

Learning outcomes as a tool to assess progression

RONALD M. HARDEN

International Virtual Medical School (IVIMEDS), Dundee, UK

Abstract

In the move to outcome-based education (OBE) much of the attention has focussed on the exit learning outcomes – the outcomes expected of a student at the end of a course of studies. It is important also to plan for and monitor students progression to the exit outcomes.

A model is described for considering this progression through the phases of undergraduate education. Four dimensions are included – increasing breadth, increasing depth, increasing utility and increasing proficiency. The model can also be used to develop a blueprint for a more seamless link between undergraduate education, postgraduate training and continuing professional development.

The progression model recognises the complexities of medical practice and medical education. It supports the move to student-centred and adaptive approaches to learning in an OBE environment.

Student progression in an outcome-based curriculum

The major advantages in adopting an outcome-based approach in medical education have been described (Harden et al. 1999). The emphasis has been on exit learning outcomes – the competencies expected of a learner at the end of a particular phase of their education or training. This is not unexpected as the abilities of a student at the point of completion of their course are of key importance. Less important is how they have progressed in the education programme to achieving these competencies. Traditionally, for example, the development of clinical skills was a feature of the later years of the curriculum, while more recently clinical skills have been introduced in the early years. It is recognized that there are legitimate differences in how students progress within different education settings to the exit learning outcomes. It is valuable, however, to plan and to document how students are expected to progress and to establish the differences that are acceptable in individual students. Student progression can be recorded in relation to each learning outcome and benchmarks can be used to detail the progression towards meeting the learning outcome.

Achievement of specified learning outcomes may be a requirement before a student can progress from one part of the medical course to the next. This has traditionally been stated in terms of mastery of a subject area as assessed by an examination covering the subject or discipline. Thus a student is expected to achieve a certain level of mastery or understanding in the basic and clinical medical sciences before proceeding to clinical studies in the later years of the course. The development of a 'progress test' usually in the form of a written test taken by students in all years of the course, was

Practice points

- The progression of students to the exit learning outcomes in the undergraduate curriculum should be planned and monitored.
- A model of progression that takes account of increasing breadth, depth, utility and proficiency is useful for this purpose.
- The progression model can be implemented in the planning of a more seamless transition between the different phases of medical education.

predicated by the desire to be able to assess, document and provide feedback about a student's progress (Van der Vleuten et al. 1996).

An outcome-based education (OBE) approach to curriculum planning has encouraged a more sophisticated consideration of student progression and the monitoring of students' progress through the curriculum. A study of anatomy, for example, is likely to constitute an important element in the early years of the curriculum. The expected outcomes may, however, extend beyond a mastery of an understanding of the structure of the human body to include an acquisition of communication skills, teamwork competencies and other elements of professionalism (Pawlina et al. 2006). A similar situation in relation to the progression to the exit learning outcomes is found also with other subjects.

The benefits of a more seamless continuum of education from undergraduate through postgraduate education to continuing professional development have been widely accepted (Harden 2006a). The implementation of such a continuum, however, has proved elusive and difficult to

Correspondence: Ronald M. Harden, IVIMEDS, Tay Park House, 484 Perth Road, Dundee, DD2 1LR, UK. Tel: +44(0) 1382 381963; fax: +44(0) 1382 645748; email: r.m.harden@dundee.ac.uk

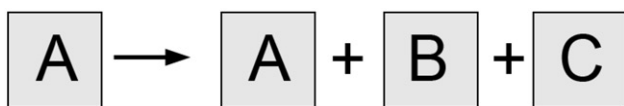
achieve in practice. There are many reasons for this, not least the current organisation and funding arrangements for medical education. A significant additional factor, however, has been the lack of an accepted framework on which such a continuum can be planned and a language with which the continuum can be discussed. Learning outcomes provide such a framework. An agreement can then be reached as to the contribution made by undergraduate education and postgraduate education in relation to each of the learning outcome domains. A feature of the work on learning outcomes has been that it has been undertaken for the most part by groups each concerned specifically with one phase of education, e.g. undergraduate education, postgraduate education or continuing professional development or by bodies with an interest in one aspect of medicine such as neurology and gastroenterology. There is some evidence, however, that outcome frameworks such as CanMEDS and ACGME competencies (Frank & Danoff 2007, Swing 2007) prepared in the context of postgraduate education can be applied to undergraduate education and that outcome frameworks designed in the context of undergraduate education such as the three-circle 12 domain model used in the 'Scottish Doctor' outcomes in medical schools in Scotland can be applied to postgraduate education (Paterson Davenport et al. 2004).

This paper describes a model for studying and recording the progression of students through the different phases of the undergraduate curriculum from the first year of the medical school to the later years and between undergraduate and postgraduate education. The model can be applied to students' progress in relation to the different outcome domains including communication skills, practical procedures and decision making.

Dimensions of progression to exit learning outcomes

Learners can progress towards exit learning outcomes in four dimensions (Table 1).

1. Increased breadth

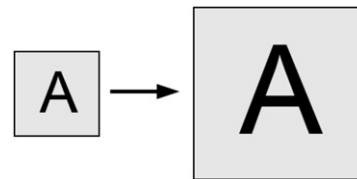


The learner can increase the breadth of their mastery of a learning outcome by extending their area of competence to new topics or different practice contexts. They may learn additional clinical skills, practical procedures or approaches to investigation or management of a patient. In relation to communication skills, for example, having acquired basic interviewing skills they may move on to learn in more detail the techniques of opening or closing an interview with a patient or communicating in other settings, e.g. with the press or in a court of law. The learner may extend their competencies in physical examination by acquiring the ability to identify diastolic murmurs on auscultation in addition to systolic murmurs or may learn about diseases not previously covered. They may address aspects of the health care delivery

system not included in their earlier studies. Increasing the learner's breadth of competence also embraces expanding their existing understanding and skills to take account of advances in medicine.

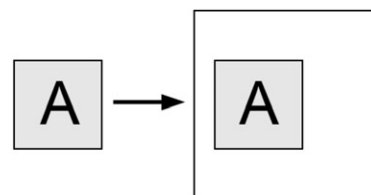
Having looked at medicine as it relates to the adult, the learners may progress to look at differences in children or in the elderly. They may also progress, having studied medicine in the context of one culture, to a more international perspective of medical care (Harden 2006b).

2. Increased difficulty



The second dimension is also concerned with a progression in terms of an increased scope for the learning outcomes. In this case it relates to an increase in depth of study or level of difficulty rather than an increase in breadth. This may involve a more in-depth understanding of a physiological mechanism or alternative views as to the pathogenesis of a disease. In relation to communication skills, the learner may be expected to cope with a more difficult interview such as an aggressive or nervous patient and in relation to auscultation skills may be expected to identify a less loud murmur in an obese patient. The increased difficulty may be attributed also to an increased complexity due to multiple complaints and pathologies or to multifactorial problems involving a combination of social, economical and medical issues. The increased difficulty may be related to less typical presentations or to the presence of fewer or less obvious cues such as a patient with only the early signs of hypothyroidism and lacking the classical features.

3. Increased utility and application to practice



The third dimension represents the move from a theoretical understanding to an application to practice. Students may progress from a theoretical understanding of basic medical sciences to their application in providing a better understanding of the clinical problems with which a patient presents. Students may progress from an understanding of the pharmacology and indications for a drug to a position where they are able to identify patients in whom the drug is indicated and are competent to prescribe the drug in the patient and to monitor the patient's progress.

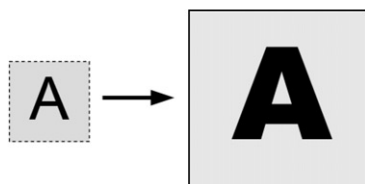
This progression through an increase in utility can be seen in relation to communication skills. In the early years, students

Table 1. Exit learning outcomes in four dimensions.

<i>Increased Scope</i>		<i>Increased Utility</i>	<i>Increased Proficiency</i>
<i>Increased Breadth</i> A → A + B + C	<i>Increased Difficulty</i> A → A	<i>Application (to medical practice)</i> A → A	<i>Increased Accomplishment</i> A → A
<ul style="list-style-type: none"> ■ Extension to more or new topics ■ Extension to different practice contexts ■ Accommodation of existing knowledge or skills to new knowledge or skills 	<ul style="list-style-type: none"> ■ More in-depth or advanced consideration ■ Application to a more complex situation <ul style="list-style-type: none"> • move from a unidimensional straight forward situation to one involving multiple problems or systems • move to multifactorial problems involving different factors(eg social, economical, medical) • complications (eg associated with treatment) ■ Less obvious or more subtle situations <ul style="list-style-type: none"> • fewer cues • less obvious cues • atypical cues 	<ul style="list-style-type: none"> ■ Move from general context to specific medical context ■ Move from theory to practice of medicine ■ Move to integration into the role of a doctor <ul style="list-style-type: none"> • an integrated repertoire involving a holistic approach to practice and bringing together the different abilities expected of a doctor • dealing with and reconciling competing demands, such as time spent on curative and preventative medicine 	<ul style="list-style-type: none"> ■ More efficient performance <ul style="list-style-type: none"> • better organised • more confident • takes less time • more accessible • less unnecessary or redundant action • higher standards • fewer errors ■ Less need for supervision ■ Takes initiative and anticipates events ■ Better able to defend and justify actions ■ Adopts routinely as part of practice

may practice communication skills first with their peers and then with simulated patients. They progress to communicating in hospital with patients who have had their history taken on a number of occasions and from there to patients in the emergency department or their own home presenting for the first time with a complaint. This progression in the application to practice also relates to the move to the more integrated repertoire expected of a doctor involving a holistic approach to practice and the dealing with and reconciling competing demands such as time spent in curative and preventative medicine. This is equivalent to the third level of progression from novice to expert in the Dreyfus model as described by Benner (2001).

4. Increased proficiency



Progression can be associated with an increased proficiency on the part of the learner with more efficient performance as exemplified by less time required for a task such as taking a history from a patient or carrying out a procedure, the achievement of higher standards and the commission of fewer errors. A further indicator of increased proficiency is that the

learner proceeds from working under close supervision to unsupervised practice and when appropriate takes the initiative in the provision of health care for patients. Just as certain procedures in driving a car become with time and practice routine and automatic, so in medicine an increase in proficiency can be observed as part of a progression.

Representation of progression

The progression of a student to the exit learning outcome can be represented in a chart as I shown in Figure 1. In this example twelve learning outcome domains as adopted in the ‘Scottish Doctor’ (Simpson et al. 2002) are shown. Progress in each domain is charted with the achievement of the minimum standards required in each outcome domain noted at the end of the first phase or cycle of the undergraduate programme and represented by the inner target, the achievement by the end of the undergraduate programme or second cycle represented by the middle target and the expected outcome of postgraduate training by the outer target. The student illustrated in Figure 1 has achieved the minimum standards in nine outcome domains (outcomes 1, 2, 3, 5, 6, 7, 10, 11 and 12), has progressed significantly beyond the standard required for the first phase embracing some of the expected learning outcomes for the second phase in two areas - understanding of the basic sciences and patient management (outcomes 4 and 8), but has not yet reached the required standard in the domain of attitudes and ethics (outcome 9).

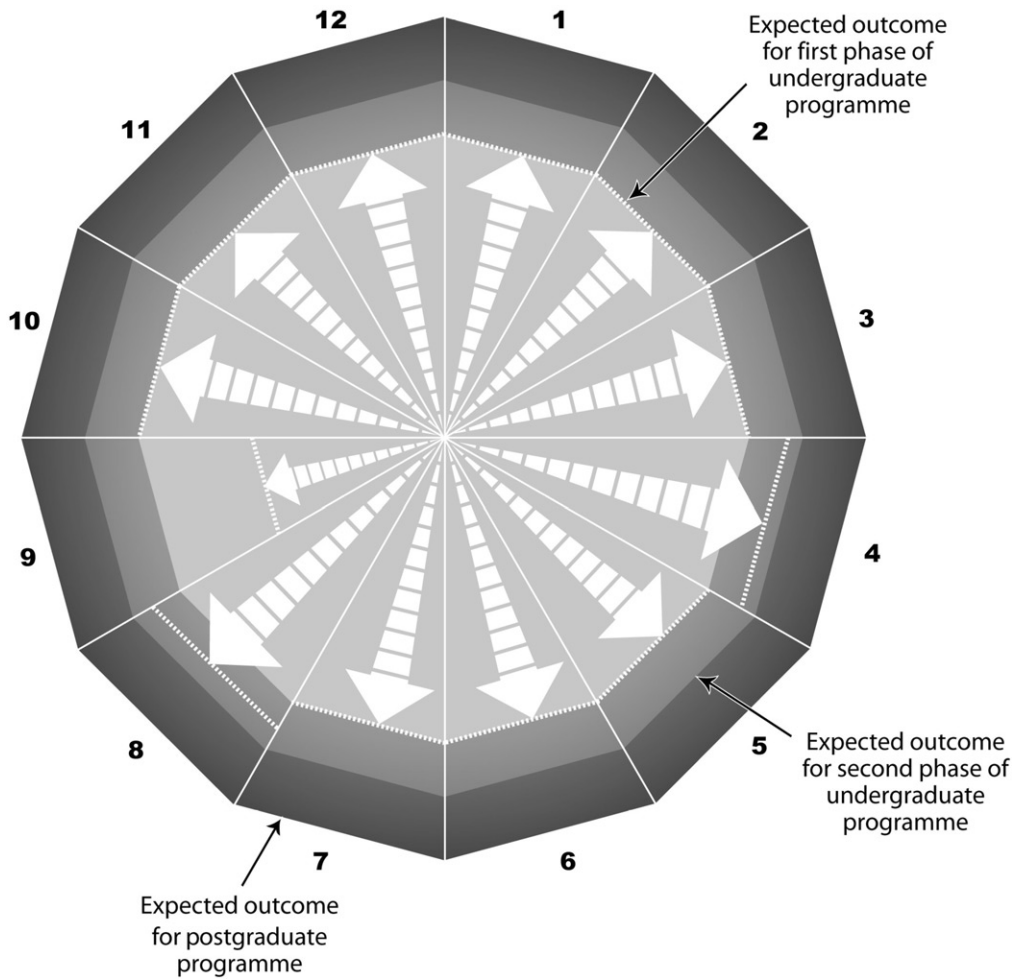


Figure 1. A representation of progress by a first phase student in relation to each of 12 learning outcome domains. The expected progress for each outcome is indicated by the inner target for the first phase of the programme, by the middle target for the second phase of the curriculum and by the outer target for postgraduate training.

Discussion and conclusion

Hamilton (1999) has distinguished between external progression by the student through the medical curriculum as represented by success in examinations – the outward journey of a career – and the deep or inner journey that has much to do with motivation, morale, personal values and integrity and professional ethics. It is this deep inner journey, in addition to the outward journey, that is made explicit in an OBE approach. The issue of progression is a key feature of the journey and is of fundamental importance in an educational system. An outcomes model provides the necessary blueprint for planning and documenting this progression. Progression in relation to each learning outcome can be charted using the four dimensions described in this paper.

It is recognized that students may progress at different rates through a curriculum. In the UK, for example, graduates entering medical studies may have a faster track through the curriculum than students entering directly from school. Extending the argument, it can be concluded that what should be fixed is the standard students achieve with time as the variable. This is the reverse of the current position where time is the fixed element and standards (within certain limits)

are the variable. The concept of an adaptive curriculum tailored or personalized to the needs of the individual student with a clear statement of exit learning outcomes and attention to progression by the student towards these will undoubtedly attract increasing attention.

As schools adopt an OBE approach, increasing attention will be paid to the assessment of the student's progression to the exit learning outcomes. Where a student at the end of the course is found lacking or deficient in a domain such as attitudes or communication skills, it will be asked why this was not detected earlier in the curriculum on the assumption that a problem with progress in this area should have been detected at an earlier stage.

Learning outcomes can be embedded as nodes in a curriculum map (Harden 2001). This can be used to plan progress through the curriculum and to relate learning experiences to the outcomes as developed in the International Virtual Medical School (Harden & Hart 2002). On the first visit to an area in the map, such as the cardiovascular system, nodes can be identified as relevant for study in that phase of the curriculum. On subsequent visits in a later phase of the curriculum, nodes not visited during the first phase can be addressed thus increasing the

breadth of study by the student. In addition the student may progress by revisiting the same nodes but on the second occasion studying them in more depth. An appreciation of the relation and links between nodes relating to the basic sciences and nodes relating to the clinical aspects of practice represents a utility progression. This progression is consistent with the concept of a spiral curriculum which is characterised by the revisiting of topics at an increasing level of difficulty, the relation of new learning to previous learning and an increasing level of competence in students (Harden & Stamper 1999). Nash (1995) highlighted that OBE was designed to promote learning, emphasise performance and attainment and encourage active and participative learning. This is facilitated by attention to progression and a visualisation of the process, encouraging a student-centred approach to the curriculum. Learning outcomes embedded in a map provide students with an understanding of where they are going and the steps that they need to make to progress to their destination. In this way the student can judge the relevance or otherwise of the various learning opportunities presented to them.

Through real and simulated patient encounters students are increasingly introduced to the full range and complexity of health, disease and illness from the first day of medical school. In this environment an understanding of the exit learning outcomes and the expected progression by students to these is important. The learning outcomes expected in a first year student in relation to a patient with a myocardial infarction will differ from those expected of a fourth year student or a postgraduate trainee. The model presented in this paper offers an approach to conceptualizing and planning the progression of students during the course to the exit learning outcomes, distinguishing four different dimensions of progression.

Note on contributor

RONALD HARDEN is Director of Education for the International Virtual Medical School (IVIMEDS), General Secretary of the Association for Medical Education in Europe (AMEE) and Editor of Medical Teacher.

He was formerly Director of the Centre for Medical Education, Postgraduate Dean and Teaching Dean at University of Dundee, UK.

References

- Benner P. 2001. *From Novice to Expert. Excellence and Power in Clinical Nursing Practice* (New Jersey, Prentice Hall).
- Frank JR, Danoff D. 2007. The CanMEDS Initiative: implementing an outcomes-based framework of physician competencies. *Med Teach* 29.
- Hamilton JD. 1999. Outcomes in medical education must be wide, long and deep. *Med Teach* 22:125–126.
- Hamilton JD. 2000. International standards of medical education: a global responsibility. *Med Teach* 22:547–548.
- Harden RM. 2001. AMEE Guide Mo. 21: Curriculum mapping: a tool for transparent and authentic teaching and learning. *Med Teach* 23:123–137.
- Harden RM. 2006a. Trends and the future of postgraduate medical education. *Emerg Med* 23:798–802.
- Harden RM. 2006b. International medical education and future directions: a global perspective. *Acad Med (Suppl)* 81:S22–S29.
- Harden RM, Crosby JR, Davis MH. 1999. An introduction to outcome-based education. *Med Teach* 21:7–14.
- Harden RM, Stamper N. 1999. What is a spiral curriculum? *Med Teach* 21:141–143.
- Harden RM, Hart IR. 2002. An international virtual medical school (IVIMEDS): the future for medical education? *Med Teach* 24:261–267.
- Nash C. (1995). Flexible learning and outcomes in outcomes, learning and the curriculum implications for NVQs, GNVQs and other qualifications. John Burke (Ed). The Falmer Press, London, Washington DC.
- Paterson Davenport LA, Hesketh EA, MacPherson SG, Harden RM. 2004. Exit learning outcomes for the PRHO year: an evidence base for informed decisions. *Med Educ* 38:67–80.
- Pawlina W, Hromanik MJ, Milanese TR, Dierkhising R, Viggiano TR, Carmichael SW. 2006. Leadership and professionalism curriculum in the gross anatomy course. *Ann Acad Med Sing* 35:609–614.
- Simpson JG, Furnace J, Crosby J, Cumming AD, Evans PA, Friedman Ben-David M, Harden RM, Lloyd D, McKenzie H, McLachlan JC, McPhate GF, Percy-Robb IW, MacPherson SG. 2002. The Scottish Doctor – learning outcomes for the medical undergraduate in Scotland: a foundation for competent and reflective practitioners. *Med Teach* 24:136–143.
- Swing SR. 2007. The ACGME outcome project: retrospective and prospective. *Med Teach* 29(7):648–654.
- Van der Vleuten CPM, Verwijnen GM, Wijnem WHFW. 1999. Fifteen years of experience with progress testing in a problem-based learning curriculum. *Med Teach* 18:103–109.