 1985). The basis of this theory is the stimulus–response model of conditioning and the benefits of rewards (Skinner, 1938). *Activity, repetition* and *reinforcement* are thought to help people learn.
2 The *neo-behaviourists* explain learning as a cognitive map, with one thing leading to another and a hierarchy of learning (Bednar *et al*, 1995). Application of learning is emphasised, with 'operant conditioning', where a learner completes a series of tasks. *Activity, repetition* and *motivation* are thought to be important.
3 The *gestaltists* believe that the *pattern* is important (Koffka, 1935; Wallace *et al*, 1998). Understanding is based on insight, the flash of inspiration when the pattern is recognised.
4 The *cognitivists* focus on mental processes. They believe learning takes place through the construction of personal schemes ('conceptual schemata') and that for new information to take its place in the scheme, reflection is necessary (Dewey, 1929). The learning process and learning by discovery are emphasised (Bruner, 1967). The use of advance organisers is advocated to bridge the gap between existing knowledge and what the students need to know (Ausubel, 1960). The advance organiser is somewhat similar to a signpost that points to the possible directions in which learning could go. Learning is seen as cyclical (Kolb & Fry, 1975), and a four-phase cycle for effective learning has been described:
   - concrete experience
   - reflective observation
   - abstract conceptualisation
   - active experimentation.

   Different learners will start at different places in this cycle and will rely more heavily on some phases of the cycle than others. This has led to the description of learning by *experiencing, reflecting, thinking* and *doing*.
5 The *humanists* believe that people have a propensity to learn and will learn when the conditions are appropriate (Rogers & Freiberg, 1994). They emphasise the education of the whole person, of everyone being helped to make the most of themselves. The importance of an environment where all students feel valued is highlighted. Learning as active self-discovery and active learning by doing (experiential learning) are emphasised. Positive emotions will facilitate learning and negative emotions such as stress and anxiety will inhibit it. *Relevance, choice, purposes, goals, anxiety* and *emotion* are seen as important.

Different people learn in different ways and it is not often possible to identify how individual undergraduate medical students learn. Nor is this necessary, as it is not usually possible to provide customised teaching for individual learning styles. Thus, as teachers, we need to cater for different learning styles and provide in our teaching a range of educational experiences

that will suit different styles of learning. You can cater for different learning preferences by applying the FAIR principles (Hesketh & Laidlaw, 2002*b*).

Principles of effective learning: the FAIR principles

The FAIR principles for effective learning take key elements of different learning theories and put them together in an easily remembered model that you can use in many different teaching situations: feedback; activities; individualisation/interest; relevance. These principles will help you to provide experiences for your students that encourage 'deep' and more lasting learning than memorising or rote learning facts.

Feedback

Providing feedback to learners regarding their progress allows them to assess their knowledge or proficiency and to identify gaps or strengths; it motivates them to correct any deficiencies or weaknesses. Feedback should be constructive (Hesketh & Laidlaw, 2002*a*); it should be in the form of explanations of how to improve rather than simply telling students that they are poor or incorrect. Feedback should be timely and given immediately after the event, when the student is likely to be avid to learn: the longer the delay is, the less will be the student improvement. Feedback should be *criterion referenced*, that is, it should explain to the student where he or she is situated in relation to the required standard, rather than *norm referenced*, which tells the student where he or she is in relation to fellow students, but does not tell the student how to improve. It is important to remember that students can effectively provide some of their own feedback both for themselves and for their peers (Hesketh & Laidlaw, 2002*a*).

There are many methods of providing feedback. The fact that examination results provide feedback is often forgotten. In recent years there has been a trend to increase the use of formative assessment in medical education, with the specific intention of providing feedback to students on their progress. It should be remembered, however, that summative assessment (the end-of-course examinations, where pass/fail decisions about the students are taken) is also a source of feedback. One of the most successful developments in lecturing in recent years has been the use of audience response systems, which enable the lecturer to set quizzes for the students during delivery (Robertson, 2000). The lecturer is given feedback as to whether the students have understood the messages of the lecture and individual students are given feedback as to whether they have appropriately understood the messages. Workbooks that are submitted by the student for marking (Mires *et al*, 1998), face-to-face discussions with tutors and workplace-based assessment methods (such as multi-source feedback and patient satisfaction questionnaires) also provide students and trainees with feedback.

Activities

Activities encourage learners to engage in the learning process and to internalise their learning. Activities can shift the learning from a low level, such as factual recall and memorisation, to higher-order thinking. Activities can be designed to help learners: to understand the material they have to learn; to apply what they have learned to the clinical situation; and to develop critical thinking and clinical judgement. Activities may include: practical exercises; case studies that set a problem the student has to solve; group discussions about a clinical problem; 'buzz groups' in lectures; reading a relevant section of text; and reflecting on the application of what they are learning to their own practice or to patients seen in the wards or out-patient department.

Individualisation/interest

Sometimes it is possible to individualise learning for different groups of students or trainees (Harden & Laidlaw, 1992). Selection of pertinent examples, dealing with cases at an appropriate level for the group or setting the learning in the context in which the learners work may all help to individualise learning. Whether individualisation is possible or not, arousing the interest of learners is crucial for motivating them to learn (Harden & Laidlaw, 1992). The intrinsic interest of the content matter; the use of an especially fascinating case; and photographic illustrations or other media may all increase interest. Humour can sometimes be used successfully to increase interest and, at the same time, lighten the mood. Care is necessary, however, with the use of humour as it is important not to cause offence or trivialise the material to be learned.

Relevance

Learning will be much more successful if learners see the relevance of what has to be learned to themselves and to their goals (Harden & Laidlaw, 1992). Medical students will be much more engaged in learning psychiatry if they see its relevance to their future career pathway. Pointing out the relevance of learning about psychiatric disorders to those destined for a career in other specialties is an important strategy to encourage learning.

Role-modelling and the personal attributes of a good facilitator of learning

The teacher may have many different roles. Harden & Crosby (2000) have identified 12 roles of the doctor as a teacher. Some of us are teachers in

clinical skills centres, wards or out-patient departments, while others may prefer to develop online learning materials for our students or involve ourselves with student assessment or curriculum evaluation. Whatever our teaching role, there are some personal qualities that seem to be important for the facilitation of learning, particularly with small groups of students (Schmidt & Moust, 1995; Harden *et al*, 1999). The ability to communicate with students in an informal way and the skills to express oneself in a language that students understand seem to be important. An empathic attitude and the ability to create an atmosphere in which the open exchange of ideas is facilitated seem to help, as does a willingness to become involved with students in an authentic way.

All those who teach act as role-models for students. A high level of professionalism, both as doctors and as teachers Is important for good role modelling, and we should ask ourselves what sort of example we are providing for our students whether in clinical practice or teaching practice.

As with clinical practice, a good teacher remains abreast of the evidence. BEME (Best Evidence Medical Education) is an organisation devoted to the provision of the best evidence for educational practice; BEME is to medical education what the Cochrane Collaboration is to medicine (Harden *et al*, 1999). From the BEME website (http://www2.warwick.ac.uk/fac/med/beme/) you will be able to access a number of meta-analyses of the literature that will help you decide what works in health professions' education.

Summary

An understanding of how students learn will enable teachers to facilitate their students' learning. It is not usually possible to plan learning for individual students' learning styles and the FAIR principles for effective learning provide a tool that all teachers can use in their teaching in order to facilitate student learning, whatever the student's individual learning style.

It may be possible to provide a wide range of educational opportunities for students and then allow them to select those that best suit their individual learning styles. Some students may find lectures helpful, while others may prefer independent study or study with a group of colleagues. The provision of a study guide that identifies the educational opportunities along with the outcomes of each session will help students to plan their learning to suit their learning preferences.

The professionalism of the individual teacher both as a specialist and as an educator is another area for consideration and the way that teachers interact with students may have a powerful effect on their learning, particularly in a small-group setting.

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