

**AMEE Guides**

**AMEE** **گایدهای**

# AMEE Guide No. 14: Outcome-based education: Part 1—An introduction to outcome-based education

R. M. HARDEN\*, J. R. CROSBY & M. H. DAVIS

Centre for Medical Education, Tay Park House, Dundee, UK

**SUMMARY** *Outcome-based education, a performance-based approach at the cutting edge of curriculum development, offers a powerful and appealing way of reforming and managing medical education. The emphasis is on the product—what sort of doctor will be produced—rather than on the educational process. In outcome-based education the educational outcomes are clearly and unambiguously specified. These determine the curriculum content and its organisation, the teaching methods and strategies, the courses offered, the assessment process, the educational environment and the curriculum timetable. They also provide a framework for curriculum evaluation.*

*A doctor is a unique combination of different kinds of abilities. A three-circle model can be used to present the learning outcomes in medical education, with the tasks to be performed by the doctor in the inner core, the approaches to the performance of the tasks in the middle area, and the growth of the individual and his or her role in the practice of medicine in the outer area.*

*Medical schools need to prepare young doctors to practise in an increasingly complex healthcare scene with changing patient and public expectations, and increasing demands from employing authorities. Outcome-based education offers many advantages as a way of achieving this. It emphasises relevance in the curriculum and accountability, and can provide a clear and unambiguous framework for curriculum planning which has an intuitive appeal. It encourages the teacher and the student to share responsibility for learning and it can guide student assessment and course evaluation.*

*What sort of outcomes should be covered in a curriculum, how should they be assessed and how should outcome-based education be implemented are issues that need to be addressed.*

## Outcomes and curriculum planning

*A good archer is not known by his arrows but by his aim.*

Thomas Fuller

*A windmill is eternally at work to accomplish one end, although it shifts with every variation of the weathercock, and assumes ten different positions in a day.*

Charles C. Colton

A key element in the conceptualisation and construction of a building is the architect's plan. This conveys an image in some detail of what the building will be like after it has been completed. It is accompanied usually by an artist's impression or even a three-dimensional model of the finished construction. The plans provide, for those who are commissioning the building and for the intended users, a clear unequivocal statement as to what they can expect when the building is completed. A judgement can then be made as to

whether the final product matches what has been proposed and agreed. Building authorities can see whether the building corresponds to the building regulations. Neighbours can see whether the building will intrude on their privacy or space, and negotiations can take place with amendments to the plan where necessary. The plan of the completed building will influence, too, the materials required for use in its construction and the methods of construction adopted. It will provide a tool for overseeing progress in the construction of the building.

In the same way, there is a need for a clear and public statement of the learning outcomes for a medical education programme. What sort of doctors will the programme produce? What competencies will they possess? What basic skills, including personal transferable and communication skills, will the doctors have? Will the doctors be orientated to healthcare in the community as well as in the hospital? Will they have training in health promotion? Will they be competent to undertake research? Will they have a commitment to the ethical principles of medical practice? A statement of the learning outcomes for the programme will address these and other questions.

All medical schools have outcomes whether by design or not. That is, they produce doctors, but the nature of the product may be unspecified. Zitterkopf (1994) reminded us, however, that "the difference between being outcome-based and simply producing outcomes is significant. An outcome-based school produces results relating primarily to predetermined curriculum and instruction. The focus is on the achievement of results . . ." The results of medical training, according to national reports and studies of graduates from different medical schools, are newly qualified doctors who do not demonstrate some of the basic competencies expected of them (Walton, 1993). A common perception of current medical education is of inappropriate and insufficiently rigorous outcomes.

The concept of a curriculum traditionally included two elements—the content or what the students studied, and the examinations which were designed to assess the extent to which the students had learned the content. This concept expanded to include the learning methods and educational strategies adopted, and later to include the aims and objectives of the programme. Harden (1986) has described these key curriculum components in the context of medical education. It is now accepted that learning outcomes should occupy a key position in curriculum planning and a model for the curriculum which recognises this is given in

Figure 1. Students pass through an educational programme receiving support as required. They study the prescribed content, using an appropriate learning approach and through this achieve the educational outcomes specified. Discussions about the various components of the curriculum are meaningless unless carried out in the context of these learning outcomes. Consideration of the outcomes should be the basis for curriculum development and evaluation.

**What is outcome-based education?**

Outcome-based education is easy to conceptualise but difficult to define. It is an approach to education in which decisions about the curriculum are driven by the outcomes the students should display by the end of the course. In outcome-based education, product defines process. Outcome-based education can be summed up as ‘results-orientated thinking’ and is the opposite of ‘input-based education’ where the emphasis is on the educational process and where we are happy to accept whatever is the result. In outcome-based education, the outcomes agreed for the curriculum guide what is taught and what is assessed.

The educational outcomes are clearly specified and decisions about the content and how it is organised, the educational strategies, the teaching methods, the assessment procedures and the educational environment are made in the context of the stated learning outcomes. Thus outcome-based education has two requirements. First that the learning outcomes are identified, made explicit and communicated to all concerned, including the students, the teachers, the public, employers and other stake-holders. (The range of stake-holders may all be involved also in determination of the learning outcomes.) Second, the educational outcomes should be the over-riding issue in decisions about the curriculum. Staff should consider course content, teaching methods, educational strategies and time allocated, in terms of the learning outcomes achieved by the course. It should be made explicit, for example, through study guides, how the course contributes to the learning outcomes. A clinical attachment in obstetrics, for example, might cover not only the outcomes directly relating to the field of obstetric practice, but may also contribute to other outcomes such as communication skills, the principles of screening and prevention, health promotion, information

handling and retrieval, ethics in medical practice and the role of the doctor as a member of a team providing health-care.

Outcome-based education, as defined by Spady (1988) is “a way of designing, developing, delivering and documenting instruction in terms of its intended goals and outcomes.” “Exit outcomes are a critical factor, in designing the curriculum,” Spady suggests. “You develop the curriculum from the outcomes you want students to demonstrate, rather than writing objectives for the curriculum you already have.”

Some workers in the field associate outcome-based education with mastery learning. There is an important link between outcome-based education and mastery learning. “Outcome-based education”, suggests McNeir (1993), “specifies the outcomes students should be able to demonstrate upon leaving the system. OBE focuses educational practice on ensuring that students master those outcomes and it asserts that all students can succeed”. Spady (1993) has described the principles or characteristics of a ‘fully operational outcomes-based school’:

- (1) A collectively endorsed mission statement that reflects commitment to success for all students and provides the means for translating that commitment into action.
- (2) Clearly defined publicly derived ‘exit outcomes’ that students must demonstrate before they leave school.
- (3) A tightly articulated curriculum framework of program, course and unit outcomes that derive from the exit outcomes.
- (4) A system of instructional decision making and delivery that employs a variety of methods, assures successful demonstration of all outcomes and provides more than one chance for students to be successful.
- (5) A criterion-referenced system of assessment.
- (6) An ongoing system of programme improvement that includes staff accountability, effective leadership and staff collaboration.
- (7) A data base of significant, visionary outcomes for all students, plus key indicators of school effectiveness, that is used and updated regularly to improve conditions and practices that affect student and staff success.

**Development of outcome-based education**

The development of outcome-based education owes much to the work of Spady (1988). Pioneering work was carried out in schools in the United States of America where outcome-based education promised far reaching reform through increasing accountability, while at the same time offering more school autonomy or flexibility. Some states, such as Pennsylvania, legislated for outcome-based education (Pliska & McQuaide, 1994). In Florida, for example, the state legislature helped districts to define outcomes, then waived dozens of statutes to give the schools the flexibility they needed to meet these goals (McNeir, 1993).

This move to outcome-based education, however, also attracted fierce opposition. One concern was that education should be open-ended, not constrained by outcomes. Another concern was that the inclusion and emphasis on attitudes and values in the stated outcomes was inappropriate. Opponents claimed that “the proposed outcomes watered down academics in favour of ill defined values and

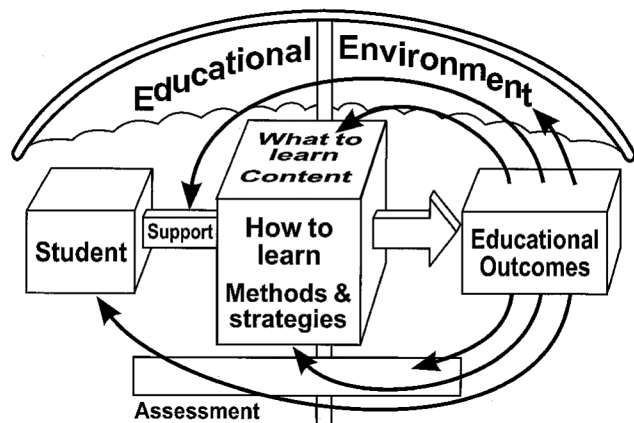


Figure 1. A model for the curriculum emphasising the importance of educational outcomes in curriculum planning.

process skills” and that “traditional academic content is omitted or buried in a morass of pedagogic clap-trap in the OBE plans that have emerged to date” (O’Neil, 1994). McKernan (1993) has presented what he sees as the limitations of outcome-based education. He argues that we must value education for its own sake, not because it leads to some outcome. “To define education as a set of outcomes decided in advance of teaching and learning conflicts with the wonderful, unpredictable voyages of exploration that characterise learning through discovery and inquiry.” This liberal notion of education he accepts, however, is more appropriate in the arts and humanities. This view is discussed by Glatthorn (1993) who argues that it is possible for outcome-based education to accommodate a range of outcomes. Whatever the position in other disciplines, in medicine we cannot afford the luxury of ignoring the product. The need for a core curriculum in medicine with clearly specified learning outcomes has been identified (GMC, 1993; Harden & Davis, 1995) and the development of appropriate behaviours and attitudes is an essential component of the educational process in medicine.

In the UK, a 2-year Training Agency funded project led by the Unit for the Development of Adult and Continuing Education (UDACE), attempted to define learning outcomes and pilot their assessment for five disciplines in Higher Education (Otter, 1992). The project, suggested Drew (1998), reflected growing Training Agency interest in clarifying outcomes rather than prescribing the content of education and training or the processes by which it takes place. Drew believes that the project was extremely influential and that there is now increasing use in universities of learning outcomes.

### **Advantages of outcome-based education**

There are major advantages in adopting an outcome-based model for medical education.

#### *1. Relevance*

Outcome-based education helps to focus discussion on the relationship between the curriculum and the practice of medicine and on education for capability. Use of an outcome-based model can highlight neglected areas, for example, informatics, health promotion, appropriate attitudes and communication skills while recognising the importance of traditional disciplines and content areas. By specifying the level of study, it can encourage higher level objectives and not just rote learning.

#### *2. Controversy*

“The very nature of outcome-based education forces one to address inherently controversial issues”, suggests O’Neil (1994). Questions have to be asked as to what is the purpose of the medical school programme and what sort of doctor we are training. What are the fundamentals of medical education?

#### *3. Acceptability*

Outcome-based education is a model of education which is readily acceptable to most teachers. Outcome-based educa-

tion is teacher friendly. Few can disagree with the idea. “I find it hard to oppose the concept of OBE!” wrote Slavin (1994) “Who would argue that educational programmes should not be based on some idea of what we want students to know or be able to do?” Outcome-based education has an intuitive appeal that hooks people (Evans & King, 1994), and is acceptable politically, educationally, professionally, and ethically (Zitterkopf, 1994).

#### *4. Clarity*

The concept of outcome-based education is easily understandable. It is not constrained by educational jargon and is a relatively simple and unambiguous concept.

#### *5. Provision of framework*

Outcome-based education provides a powerful and robust framework for the curriculum. It helps unify the curriculum and prevents it becoming fragmented. It can be thought of as the glue that holds the curriculum together. By specifying courses in terms of their outcomes, individual teachers can see what they contribute to the whole curriculum. It can help to integrate the learning experiences, the teaching methods and the assessment.

#### *6. Accountability*

Outcome-based education, by setting out details of the finished product against which the product will be judged, emphasises accountability and quality assurance.

#### *7. Self-directed learning*

Outcome-based education encourages students to take more responsibility for their own learning. It provides students with a clear framework which allows them to plan their studies and to gauge their progress through the curriculum.

#### *8. Flexibility*

Outcome-based education is a potentially flexible approach. It does not dictate the form of course delivery or the educational strategy. Adjustments can be made at any time to the educational process provided that the changes proposed can be justified in terms of the specified learning outcomes.

#### *9. Guide for assessment*

Specification of the intended learning outcomes is essential for the planning and implementation of student assessment. Outcome-based education is consistent with the move to more performance-based assessment. It facilitates an assessment-to-a-standard approach in which what matters is the standards that students achieve and not the time they take to achieve this (Harden *et al.*, 1997).

#### *10. Participation in curriculum planning*

Many individuals or groups can contribute to the specification of outcomes. It encourages and facilitates integrated

teaching and learning and collaboration between different disciplines in medicine. The approach allows for wide participation in curriculum development and may involve members of the community, patients, other professions and employers. It embraces readily the concept of multi-professional education (Harden, 1998).

11. Tool for curriculum evaluation

Increasing attention has been focussed on curriculum evaluation. Outcomes provide a yard stick against which a curriculum can be judged. A failure to achieve the agreed outcomes almost certainly identifies a problem with the curriculum.

12. Continuity of education

Outcome-based education, by making explicit the outcomes for each of the phases or stages of education, helps to encourage continuity between basic or undergraduate education, postgraduate or vocational training and continuing education.

Presentation of the outcomes

Learning outcomes can be presented in a number of ways. Brown University described their learning outcomes as a list of nine abilities (Smith & Dollase, 1999). The English National Board of Nursing, Midwifery and Health Visiting (1991) have identified 10 key characteristics as the basis for the learning outcomes required for the Higher Award (Table 1). The Association of American Medical Colleges in the USA have developed a set of goals for medical education (AAMC, 1998). These are designed to guide individual schools to establish objectives for their own programmes. A consensus was reached on the attributes that physicians need in order that they are able to meet society's expectations of them in the practice of medicine. The attributes identified were grouped in four areas.

- Physicians must be altruistic
- Physicians must be knowledgeable
- Physicians must be skilful
- Physicians must be dutiful

Each attribute was followed by a more detailed statement as to contributions that the medical school experiences should make towards achievement of those attributes.

In Dundee we described initially the curriculum outcomes in 11 areas (Harden, 1998). These had many similarities to the Brown University abilities. Long lists of outcomes, however, are unmanageable and hard to apply in practice, and it is difficult to compare the outcomes included in different lists. McNeir (1993) suggested in relation to drafting outcomes, "the key for most schools seems to be developing outcomes that are broad in their vision but specific enough to be taught and measured effectively". There are advantages in having a structure which offers an easily remembered and understood framework. Such a structure could also allow comparisons to be made more readily between sets of outcomes from different sources.

With this in mind, we have developed a simple classification and format for the presentation of learning outcomes

**Table 1.** Ten key characteristics identified by the English National Board for Nursing, Midwifery and Health Visiting as the basis for the learning outcomes for the Higher Award.

1. Ability to exercise professional accountability and responsibility, reflected in the degree to which the practitioner uses professional skills, knowledge and expertise in changing environments, across professional boundaries and in unfamiliar situations.
2. Specialist skills, knowledge and expertise in the practice area where working, including a deeper and broader understanding of client/patient health needs, within the context of changing health care provision.
3. Ability to use research to plan, implement and evaluate concepts and strategies leading to improvements in care.
4. Team working, including multi-professional team working in which the leadership role changes in response to changing client needs, team leadership and team building skills to organise the delivery of care.
5. Ability to develop and use flexible and innovative approaches to practice appropriate to the needs of the client/patient or group in line with the goals of the health service and the employing authority.
6. Understanding and use of health promotion and preventative policies and strategies.
7. Ability to facilitate and assess the professional and other development of all for whom responsible, including where appropriate learners, and to act as a role model of professional practice.
8. Ability to take informed decisions about the allocation of resources for the benefit of individual clients and the client group with whom working.
9. Ability to evaluate quality of care delivered as an on-going and cumulative process.
10. Ability to facilitate, initiate, manage and evaluate change in practice to improve quality of care.

in medical education. In the three-circle outcome model described, outcomes are grouped in three areas (Figure 2). In this model the product of the training programme is identified as a doctor who is a professional able to undertake the necessary clinical tasks in an appropriate manner. The



**Figure 2.** A three-circle model representing educational outcomes.

inner segment of the diagram represents the tasks undertaken by a doctor. These relate both to health and illness and to individual patients and populations. The middle segment of the circles represents the expected outcomes which relate to the approach adopted by the doctor to the performance of the tasks in the inner segment. The outer segment represents the outcomes relating to professionalism and the development of the individual. A summary of outcomes in each of the three areas is given in Table 2.

The description of the 12 outcomes noted in Table 2 can be expanded to clarify what is expected in each area. Outcome 1, which relates to ‘competence in clinical skills’, is one of the outcomes which relates to the performance of the tasks expected of a doctor. It includes:

- obtaining and recording a comprehensive history;
- performing a complete physical examination and assessment of the mental state;
- interpretation of the findings obtained from the history and the physical examination; and
- reaching a provisional assessment of the patients’ problems.

Outcome 9 ‘behaving ethically, recognising legal responsibilities and demonstrating appropriate attitudes’, is an example of an outcome related to the doctor’s approach to the tasks. It includes:

- an understanding of the law and medicine;
- moral reasoning;

**Table 2.** A three-circle outcome model adopted in the Dundee curriculum.

1.	Outcomes related to the performance of tasks expected of a doctor
	(1) Application of clinical skills of history taking and physical examination
	(2) Communication with patient’s relatives and other members of the healthcare team
	(3) Health promotion and disease prevention
	(4) Undertaking practical procedures
	(5) Investigation of patients
	(6) Management of patients
2.	Outcomes related to the approach adopted by the doctor to the performance of tasks
	(7) Application of an understanding of basic and clinical sciences as a basis for medical practice
	(8) Use of critical thinking, problem solving, decision making, clinical reasoning and judgement
	(9) Incorporation of appropriate attitudes, ethical stance, and an understanding of legal responsibilities
	(10) Application of appropriate information retrieval and handling skills
3.	Outcomes related to professionalism
	(11) Role of the doctor within the healthcare delivery system
	(12) An aptitude for personal development and appropriate transferable skills

- ethical judgement;
- respect for dignity, privacy and the right of the patient as an individual in all respects, particularly with regard to confidentiality and informed consent;
- acceptance of the principle of collective responsibility;
- moral and ethical responsibilities involved in individual patient care and in the provision of care to populations of patients;
- practice of medicine in a multicultural society;
- respect for colleagues; and
- awareness of the need to ensure that the highest possible quality of patient care must always be provided.

Outcome 11, ‘the role of the doctor within the health-care delivery system’, is one of the outcomes related to professionalism. It includes:

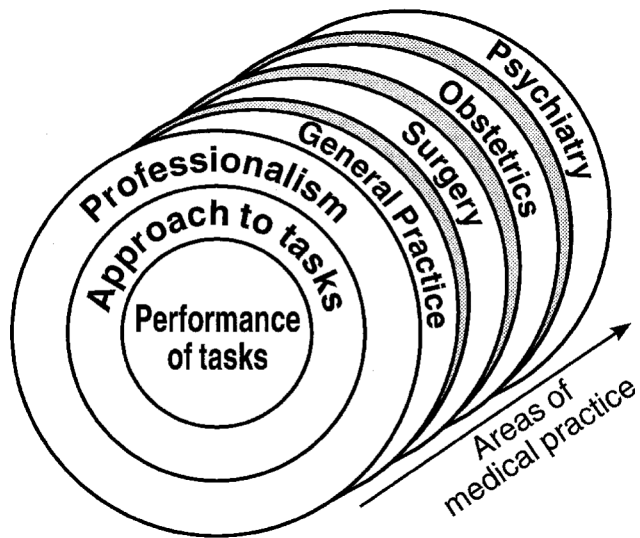
- professionalism, code of conduct and personal attributes, for example, attention to duty, altruism, empathy, probity, punctuality, and putting the needs of the patient before one’s own;
- role and responsibilities of a doctor;
- role of other professionals/interaction with other professionals/multi-professional practice;
- doctor as manager;
- medicine and alternative therapies; and
- healthcare delivery system including social and community contexts of care and relationships between primary care and hospital care.

This expansion is the first step in the production of a more detailed statement of outcomes in each area.

The three-circle outcome model described emphasises that medical practice is not just what a doctor does—the inner area of ‘task performance’—but it is defined also by the doctor’s approach to the task—the middle area. This is an important aspect of medical competence. To quote the song by Oliver “*It ain’t what you do it’s the way that you do it. And that’s what gets results.*” In the same way, a ‘good’ doctor is defined not just by what he does but by the way he or she does it. The outer area represents the growth of the doctor as an individual, the personal attributes which are desirable and necessary in a doctor and the context within which he or she practices. Charles Handy (1994) in his book *The Empty Raincoat*, talks of the doughnut principle. In his inside-out doughnut the dough in the middle represents the core, what we have to do, and this is surrounded by the unbounded space of the hole on the outside, what we could do or could be.

The inner circle in the three-circle outcomes model represents the tasks we have to do, which are usually well defined and well understood. This is, however, not the whole picture. There is, according to Handy, the space beyond—the opportunity to make a difference, to go beyond the central duties in the core. Thus, the middle area represents the approaches to that which we could do and beyond this, the outer area represents the professionalism or what we could be. “The doughnut image” suggests Handy, “is a conceptual way of relating duty to a fuller responsibility in every institution or group in society”.

The three-circle representation of outcomes can be viewed from a multi-dimensional perspective with a third dimension being the different areas of medical practice (Figure 3). The outcomes described may be exhibited in



**Figure 3.** A three-dimensional view of the three-circle outcome model representing the outcomes in different specialties.

different ways in each specialty; for example, general practice, surgery, obstetrics, psychiatry, paediatrics, critical care, rehabilitation and so on. The undergraduate curriculum is built upon an integrated and cohesive structure through the contributions each discipline makes to the outcomes. In specialist or postgraduate training for one area of medical practice, the outcomes are viewed from the perspective of that specialty.

**Specification of outcomes**

Outcome-based education does not represent an easy option. Anyone adopting an outcome-based approach will find themselves struggling with difficult challenges. The identification of a school's educational outcomes represents a mission statement of what the school values. The outcomes specified indicate the importance the school attaches to issues such as the community, disease prevention, scientific thinking and the psychosocial model.

A range of stakeholders can be involved in the specification of outcomes. The following might contribute:

- university staff within the medical school with a broad range of interests;
- NHS hospital colleagues;
- general practitioners;
- recent graduates;
- students;
- other professions, e.g. nursing and professions allied to medicine;
- representatives of employers, e.g. government and trust managers;
- patients and representatives of patient groups; and
- the public including, for example, leaders of community health groups.

A measure of support and acceptance, by the stakeholders, of the outcomes specified is required if outcome-based education is to be implemented successfully.

Approaches developed for the identification of educational needs (Dunn *et al.*, 1985) may be applied to the identification of outcomes. These include:

- the Wisemen approach;
- the Delphi technique;
- critical incident studies;
- task analysis;
- study of errors in practice; and
- content analysis.

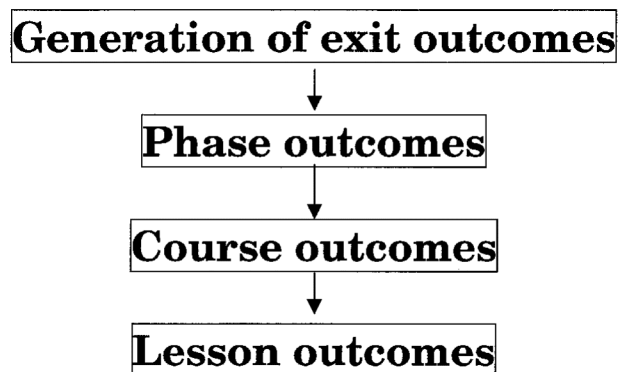
An outcome-based design sequence should be adopted in which the exit outcomes for the curriculum are first specified (Spady, 1988). The outcomes for the different phases of the curriculum are then derived from these and the process is repeated for the courses within each phase, the units within each course and the learning activities within each unit (Figure 4). The outcomes for the phases, courses, units and learning activities should be aligned with and contribute to the visionary exit outcomes. In this 'design down' process we move from exit outcomes to course outcomes and outcomes for individual learning experiences in a carefully structured manner.

A major challenge in outcome-based education is the design and implementation of an appropriate system for student assessment. The standards need to be set for each outcome. For example, for a practical procedure the level of proficiency expected of the student should be made explicit. This may vary at each phase of the course. It might include:

- Level 1.* an awareness of the procedure;
- Level 2.* a full theoretical understanding of the procedure;
- Level 3.* observation of the procedure;
- Level 4.* carrying out part of the procedure;
- Level 5.* undertaking the procedure under supervision; and
- Level 6.* undertaking the procedure unsupervised.

The precise definition or distinction between these stages will vary from outcome to outcome.

We can take one of the outcomes within the practical procedure domain as an example—lumbar puncture. Young doctors after several years of postgraduate training may be expected to carry out a lumbar puncture for therapeutic purposes unsupervised. On qualification they may be expected to be able to undertake the procedure under supervision and for diagnostic purposes will have practised the technique on models in the Clinical Skills Centre, and/or patients in the wards. After 3 years of a 5-year undergraduate programme they will have an understanding of the technique and the indications for it, and will have seen it demonstrated live or on a videotape. After the first year of the undergraduate programme they will have an awareness of the



**Figure 4.** The design down process for development of outcomes.

technique and an understanding of the normal anatomy and physiology.

### **Implementation of outcome-based education**

There are implications of implementing an outcome-based education programme for all concerned with the educational process. This includes faculties, curriculum committees, course planning groups, individual teachers, assessment committees and students.

#### *Implications for Faculty or School of Medicine*

The outcomes, as displayed, represent a mission statement by a Faculty or School of Medicine and communicate to the staff, to students and to others what the school values. A statement of outcomes is important too from an accountability or academic standards perspective. The outcomes can be used as the standard against which an internal or external judgement of the success or otherwise of the educational programme can be made.

- Was due consideration given to determining the educational outcomes? Were all the stakeholders involved?
- Have the outcomes been clearly and unambiguously communicated to all concerned?
- Is the overall educational programme and educational environment consistent with the outcomes as stated?
- Are the exit outcomes achieved by the students at the time of graduation?

#### *Implications for curriculum planning committees and course committees*

The outcomes should guide the courses included in each phase of the curriculum, the content in each course, and the teaching methods and strategies to be adopted.

- Are teachers familiar with the specified educational outcomes?
- Are the outcomes, appropriate to each phase of the curriculum, addressed in that phase?
- Does each course contribute appropriately to the outcomes for the phase?
- Are the learning experiences offered likely to assist the students to achieve the outcomes?
- Do students achieve the outcomes specified for the phase of the curriculum by the end of the phase?

#### *Implications for individual teachers*

Educational outcomes help teachers to relate their own contributions to the curriculum as a whole and help to clarify their role as teachers in the educational programme.

- Have teachers a general awareness of the educational outcomes for the curriculum?
- Have teachers a detailed understanding of the educational outcomes relating to their own contribution to the curriculum?
- Does their contribution to the educational programme reflect this understanding?

#### *Implications for staff with responsibility for assessment*

The educational outcomes should be used as the framework for assessment in each phase of the curriculum. It is essential

that student assessment procedures reflect the learning outcomes. This is possible using performance-assessment approaches such as the OSCE (Harden & Gleeson, 1979), and portfolio assessment (Snadden & Thomas, 1998).

- Do the assessment procedures adopted assess the outcomes?
- Are under-performing students, that is those who do not reach the standard required, given appropriate feedback and a further opportunity to demonstrate their competence?

#### *Implications for students*

It is essential that not only should the outcomes for the curriculum be clearly specified, but that they should be communicated unambiguously to students at the beginning of the course and at the start of each part of it. Course handbooks and study guides should highlight the curriculum outcomes relevant to that part of the course. In the Dundee curriculum, for example, the front page of each task-based study guide describes how the study of the task contributes to the 12 curriculum outcomes.

Students should also be familiar with criteria used to assess whether they have achieved the outcomes specified and the assessment methods employed. Students should be able, as they proceed through the course, to gauge their own progress towards achieving the exit outcomes. Students may be held accountable for demonstrating that they have achieved the outcomes specified. This may be done using portfolios.

- Are students familiar with the outcomes?
- Have students been involved in discussions relating to the outcomes as specified?
- Do they find the outcomes helpful as guides to learning?
- Do students recognise that the learning experience provided and the assessment procedures reflect the outcomes?

### **Conclusion**

Outcome-based education has many inherent advantages which must make it an attractive model for curriculum planning for curriculum developers, teachers, employers, students and the public. Although outcome-based education has obvious appeal, research documenting its effects is fairly rare (Evans & King, 1994). Nonetheless, the arguments for introducing outcome-based education and evaluating its role in medical education are strong. Like many developments in medical education, however, it does not offer a panacea. It does represent, however, what is almost certainly a valuable education tool in medical education. Hopefully its adoption will encourage a legitimate debate on what kinds of educational outcomes we expect in medicine and how they will be measured.

### **Acknowledgements**

We are grateful to all staff working in the Medical School at Dundee who have contributed to the development of the outcomes for the Dundee curriculum and to Barbara Stilwell who drew our attention to the relevance of the Handy's doughnut principle to the three-circle model we have proposed.



## Notes on contributors

R M HARDEN is Director of the Centre for Medical Education, Postgraduate Dean and Teaching Dean, University of Dundee, UK.

J R CROSBY is Curriculum Facilitator at the Faculty of Medicine, University of Dundee, UK.

M H DAVIS is a doctor specialising in medical education, and Senior Lecturer in Medical Education, Centre for Medical Education, University of Dundee, UK.

## References

- ASSOCIATION OF AMERICAN MEDICAL COLLEGES (1998) *Report 1: Learning Objectives for Medical Student Education. Guidelines for Medical Schools* (Washington, Medical School Objectives Project, AAMC).
- DREW, S. (1998) *Key Skills in Higher Education: Background and Rationale* (SEDA Special No 6. Staff and Education Development Association).
- DUNN W.R., HAMILTON, D.D. & HARDEN, R.M. (1985) Techniques of identifying competencies needed of doctors, *Medical Teacher*, 7, pp. 15–25.
- ENGLISH NATIONAL BOARD FOR NURSING, MIDWIFERY AND HEALTH VISITING (1991) *Ten Key Characteristics of the ENB Higher Award* (London, ENB Publications).
- EVANS, K.M. & KING, J.A. (1994) Research on OBE: What we know and don't know, *Educational Leadership*, 51(6), pp. 12–17.
- GENERAL MEDICAL COUNCIL (1993) *Tomorrow's Doctors: Recommendations on Undergraduate Medical Education* (London, GMC).
- GLATTHORN, A.A. (1993) Perspectives and imperatives: outcome-based education: reform and the curriculum process, *Journal of Curriculum and Supervision*, 8(4), pp. 354–363.
- HANDY, C. (1994) *The Empty Raincoat: Making Sense of the Future* (UK, Hutchison).
- HARDEN, R.M. (1986) Ten questions to ask when planning a course or curriculum. ASME Medical Education booklet no 20, *Medical Education*, 20, pp. 356–365.
- HARDEN, R.M. (1998) Multi-professional education: Part 1—Effective multi-professional education: a three-dimensional perspective. AMEE Medical Education Guide No 12, *Medical Teacher*, 20, pp. 402–408.
- HARDEN, R.M. & DAVIS, M.H. (1995) The core curriculum with

- options or special study modules, *Medical Teacher*, 18, pp. 125–148.
- HARDEN, R.M., DAVIS, M.H. & CROSBY, J.R. (1997) The new Dundee medical curriculum: a whole that is greater than the sum of the parts, *Medical Education*, 31, pp. 264–271.
- HARDEN, R.M. & GLEESON, F.A. (1979) Assessment of clinical competence using an objective structured clinical examination (OSCE). ASME Medical Education Booklet No 8, *Medical Education*, 13, pp. 41–54.
- MCKERNAN, J. (1993) Perspectives and imperatives: some limitations of outcome-based education, *Journal of Curriculum and Supervision*, 8(4), pp. 343–353.
- MCFEER, G. (1993) *Outcome-based Education: Tools for Restructuring. Oregon School Study Council Bulletin* (Eugene, Oregon School Study Council).
- O'NEIL, J. (1994) Aiming for new outcomes: the promise and the reality, *Educational Leadership*, 51(6), pp. 6–10.
- OTTER, S. (1992) *Learning Outcomes in Higher Education*, London, Unit for the Development of Adult Continuing Education.
- PLISKA, A.-M. & MCQUAIDE, J. (1994) Pennsylvania's battle for student learning outcomes, *Educational Leadership*, 51(6), pp. 66–69.
- SLAVIN, R.E. (1994) Outcome-based education is not mastery learning, *Educational Leadership*, 51(6), pp. 14–15.
- SMITH, S.R. & DOLLASE, R. (1999) Planning, implementing and evaluating a competency-based curriculum, *Medical Teacher*, 21, pp. 15–22.
- SNADDEN, D. & THOMAS, M. (1998) The use of portfolio learning in medical education. AMEE Guide No 11, *Medical Teacher*, 20, pp. 192–199.
- SPADY, W.G. (1988) Organising for results: the basis of authentic restructuring and reform, *Educational Leadership*, October, pp. 4–8.
- SPADY, W.G. (1993) Cited by GLATTHORN, A.A. (1993) Perspectives and imperatives: outcome-based education: reform and the curriculum process, *Journal of Curriculum and Supervision*, 8(4), pp. 354–363.
- WALTON, H.J. (1993) Proceedings of the World Summit on Medical Education, *Medical Education*, 28, supplement 1, pp. 140–149 (Oxford, Blackwell Scientific Publications Ltd).
- ZITTERKOPF, R. (1994) A fundamentalist's defence of OBE, *Educational Leadership*, March, 51(6), pp. 76–78.

# AMEE guide No. 14: Outcome-based education: Part 2—Planning, implementing and evaluating a competency-based curriculum

STEPHEN R. SMITH & RICHARD DOLLASE

*Brown University School of Medicine, RI, USA*

**SUMMARY** *In September, 1996, Brown University School of Medicine inaugurated a new competency-based curriculum, known as MD2000, which defines a comprehensive set of competency requirements that all graduates are expected to attain. The medical students entering in 1996 and thereafter are required to demonstrate mastery in nine abilities as well as a comprehensive knowledge base as a requirement for graduation. Faculty use performance-based methods to determine if students have attained competence.*

*We describe in this article the reasons why we developed the new curriculum, how we planned and structured it, and the significance we anticipate the curricular innovation will have on medical education.*

## Why it was developed

Several well-respected reports have criticized medical education over the last two decades. The General Professional Education of the Physician (GPEP) Report, published by the Association of American Medical Colleges (AAMC) in 1985, called on medical schools to give each student the knowledge, skills, values and attitudes that all physicians should have. The report sharply rebuked medical faculties for overloading the curriculum with factual information that students were expected to memorize. "By this concentration on the transmittal of factual information, faculties have neglected to help [students] acquire the skills, values, and attitudes that are the foundation of a helping profession" (Report of Project Panel on the General Professional Education of the Physician and College Preparation for Medicine, 1984)

A report funded by the Macy Foundation highlighted deficiencies in the clinical education of medical students, noting that faculty rarely observed students directly to assess their ability to obtain a history or perform a competent physical examination (Gastel & Rogers, 1989).

A 1992 report by the AAMC reiterated the recommendations of the GPEP report and examined the reasons why implementation has been so slow (Association of American Medical Colleges, 1992). Though all these reports seem to indicate a consensus among medical educators of what's wrong and what needs to be done, the lack of progress led one observer to describe the situation as one of 'reform without change' (Bloom, 1988).

## Evaluation drives the curriculum

The leadership at Brown's medical school assert that 'evaluation drives the curriculum'. We believe that by clearly

specifying the educational outcomes in behaviourally measurable ways, we can change the way faculty teach and students learn. Instead of solely determining whether students graduate based on the accumulation of course credits, graduation would be contingent upon demonstrating mastery of a defined set of competencies.

Research in other areas of education has shown that when the ways in which students are evaluated is altered, teaching and learning quickly change to match the new expectations. Ronald Harden, director of the Centre for Medical Education, University of Dundee, Scotland, tells of soldiers being trained to assemble guns in the field. Despite a well-presented curriculum in the classroom and good scores on their exams, the soldiers were not performing well in the field. A new teacher changed the way the student soldiers were tested. He cleared away all the desks and chairs and dumped disassembled guns on the floor. The soldiers were told that in order to pass the course, they needed to correctly assemble the guns. Soon all the students were on their hands and knees struggling with the equipment and the field manuals. The classroom instructors were on the floor with them, helping the soldiers use the manual to guide the field assembly. Thereafter, the soldiers went into the field adept at assembling their guns (Harden, 1986).

While educating physicians is not the same as training soldiers how to assemble guns, the principles are the same. Medical students are highly motivated learners. Medical faculty are dedicated teachers. When both faculty and students understand clearly what is expected, they will figure out a thoughtful way to get there.

By creating a competency-based curriculum, Brown medical school hopes to better assure that it is graduating physicians who possess the qualities and attributes desired in a competent physician. Further, the new curriculum is expected to foster a sense of shared mission between student and teacher, both striving to reach a common goal.

Such a curriculum engenders more active learning on the part of the students. Teachers are more highly engaged in helping students gauge their progress and in identifying and overcoming barriers to their achievement.

This developmental process of teaching and learning is most effective when the milestones and end points are known. When known, the teacher and student can work together toward those shared goals, recognizing growth, identifying barriers, and collaboratively devising strategies to overcome those barriers. The teacher can create a learning

experience in which students may practice those intellectual skills, examine their progress, incorporate discoveries, and practice again, all under the guidance, encouragement and facilitation of the teacher.

With confidence that this model can truly reform medical education, the medical school has embarked on designing a prototype curriculum.

### How it was developed

In 1990, we assembled a group of course leaders and medical students and asked them to describe the abilities possessed by successful doctors. At first, the basic science faculty demurred, stating that they weren't qualified to make those judgments since they weren't physicians. We asked them to think about their own personal physicians—what would they like their *own* doctors to be able to do well. Once we were able to shift their frame of reference, the nonphysician basic science faculty became the most active participants in the ensuing brainstorming session! The group generated over 50 ability statements, which were listed on newsprint and taped to the walls of the room. Those ability statements that seemed redundant were combined with the approval of the individuals who originally contributed them during the brainstorming. Then, we used a nominal group process technique to select the most broadly supported abilities. Each member of the group was able to cast ballots for their top five choices. Seven abilities garnered widespread support.

We circulated these seven abilities to the group and a somewhat wider circle of key faculty, asking them to make any further suggestions. We asked the group to consider adding two abilities that seemed to have been overlooked during the initial process: moral reasoning and clinical ethics and the social and community contexts of health care. The group overwhelmingly supported adding these two abilities, thus bringing the final list to nine (see Table 1).

We took these nine abilities to the various departments to solicit their feedback and support. While the faculty did not criticize the nine abilities, they often questioned why the planning had omitted any reference to the knowledge aspect of competence. Our attempts to justify the exclusive focus on abilities by arguing that knowledge was the implicit *sine qua non* of competent performance did not allay the faculty's concern. Therefore, we agreed to develop a core knowledge base to complement the nine abilities.

The resulting knowledge base does not rely on a traditional disciplinary approach. Instead, we devised a planning model that, for basic science, employed a matrix with the horizontal axis reflecting the level of organization from the smallest—the cell and its molecular parts—to the

largest—the community. The vertical axis represented structure and function dimensions. The clinical medicine matrix focused on the five different types of encounters that occur between doctors and patients, from preventive visits to emergency room care, on the horizontal axis, and stages of life on the vertical axis (Figure 1).

Eighteen interdisciplinary working groups were formed—nine to work on the abilities and nine more to work on the nine divisions of the knowledge base, represented by the column names in the two matrixes (e.g. molecular and cellular, community, acute encounters). The chairs of these 18 working groups met together regularly as a coordinating council, supplemented by the dean, the associate dean for medical education, the chair of the curriculum committee, the chair of medicine, the chair of physiology and the director of the curriculum affairs office.

Faculty and students in the working groups translated each of the nine abilities into observable behaviors that students must demonstrate at the beginning, intermediate and advanced levels of their training. Also developed were new methods of assessing competence in these areas—methods that rely on actual performance rather than on the traditional multiple-choice examinations. These performance-based methods of assessment include the use of standardized patients, interactive computer instruction, videotapes and actual community health projects.

The working groups on the knowledge base generated an initial document on each of the nine divisions defining the core content in that area. We sent these documents to a broader and larger group of faculty using a Delphi group opinion technique to arrive at a consensus (Milholland *et al.*, 1972). We retained those items that a majority of faculty rated as 'essential' or 'very important'. Approximately 25% of items originally included by the working groups were deleted after two rounds using the Delphi technique.

The curriculum, published as *An Educational Blueprint for the Brown University School of Medicine* (available on the internet at [http://biomed.brown.edu/medicine\\_Programs/MD2000/Index.html](http://biomed.brown.edu/medicine_Programs/MD2000/Index.html)) has been named **MD2000** because all graduates of the Class of 2000 and beyond will be expected to demonstrate competency in the knowledge and abilities outlined. The name is also meant to symbolize a new curriculum model for the twenty-first century.

### Overcoming faculty resistance

Many have asked about the degree to which the proposed changes were resisted by the faculty. Initially, a number of faculty expressed skepticism about the plan. They believed that the present curriculum seemed to be working well and raised the argument that 'if it ain't broke, don't fix it'. Others expressed concern about the appearance of central control of the curriculum and erosion of academic freedom. Still others worried that the emphasis on competence and abilities conveyed an attitude that undervalued knowledge and science.

#### *Addressing the 'ain't broke' argument*

While the number of faculty expressing these sentiments never appeared numerous nor was their tone vociferous, the comments were taken seriously. We met with each department to explain the curriculum and answer questions. The

**Table 1.** Brown's Nine Abilities.

---

I—Effective communication
II—Basic clinical skills
III—Using basic science in the practice of medicine
IV—Diagnosis, management, & prevention
V—Lifelong learning
VI—Self-awareness, self-care, and personal growth
VII—The social and community contexts of health care
VIII—Moral reasoning and clinical ethics
IX—Problem solving

---

<b>Basic science matrix</b>				
	Molecular/ cellular	Single organ/ organ system	Whole person/ family	Community
Organization & structure				
Maintenance & homeostasis				
Defense against disease & injury				
Mechanisms of and response to disease & injury				
Therapies & interventions				

<b>Clinical medicine matrix—Clinical approaches to health &amp; disease</b>					
	Preventive/ developmental	Acute	Emergency	Chronic	Behavioral
Fetus/Neonates					
Children					
Adolescents					
Adults					
Elders					

Figure 1. Knowledge base matrices (each empty block represents a specific domain of knowledge).

'ain't broke' argument was easily refuted with hard data. A survey of Brown students taken by the University of Massachusetts Medical School during a collaborative venture revealed that a sizable percentage of Brown students had reported never having been observed by a faculty member doing a history and physical examination on a patient (University of Massachusetts Medical Center, 1989). Clerkship directors readily admitted that no system was in place to guarantee that students acquired the clinical skills listed in the educational blueprint. Most basic science instructors would admit that they did not have any evidence that students could apply their basic science knowledge to clinical medicine.

Despite this data, the new curriculum was not presented as a radical cure for a seriously ill educational program. Rather, faculty were told that they were doing a good job—as good as most other medical schools—as evident from the success of the graduates in matching to excellent residency programs, receiving excellent evaluations from those postgraduate programs, gaining faculty positions at other medical schools in large numbers, and establishing successful practices here in Rhode Island and elsewhere. The new curriculum offered a way to do a good job even better. In the business world, the jargon used to describe this approach is 'continuous quality improvement'.

*Respecting faculty autonomy*

While the proponents of the competency-based curriculum believe it will dramatically change teaching, learning and assessment, the new curriculum actually is less threatening to faculty who fear centralized control than other curriculum reforms employed in other medical schools. Unlike some reform efforts in which courses are broken up or merged with other courses into new configurations, MD2000 leaves the structure of courses and clerkships intact. Course leaders

retain their authority to decide on the content of courses and the pedagogical methods, in contrast to schools where specific teaching techniques (e.g. problem-based learning) are mandated from above. Faculty are held accountable for the outcomes of their courses, but the details of how to reach those outcomes are left up to them.

*Promoting self-directed learning*

The concerns about undervaluing knowledge and science were addressed by asking faculty to reflect on their own graduate education. The education that basic science Ph.D. faculty obtained was distinctly different from the traditional education of medical students. Graduate education relies much more on active, self-directed learning guided by faculty mentors. Knowledge is acquired as an inseparable part of the process of solving scientific problems, whose outcome is the creation of new knowledge. Likewise, for the expert clinician, knowledge is acquired as part of the process of solving clinical problems, whose outcome is the care of patients. Clinical investigators combine the two processes, caring for patients and advancing biomedical knowledge.

The new curriculum seeks to transform medical education more into the mold of graduate education. The nine abilities specify the ways in which students will use the content defined in the knowledge base. Each course leader selects the appropriate abilities and aspects of the knowledge base and combines them in the teaching, learning and assessment that is part of that course.

The confidence and support of faculty for the curriculum change was achieved by involving them actively in the planning process. Over 250 faculty, students and administrators served on the 18 working groups that planned the curriculum. The entire faculty was invited to participate in the Delphi survey that achieved a final consensus on the knowledge base.

**Details of the curriculum**

The three pillars of the new curriculum are the nine abilities, the knowledge base and performance-based assessment.

*Abilities*

Figure 2 illustrates the ‘anatomy’ of one of the nine abilities, namely *The social and community context of health care*. The educational blueprint defines each ability in a succinct paragraph, followed by a series of criteria that describe the desired performance of the student. Examples of behaviors that might be used by faculty to measure student competence are listed next. Finally, the level of achievement expected of students at the beginning, intermediate and advanced stages of their educational development are described.

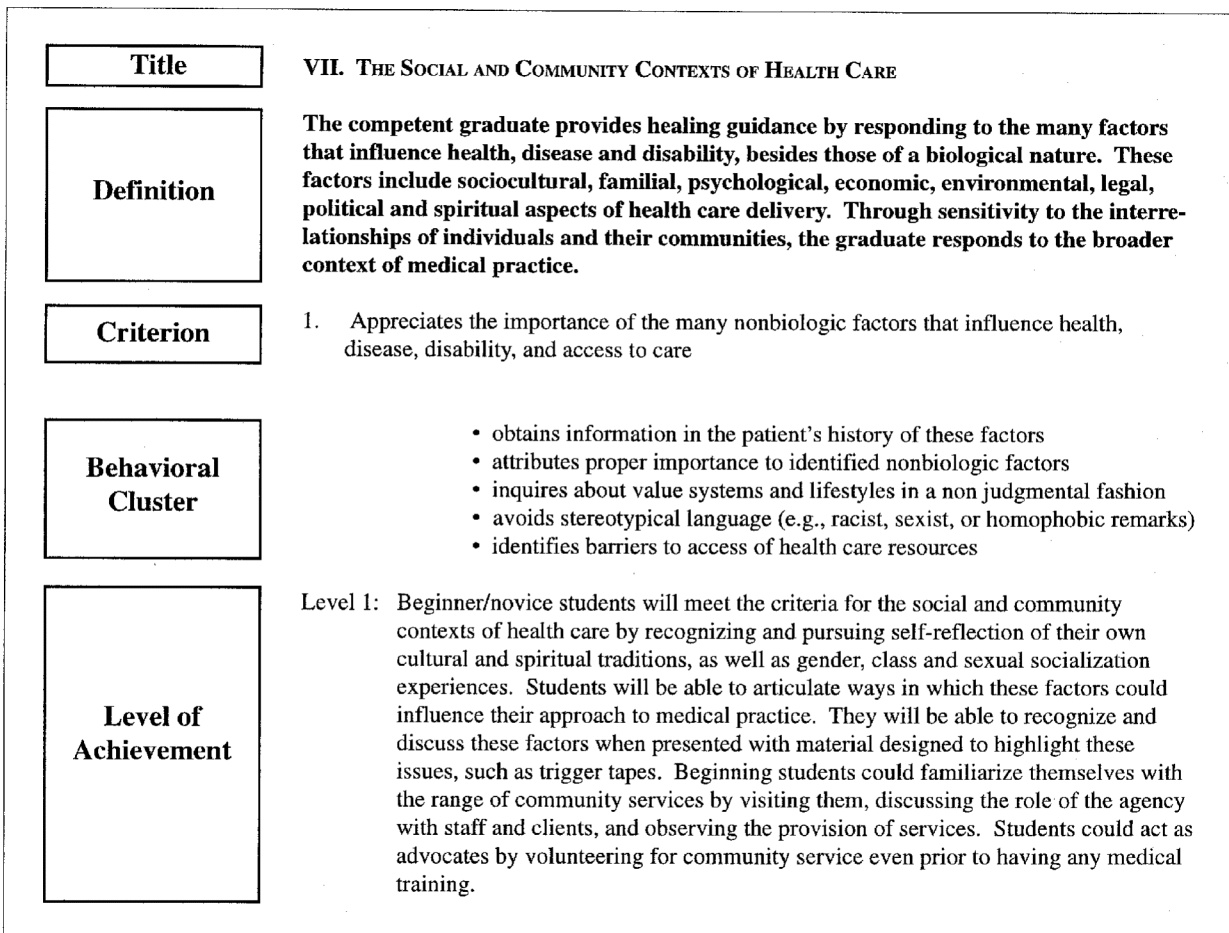
Most of the nine abilities follow this format. Ability II—*Basic clinical skills*, is somewhat different. It is a relatively long list of specific clinical skills, ranging from physical examination skills to routine clinical procedures, to complex and specialized laboratory and diagnostic tests. Each of the three levels of achievement specifies which of these skills the student is expected to be able to do and the level of proficiency. For example, beginning students are expected to be able to perform the basic elements of a history and physical examination prior to entering the clinical phase (third year) of their medical education. They are expected to perform these skills using proper maneuvers, form and

structure, though not necessarily in a smooth, efficient or proficient manner. Beginning students are expected to be able to verbally describe the procedural steps necessary to carry out routine clinical procedures such as venipuncture, starting an intravenous line and basic cardiopulmonary resuscitation. The students will have actually performed such procedures at least once, but would not be expected to be able to repeat them in a smooth, facile fashion at this stage.

*Knowledge base*

The knowledge basis consists of nine major divisions representing the column headings depicted in Figure 1. Inclusion in the knowledge base signifies the importance of a topic; all graduates should be able to use knowledge about that topic proficiently. A topic’s exclusion from the knowledge base is not an indication of its irrelevance; rather, in planning the use of curriculum time, faculty assigned a higher priority to other topics that are in the knowledge base.

Many topics in the knowledge base intentionally permit wide latitude by the instructor in the selection of specific content with which to address the topic. For example, the knowledge base includes *genetics* under *mechanisms of disease* at the cellular and molecular level, but does not specify which genetic diseases or genetic abnormalities must be used to illustrate the principles. Faculty select specific content based on its teaching value according to prevalence, importance, general applicability and particular illustrative value. Faculty are advised to present sufficient examples to



**Figure 2.** Anatomy of an ability in Brown’s competency-based curriculum.

make general principles clear, but to avoid going beyond this objective. Faculty are also urged to select content that is relevant to the practice of medicine.

#### *Performance-based assessment*

The goal of teaching is to help the student to learn. In order to do so, the teacher and the student must know how well the student is doing in reaching the educational outcome desired. Assessment is the process by which the teacher and the student gain knowledge of the student's progress. In our competency-based curriculum, we want to create assessments that reflect as closely as possible the actual tasks that students will face as physicians. These assessments need to be authentic and direct. We call this performance-based assessment.

Performance-based assessment requires the student to use knowledge in a particular way to satisfactorily complete the task assigned. Students will not be able to perform satisfactorily if they lack either the knowledge or the ability. The knowledgeable student who is unable to integrate knowledge to diagnose a patient's problems will not perform satisfactorily when confronted with a patient with a complicated history, vague physical findings and confusing laboratory data. Nor will the student who has excellent communication skills do any better if he or she does not know what clues to look for in the history. Competence requires the simultaneous application of knowledge and ability.

#### **Implementation plan**

We have developed a new organizational structure, the **MD2000** assessment committees, which provide oversight and support to course leaders in implementing the new curriculum in first- and second-year courses and in the clerkships and the electives in the third and fourth years of medical education.

#### *MD2000 assessment committees*

Assessment committees have been formed corresponding to the nine abilities and nine divisions of the knowledge base. Each committee consists of about six faculty members and one or two students.

The assessment committees do not directly assess students. Instead, they monitor and help facilitate the process by which faculty assess students. Each course or clerkship is

empowered by the assessment committee to certify student competence in that area. In order to be so empowered, the course or clerkship director must meet with the assessment committee to describe the methods by which student competence in that area will be assessed. The course leader will also describe how the course is structured and conducted to enable students to reach the learning goals.

Once a course has been empowered to certify student competence, the assessment committee will expect the faculty to rigorously evaluate how well their assessment plans are working and present progress reports to the committee. The purpose of these progress reports is primarily to engender collegial conversations, brainstorm new ideas, and creatively problem solve rather than to monitor compliance.

Rarely, assessment committees may determine that the faculty member has not undertaken a good faith effort to employ performance-based methods of assessment. In that case, the assessment committee may de-authorize the course's ability to certify student competence. That will mean that students taking the course will not be able to obtain certification for that ability.

Each student must attain competence in all nine abilities and across the entire knowledge base. Among the abilities, students must attain an intermediate level of competence in all nine, and an advanced level of competence in problem solving and three others of the student's choice.

To attain competence, students must receive a minimum number of certifications of competence in the ability in which competence is being sought (Table 2). For example, the student must receive four certifications in effective communication at the beginning level (level 1) to be designated competent in Ability 1 at the beginning level. For the knowledge base, a single certification is sufficient for that content area.

It is possible for a student to pass a course, fulfill the knowledge base requirement, and still not receive certification for competency in a particular ability. For example, a student could pass the human morphology course, thus fulfilling knowledge base requirements under the single organ/organ system division for gross anatomy, but not be deemed competent in effective communication—one of the three abilities assessed in that course.

The chairs of the assessment committees also serve on the medical curriculum committee, thus ensuring good integration of the new curriculum into the overall curriculum planning process. The full curriculum committee must

**Table 2. MD2000 Competency Attainment Grid.**

Ability	Beginner level	Intermediate level	Advanced level
I. Effective communication	3	7	2
II. Basic clinical skills	3	5	2
III. Using basic science in the practice of medicine	7	6	2
IV. Diagnosis, management, & prevention	3	7	2
V. Lifelong learning	3	2	2
VI. Self-awareness, self-care, and personal growth	2	2	2
VII. The social and community contexts of health care	2	2	2
VIII. Moral reasoning and clinical ethics	1	4	2
IX. Problem solving	5	3	2

decide on any changes in the educational blueprint proposed by the assessment committees.

Students plan their course of study using a newly developed web-based computer application called MedPlan MD2000. The program graphically portrays to students which competencies will be fulfilled by their plan (Figure 3). Students can view which courses are available to fulfill specific competencies as well as which competencies any individual course addresses. Another screen portrays which competencies have actually been achieved. The program allows the administration to easily monitor student progress.

**Institutional assessment**

In implementing MD2000, we soon realized that we needed to establish a system of institutional assessment to monitor our annual as well as long-term progress, and to determine what effect our new curriculum model was having on the teaching and learning processes in the medical school. In 1997, we established an institutional assessment committee composed of experts in education assessment from other institutions to help us design an evaluation strategy. In addition, they act as 'critical friends' offering both constructive feedback and recommendations for improvement in the implementation of our new curriculum. We also hired an independent evaluator who reports to the advisory committee about student and faculty attitudes and satisfaction with the new curriculum.

*Early results*

We are encouraged by early results of our institutional assessment after two full years of implementation. Interviews by

the external evaluator reveal that faculty and students are able to accurately, if not completely, describe the basic tenets and features of the new curriculum.

Each of the courses in the first 2 years of medical school have indicated whether each student achieved the competencies for that course. Faculty have been able to draw distinctions between knowledge and abilities evidenced by faculty giving students passing grades for knowledge but not certifying them in one or more of the abilities assessed in that course. For example, faculty members in histology and neurobiology have devised specific ways to assess problem solving in their respective courses. Students may achieve an overall passing grade on examinations indicating that they have an adequate fund of knowledge in the subject, but have performed below an acceptable level in being able to apply that knowledge on problem-solving tasks. In those cases, students pass the course but do not achieve competency certifications in problem solving. We meet with the students to plan remedial educational activities designed to help them achieve competence in the ability.

Only two students were found to be lagging behind benchmarks of progress in achieving competency certification at the end of the first 2 years of medical school. We met with them and planned activities over the summer that would enable them to catch up. In both cases the students were each missing one certification each in Ability VII—*Social and Community Contexts of Health Care* and Ability VIII—*Moral Reasoning and Clinical Ethics*.

The average score of the students in the MD Class of 2000 on the June administration of Step 1 of the United States Medical Licensing Examination was 217 (national average 216), with 98% passing (national average 95%). In the clinical clerkships, the substitution of Objective

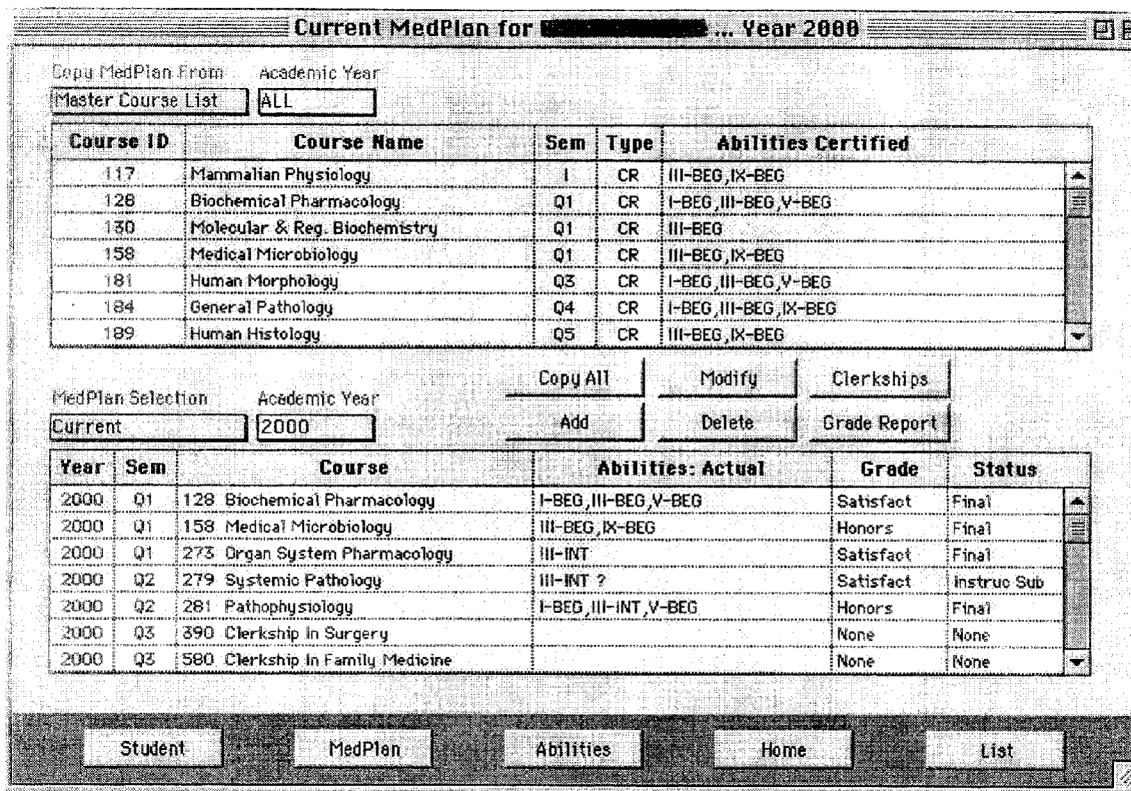


Figure 3.

Structured Clinical Examinations (OSCEs) for oral examinations has altered the learning behavior of students in positive ways, but has not resulted in any lowering of scores on National Board of Medical Examiner shelf examinations. This welcome result reassured us that the benefits of the new curriculum were not being achieved at the expense of traditional measures of performance.

The major source of criticism from students, and to some extent from faculty, was that the concepts of the new curriculum had not been fully and completely realized. These criticisms are both valid and welcome. While the majority of courses have fully embraced the concepts of a competency-based curriculum and have utilized appropriate methods of performance assessment, some courses have not been as successful in adapting to the new way of teaching, learning and assessing. We continue to work with the faculty in these courses, encouraging them to experiment and share their experiences, good and bad, with their colleagues. We welcome the criticism from students since it represents a positive valuing of the new curriculum and an impatience to see it fully realized.

We are evaluating the new curriculum using both qualitative and quantitative measures. Our advisory committee recommended the following assessment questions: Has the faculty substantially changed the way they evaluated students and the way they teach? Do the faculty buy into this? Will they maintain it over time? Are new faculty socialized to the new paradigm? Do faculty see the educational outcomes as rigorous enough? Do students view MD2000 as valuable? Are the students getting sufficient feedback on their performance? Are students better prepared, especially in the more nontraditional aspects of the curriculum? Are residency program directors satisfied with the competence of our graduates? Do our graduates seem better prepared than the graduates of other, more traditional medical schools? Are our graduates better physicians?

The results of this institutional assessment will not be clear for many years, but we are also using the process of assessing our curriculum as a means to spur its continued development and to improve it continuously. Certainly, the early results have been encouraging.

### Significance for medical education

We believe that competency-based education represents the model for medical education in the next century. The current model of medical education, based on Abraham Flexner's famous report in 1910, served medicine well by building the education of medical students on a firm scientific foundation. A new model of medical education is needed now to prepare today's graduates to face the challenges ahead. Flexner, himself, presaged the need to consider the broader needs of a comprehensive medical education. He wrote:

So far we have spoken explicitly of the fundamental sciences only. . . . The practitioner deals with facts of two categories. Chemistry, physics, biology enable him to apprehend one set; he needs a different apperceptive and appreciative apparatus to deal with the other, more subtle elements. Specific preparation is in this direction much more difficult . . . . The physician's function is fast becoming social and preventive, rather than

individual and curative. Upon him society relies to ascertain, and through measures essentially educational to enforce, the conditions that prevent disease and make positively for physical and moral well-being (Flexner, 1960).

Brown's approach to the education of medical students begins with the tasks that will be expected of the physician practicing in the twenty-first century, then builds a curriculum designed to equip its graduates with those attributes needed to competently perform those tasks. Residency programs will know that an M.D. degree from Brown means that graduates have been taught, have learned, and have been assessed competent in these outcomes.

Other medical schools in this country and around the world are adopting the model of competency-based education. In the US, we are joined by medical schools at the University of Vermont, the University of Missouri at Kansas City, East Tennessee University and the University of Indiana. Many more medical schools are in the planning stages. Copies of the educational blueprint have been requested from dozens of medical schools in other countries, and we know that most recently the International Medical College in Kuala Lumpur, Malaysia and the University of Chile Faculty of Medicine have utilized it in their own curriculum planning.

Furthermore, the AAMC's Medical School Objectives Program (MSOP) assists medical schools in their own efforts to define the educational outcomes of their teaching programs. MSOP has published a monograph that defines the attributes that medical students should possess at the time of graduation and sets forth a list of learning objectives for the medical school curriculum derived from these attributes (Association of American Medical Colleges, 1998). Brown has recently joined MSOP, now a consortium of over 20 medical schools. Such collaboration allows us to share our perspective on competency-based curriculum—what works and what needs to improve—as well as learn from other leading US medical schools how to better implement our evolving competency-based curriculum model.

### Acknowledgements

The curriculum development and evaluation described in this article was supported, in part, by grants from the Robert Wood Johnson Foundation, the Charles E. Culpeper Foundation, and the Josiah Macy, Jr. Foundation. We should like to acknowledge Affinity Software Corporation, Walpole, MA, for providing us with the graphic design for MedPlanMD2000, our web-based computer application program which tracks our medical students' attainment of competencies.

### Notes on contributors

DR S.R. SMITH, M.D., M.P.H., is associate dean for medical education and professor of family medicine at Brown University School of Medicine.

DR R. DOLLASE, Ed.D., is director, Office of Curriculum Affairs, Brown University School of Medicine.

### References

ASSOCIATION OF AMERICAN MEDICAL COLLEGES (1992) *Educating Medical Students: Assessing Change in Medical Education—The Road*



- to Implementation (Washington, DC, Association of American Medical Colleges).
- ASSOCIATION OF AMERICAN MEDICAL COLLEGES (1998) Report 1: learning objectives for medical student education: guidelines for medical schools. *Medical School Objectives Project* (Washington, DC, Association of American Medical Colleges).
- BLOOM, S.W. (1988) Structure and ideology in medical education: an analysis of resistance to change, *Journal of Health and Social Behavior*, 29, pp. 294–306.
- FLEXNER, A. (1910) *Medical Education in the United States and Canada: A Report to the Carnegie Foundation on the Advancement of Teaching* (reprinted Washington, DC, Science & Health Publications, 1960), p. 25.
- GASTEL, B. & ROGERS, D.E. (Eds) (1989) Clinical education and the doctor of tomorrow, in: *Proceedings of the Josiah Macy, Jr. Foundation National Seminar on Medical Education*, June 15–18, 1988, p. 113 (New York, The New York Academy of Medicine).
- HARDEN, R.M. (1986) Assessment of clinical competence: an examiner's toolkit in: *International Conference Proceedings: Newer Developments in Assessing Clinical Competence*, Ottawa, Canada (Montreal, Quebec, Heal Publications).
- MILHOLLAND, A.V., WHEELER, S.G. & HEIECK, J.J. (1973) Medical assessment by a Delphi group opinion technique, *New England Journal of Medicine*, 288, p. 1972.
- PROJECT PANEL ON THE GENERAL PROFESSIONAL EDUCATION OF THE PHYSICIAN AND COLLEGE PREPARATION FOR MEDICINE (1984) *Physicians for the twenty-first century, report project panel on the general professional education of the physician and college preparation for medicine*, *Journal of Medical Education* (Supplemental issue), 2, p. 5.
- UNIVERSITY OF MASSACHUSETTS MEDICAL CENTER (1989) *Collaborative Effort Among Four New England Schools to Assess the Clinical Skills of Beginning Fourth-Year Medical Students* (University of Massachusetts Medical Center).

# AMEE Guide No. 14: Outcome-based education: Part 3—Assessment in outcome-based education

MIRIAM FRIEDMAN BEN-DAVID

*International Consultant in Medical Education, Jenkintown, PA 190 Y6, USA*

**SUMMARY** *The role of performance assessment in outcome-based education is discussed emphasizing the relationship and interplay between these two related paradigms. Issues of the relevancy of assessment to student learning are highlighted in the context of outcome-based education. The importance of defining assessment premises and the role of institutions in defining their educational philosophy as it pertains to student learning and assessment is also presented. A brief description of implementation guidelines of assessment programs in outcome-based education are presented indicating the key features of such programs.*

## Introduction

Higher education institutions have been responding to a growing concern for the adequacy of students' professional and career preparation by specifying the outcomes or abilities critical for future professional performance (Friedman & Mentkowski, 1980). Such outcome educational programs focus on assessing performance as well as knowledge as a key to bridging the gap between college and career.

Institutions of higher education who set pre-defined learning outcomes in behavioral objectives demonstrate advanced educational reform in teaching, learning and assessment. These programs demonstrate a unique approach to education by designing a comprehensive systemic (school wide) and systematic curricula which goes beyond knowing.

Outcome-based education and performance assessment are closely related paradigms. They are bound by simple educational principles: (1) assessment methods should match the learning modality; (2) in all fairness, students are entitled to learning experiences which will adequately represent the assessment methods. Consequently, outcome-based programs are faced with the need to develop non-traditional teaching and assessment techniques, which capture both the learning and performance of broad abilities. Recent developments in assessment methodology have focused on performance assessment, and somewhat neglected the related paradigm of outcome based education. Ideally, at the didactic phase of medical education, where the full scope of professional development is considered, the two are inseparable. In such programs, a comprehensive assessment will be integrated with all stages of the curriculum from its initial conception. Furthermore, assessment activities are integrated with learning to enhance student learning from their own assessment experience (Loacker, 1993). Medical schools have unique opportunities to observe students through their learning and assessment over a prolonged period of time. Students are eager to demonstrate their professional growth, and to monitor their own learning. Thus, clear outcome objectives, assessment-feedback and student self-assessment are central to outcome-based education.

The call for performance assessment by US national organizations is actually a call for outcome-based education. Proposals of the National Educational Goals Panel (1991) and the National Council on Educational Standards and Testing (1992), have both called for national examinations with performance assessment as a featured concept with an emphasis on testing complex 'higher order' knowledge and skills in the setting in which they are actually used (Swanson *et al.*, 1995). In order to respond to these proposals, 'higher order' knowledge and skills need to be defined and incorporated in the instructional design along with performance assessment methods. Abilities may be defined as short-term behaviors, which are prerequisite to the next stage of learning; as long-term behaviors linked to the work place; or both. However, common to all outcomes based curricula is the desire to demonstrate the credibility of the program in terms of what graduates know and can do.

The purpose of this paper is to highlight important concepts of assessment in outcome-based education along the following three topics:

- (1) the interplay between assessment and outcome based programs;
- (2) assessment premises in outcome-based education;
- (3) implementation of assessment programs in outcome-based education.

## The interplay between outcome-based education and assessment

The design of outcome-based education and student assessment must include consideration of expected student outcome as viewed by different consumer groups. These views reflect different needs and expectations. Examples of consumer perspectives are found in faculty expectations from students, future employers or licensure/certification bodies. Faculty may expect students to master the learning material, future employers may expect readiness to enter specialized programs and licensure/certification bodies may expect demonstration of general professional competencies. By whichever perspective the outcome objectives are defined, from an assessment perspective, the stakes are not similar. Thus, the school decision to satisfy the needs of one or more consumer groups will dictate the nature of the outcome objectives and the assessment program.

For example, Brown University School of Medicine (Smith & Fuller, 1994), have developed a competency-based curriculum which defines nine activities: effective

communication; basic medical skills; using basic science in the practice of medicine; diagnosis, management and prevention; lifelong learning; self-awareness, self-care and personal growth; social and community contexts of health care; moral reasoning and ethical judgment; and problem solving. In addition to the nine abilities, knowledge-based requirements are grouped into nine categories. Assessment criteria are developed for each activity according to the level of performance. In contrast, the Society for General Internal Medicine in its 1996 annual meeting (Holmboe *et al.*, 1996) conducted a workshop to explore current methods in the evaluation of clinical competence. They present the components of the definition of a certifiable internist as clinical judgment; medical knowledge; clinical skills; humanistic qualities; professionalism; medical care; moral and ethical behavior.

The abilities defined by the medical school and the certification body present similarities as well as differences. Differences may stem from the short-term/long-term definitions of abilities, the specific values of the medical school and its educational philosophy, abilities defined for the undifferentiated physician and the link between education and practice. The clearer the definition of outcome-based objectives the more effective are the assessment techniques. The clarity of the definition allows the specification of the nature of the abilities and the setting in which they are assessed and, most importantly, how results should be interpreted (Messick, 1994).

#### **Assessment premises in outcome-based education**

The assessment premises adopted by the medical school are the reflection of its institutional values. Institutions need to define their education and assessment premises prior to the design of assessment material. Examples of assessment premises are: assessment is integral to learning; abilities must be assessed in multiple modes and contexts; content is the stimulus for learning and it also provides a context to demonstrate one's ability; performance assessment implies explicit criteria, feedback and self-assessment; core abilities must be assessed repeatedly over time to measure growth; assessment should be cumulative and comprehensive; deficiencies should be remediated (Loacker, 1993).

The New Mexico School of Medicine has defined in their assessment manual (1992) guidelines for planning and implementation of assessment programs in an ability-based curriculum. The guidelines state that a well-defined and well-managed system of formative and summative assessment should be developed and implemented. It recognizes the importance of developing assessment expertise among faculty and students to enhance the quality of assessment. Students should assume the responsibility of monitoring their own learning progress and a mastery approach to learning is implemented. Faculty will define standards and students are expected to meet those standards.

#### **Implementation of assessment programs in outcome-based education**

In planning an assessment program in outcome-based education, faculty are undertaking multiple tasks. Examples of faculty activities are listed here in chronological order. The list is not inclusive, but it contains important aspects of assessment program development and implementation.

- (1) **Assessment premises**—Outline the assessment premises and the educational philosophy of the institution and define the relationship between students and faculty, as well as the responsibilities students are expected to take to monitor their own learning. On the other hand, the school will define its responsibility to allow students to meet their educational goals.
- (2) **Principles of outcome-based education**—Establish outcome behavior principles, which will consider consumer groups, short vs long term abilities, the link between education and practice and the institutional goals.
- (3) **Define methods**—Select the methods by which outcome behaviors are defined, such as critical incidence techniques, job analysis, Delphi techniques, national/professional surveys, faculty/expert judgment or others.
- (4) **Assessment criteria**—Develop assessment criteria for each of the abilities defined. The criteria should include a description of the instructional methods employed for this ability and the setting in which behavior should be demonstrated. If abilities are described in developmental terms. The specific levels should be outlined.
- (5) **Assessment taskforce**—Establish an assessment taskforce, which will include an assessment expert. The taskforce will coordinate the development of assessment materials and will recruit faculty for the various tasks. Have faculty from different disciplines work together to allow integration of abilities across disciplines.
- (6) **Systemic assessment program**—Work towards establishing an 'assessment oriented faculty' which will assist in creating a systemic assessment program. One which will reach all institutional aspects—administrative as well as educational.
- (7) **Systematic assessment program**—Design a systematic assessment program, which will ensure uniformity of assessment across programs.
- (8) **Flow of assessment information**—Indicate the flow of assessment information, lines of communications and how do promotion decisions and remediation fit into the loop—and make sure the students are not lost in the process. In an outcome-based program often students may feel they are over tested and under informed.

#### **Summary**

The list of activities is certainly overwhelming. Faculty willingness to engage in such an undertaking is the first indicator of institutional values. Faculty understand that outcome-based education ensures that students are better able to meet their learning goals and faculty gain more insight into the nature of professional behaviors and the related learning activities. Faculty may take on an expert role in evaluating student performance. Sampling their subjective judgments over time and over judgments may provide the statistical confidence that the evaluation of clinical abilities is not a matter of an expert's personal judgment but rather reflects the examinee's consistent behavior (Friedman & Mennin, 1991). It is indeed a win/win situation.

**Notes on Contributor**

DR MIRIAM FRIEDMAN BEN-DAVID is an International Consultant in Medical Education, 129 Woodpecker Road, Jenkintown, PA 190Y6, USA.

**References**

- FRIEDMAN, M. & MENNIN, S.P. (1991) Rethinking critical issues in performance assessment, *Academic Medicine*, 66, pp. 390-395.
- FRIEDMAN, M. & MENTKOWSKI, M. (1980) *Validating Assessment Techniques in an Outcome-centered Liberal Art Curriculum Summary*, Milwaukee, Wisconsin, (Alverno College Productions).
- HOLMBOE, E.S., HAWKINS, R.E., HAMMETT, T.W. & MACKRELLI-GAGLIONE, M. (1996) *Current Methods in the Evaluation of Clinical Competence*. Society for General Internal Medicine annual meeting.
- LOACKER, G. (1993) Performance assessment in undergraduate education. Paper presented at the AERA annual meeting, Atlanta, GA.
- MESSICK, S. (1994) The interplay of evidence and consequences in the validation of performance assessment, *Educational Researcher*, March, pp. 13-23.
- NATIONAL COUNCIL ON EDUCATION STANDARDS AND TESTING (1992). *Raising standards for American education*. Washington, DC: Author.
- NATIONAL EDUCATIONAL GOALS PANEL. (1991). *Measuring progress toward the National Educational Goals: Potential indicators and measurement strategies* (compendium of interim resource group reports). Washington, DC: Author.
- SMITH, S.R. & FULLER, B. (1994) *An Educational Blueprint for the Brown University School of Medicine, Competency Based Curriculum*, (Providence, RI, Brown University School of Medicine).
- SWANSON, D.B., NORMAN, G.R. & LINN, R.L. (1995) Performance-based assessment : lesson from the health professions, *Educational Researcher*, June/July, pp. 5-11.
- UNIVERSITY OF NEW MEXICO SCHOOL OF MEDICINE (1992) *State of the Art Assessment in Medical Education*, A faculty development manual (New Mexico, University of New Mexico School of Medicine).

# AMEE Guide No. 14: Outcome-based education: Part 4—Outcome-based learning and the electronic curriculum at Birmingham Medical School

NICK ROSS\* & DAVID DAVIES

*The School of Medicine, The University of Birmingham, UK*

**SUMMARY** *Outcome-led curricula are increasingly relevant to medical education as Universities seek means to make explicit the criteria against which the success of both the course and the students should be judged. This paper outlines some of the main factors which led the University of Birmingham School of Medicine to develop an outcome-led curriculum for the new undergraduate medical course. Having set the general context, it then describes how the specific structure used by the school for organising integrative learning outcomes both influenced and was influenced by the parallel decision to develop an 'electronic curriculum' database. The advantages of the electronic curriculum database developed by the School are discussed and examples are given to demonstrate the flexibility with which information can be accessed by students, clinicians and other teachers.*

Although the term curriculum might most appropriately refer to the whole educational experience of the student (Lawton, 1973), it is more commonly used to refer to the course as planned. As Lowry (1993) points out, there may be a considerable difference between the curriculum as planned, the curriculum as implemented and the curriculum as experienced by the students. There are a number of reasons for this potential dissonance, including a general resistance to change, a failure to share 'ownership' of new curricular plans, and the reaction of the students.

A further pressure relates particularly to the clinical component of education and to the variation in the learning environments used to undertake a particular part of the course. The learning resource and opportunity offered by two different junior medical firms will not be precisely the same. Indeed, one medical firm is unlikely to be able to offer precisely the same experience on two different days. In the past, medical curricula have managed this disparity largely by avoiding it, through the use of an apprenticeship system in which responsibility for determining content rests with the supervisor (Lowry, 1993). They have simply stipulated that, for example, students will have a certain number of weeks of 'junior medicine' in the third year. Since the detail of the expected experience was not specified in the curriculum plan, the experience the students gained could not be dissonant. However, students were only too aware of the differences between their individual experiences and understandably concerned about how this might affect their assessment performance.

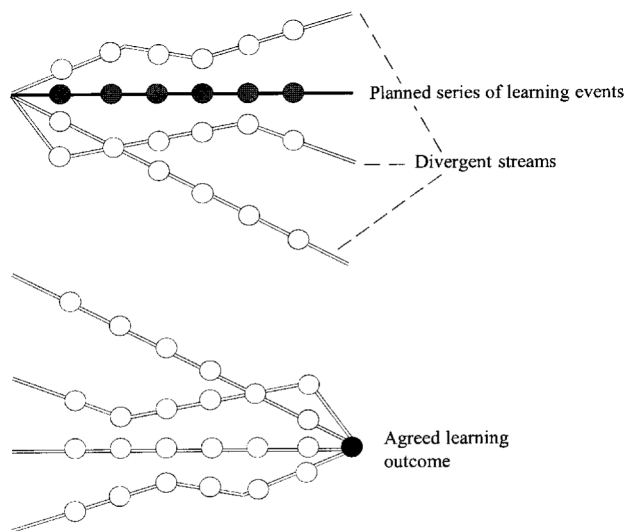
Despite this, the 'steady state' of medical education, in which consultants could, to a greater or lesser extent, rely on their own student experience as the basis for structuring the experience they offered to their students, meant that such a system could be maintained. When the intention is to

radically revise the nature of medical education, a more directive strategy is required. With the publication of *Tomorrow's Doctors* (GMC, 1993), the General Medical Council set in motion just such a broad change process.

Whatever structure were to be imposed on clinical experience, some variation would be inevitable, since educational planning will always have to take second place to patient need. Both higher education and professional bodies (QAA, 1997; GMC, 1993) are challenging the tradition of unregulated apprenticeship and increasingly requiring schools of medicine to exercise tighter control over the curriculum as implemented and experienced: to offer a specification of intent against which the education of the student can be judged. In this climate, schools of medicine cannot continue to give individual clinical firms 'free rein', but it is up to them to determine how educational planning can regulate the serendipity of clinical learning without hobbling it.

If the main specification of education in the curriculum is in terms of input (taught sessions or particular learning events), conflict with available learning opportunities and resources in a particular environment will be inevitable. Where there is conflict, the learning resource is bound to be the ultimate determinant of experience. The danger is that relatively few 'unachievable' or 'impractical' proposals in the curriculum plan may lead to the whole being characterised by a clinical firm as 'not written with us in mind' and therefore irrelevant. In this context, even those proposals which might have worked within the pattern of available opportunity to enhance the educational experience may remain unimplemented. Even where plans are partially implemented, there is no framework within which the remaining differences in student experience can be resolved (see Figure 1).

Where the curriculum specifies education in terms of learning outcome, different clinical environments can be encouraged to use their strengths, identifying the most appropriate means through which *they* can enable students to achieve the required objective. Differences in student experience will remain, but the common endpoint specified in the learning outcomes constrains differences and provides a point of resolution. Furthermore, the explicit acceptance of diversity of experience/input within the planned curriculum means that it retains its relevance to the course as



In an outcome led curriculum, a number of different sets / patterns of learning events can be selected to achieve resolution in the same specified endpoint.

**Figure 1.** In an input/learning event-led curriculum, divergence in the pattern of learning events remains unresolved: there is no common endpoint.

implemented in each environment and maximises its effect on the experience of the students.

This is equally true of the non-clinical aspects of medical education. A ‘contract’ with a module co-ordinator, based on an identified contribution to the required learning outcome for the year, can be fulfilled even if circumstances force a change in some aspect of the lecture programme or other input. As with clinical teaching, the encouragement to take account of the reality of a situation and utilise the strengths of the available learning resource can serve to maintain the perceived relevance of the outcome-led curriculum. By focusing the planning on contribution to an overall outcome, individual module co-ordinators are also encouraged to develop awareness of the broader context within which their module is offered.

Perceived dissonance between the planned and implemented curriculum also suggests a process where the new curriculum, once planned, returns to a steady state, whilst the ‘curriculum as implemented’ drifts further and further from the original intent. In reality, curriculum development should be a continuing process, running alongside curriculum implementation and taking account of educational reality through ongoing evaluation (Lowry, 1993; Schwartz *et al.*, 1994). However, unless there is some semi-permanent core around which to work, continuing development can mean continuing uncertainty. The specification of learning outcomes can provide this core, whilst retaining flexibility. Although the outcomes of undergraduate medical education have to change in response to professional and service need (GMC, 1993), the shift tends to be gradual and concerted. By comparison, the specification of input is at the mercy of rapid, uncontrolled changes in personnel, resources etc.

At a time of change, a lack of access to the ‘curriculum as planned’ for students and large numbers of teaching staff means that there is little opportunity to counter other forces in the educational environment, which may be resisting

change, or to identify whether any variation in the learning experience offered is or is not legitimate. Such access needs to be enabled, but it also needs to be encouraged. An outcomes-led curriculum can encourage the active involvement of students by placing equal weight on taught input and independent study and encourage the active involvement of teachers by allowing them to take account of local constraints and opportunities. An input-led curriculum is the responsibility of the faculty. An outcome-led curriculum is the responsibility of all.

At the University of Birmingham, the development of the MBChB programme in line with the recommendations of the GMC (1993) has provided an opportunity to tackle these problems and to make the planned curriculum an integral part of the educational experience for the students, rather than a snapshot for the purposes of validation or review. This has involved the development of a framework of ‘nested’ outcomes for the course, which, in turn, has been utilised as a vital component in the development of electronic curriculum documentation. The electronic curriculum is on the web and can be accessed by students, clinical and non-clinical teaching staff and support staff.

Normally, especially with a long and complex course like medicine, formal curriculum documentation for validation and review is restricted, both in the detail it provides about any particular teaching and learning event and in its circulation. Further documentation about particular course components or learning experiences may provide students and teachers with additional layers of detail, but without access to the framework this can appear as disconnected elements. The electronic curriculum provides students, clinicians and other teaching staff with a database which allows the detail of individual educational experiences and learning opportunities to be planned and understood within the larger context of the course as a whole. As is often the case, the use of information technology has allowed new functions (new approaches to the data which were simply not possible through paper documentation), but the electronic curriculum also improves on the performance of those functions which the paper document already fulfilled.

Standard paper-based curriculum documentation will often provide some information about the philosophy or the curriculum model which underpins the design of the course, but the bulk of the information relates to the structure of the course, the nature of the educational process and, to a greater or lesser extent, the expected learning outcome.

The structural information included in paper documentation usually describes how the content of the course is divided up between various ‘modules’ or differently defined course components: outlines the content of each module and states how the teaching load is shared out between individuals, departments and hospitals. It will identify the temporal relationships of one course component with another, but is often less successful at mapping out the more complex, conceptual relationships.

The educational experience the students get and the learning opportunities provided are defined as much by teaching and learning processes as by course content. Curriculum documents may define what is to be taught in the medical school, either through didactic lectures or interactive, small-group teaching, or in the hospital, through bedside teaching or clinical tutorials. They may be much

less explicit about what students are expected to learn independently.

Increasingly, curriculum documents are expected to specify, in the form of objectives or learning outcomes, what students are required to achieve through the course. These outcomes form criteria against which the students (Brown & Knight, 1994) and, ultimately, the course (QAA, 1997) may be judged. Although more explicit than aims, the outcomes included in curriculum documents are often broad. This is, in part, an appropriate educational response to the diversity of valid student experience. However, a number of other factors may also affect the decision.

If the main purpose for providing outcomes is to meet the needs of subject review or other evaluative processes then a limited set of broad statements may be appropriate. If they are intended to provide guidance to teachers and students in determining appropriate learning, then more detail is required. Even where the latter is the intention, paper documentation imposes certain constraints. A set of detailed outcomes for an individual course component may be manageable, if rarely user-friendly, but when collected together for a course, they may simply become an impenetrable mass. The danger is that separate sets of outcomes fail to facilitate cross-referencing between components and consequently horizontal and vertical integration. One of the major advantages of an integrative set of outcomes is that it can help students to independently make such links; to develop their own conceptual map. Any loss of perceived connectivity between course components is therefore a serious deficit.

In addition to concepts, clinical skills and attitudes, outcomes can also specify expected learning to be achieved through independent study and other, 'process-related' learning, such as communication and group working skills, familiarity with IT, ability to value differing points of view etc. However, unless a means is found to deal with the sheer bulk of content-related outcomes, such valuable additions are unlikely to prove attractive.

The University of Birmingham School of Medicine has used a detailed set of outcomes relating to both course content and educational process: specifying the knowledge, skills and attitudes expected of students and providing a framework within which they are able to take a greater level of responsibility for their own learning. These detailed outcomes form a vital structural element within the 'electronic curriculum': a database which, in turn, allows the outcome set to be presented in a user-friendly manner. To facilitate the integration of learning and enable the development of the database, these outcomes are 'nested' (see Figure 2).

A set of 24 broad outcomes outlines the learning to be achieved at the end of the course. Each of these broad outcomes has a counterpart in each of the preceding years, enabling students and teachers to identify the progression needed to achieve the required endpoint with regard to that particular 'theme'.

Within a given year, each course component has a set of detailed outcomes. Each of these detailed outcomes makes a specified contribution to one or more of the broad year outcomes. The majority of year outcomes are contributed to by more than one module.

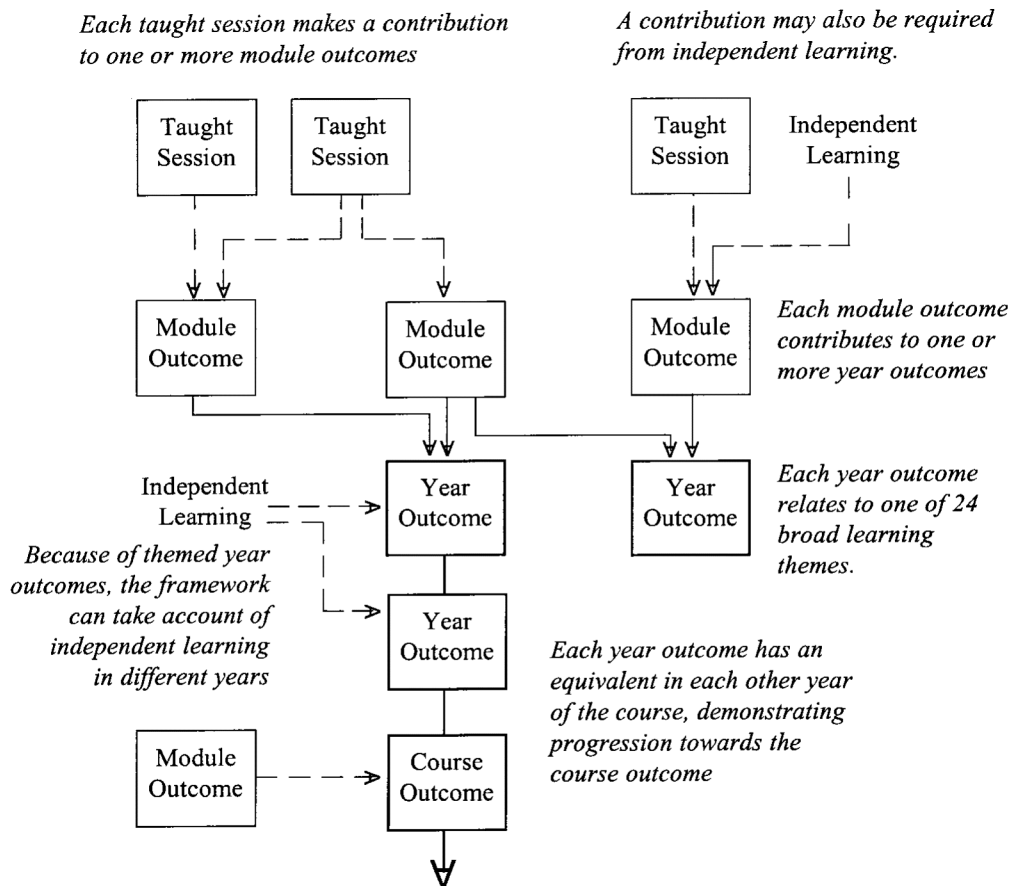


Figure 2. Nested outcomes, showing the relationship between taught input, independent learning, module, year and course outcomes.

Within each module, individual lectures, tutorials etc. make a specific contribution to the achievement of a particular detailed outcome. However, the detailed outcome set for any course component is more than the sum of the formal taught parts and gives equal weight to aspects to be achieved through informal clinical teaching and independent learning.

The belief that a detailed outcome-led curriculum is of value, but requires electronic management if it is to be user friendly might, of itself, have been sufficient motivation for the development of the electronic curriculum, but there are a number of other advantages. Before considering how the electronic curriculum enables students to take a greater level of responsibility for their own learning, it may be appropriate to consider some of the more prosaic benefits.

Prior to the implementation of the electronic curriculum, a paper document was produced for the first 2 years of the course. For each component, it contained:

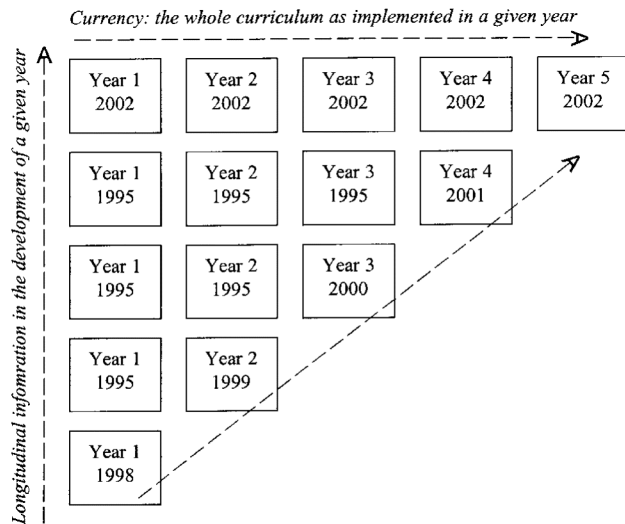
- an introduction
- a map of the overall structure
- a summary of each taught session
- details of the outcomes.

Handouts, workbooks etc. were provided separately, but even so, this amounted to an average of 20 pages per module, or 240 pages per year. Extended to the whole course, this would have resulted in 1200 pages of information. Leaving aside the sheer weight and user-unfriendliness of such a document, it would be hard to justify the cost to either the University or the environment. The electronic curriculum provides this comprehensive level of data in a cheaper, more useable form, with automatic links to further material.

Educational development is a continuing process of which a paper document can only be a snapshot in time. The more detail the document includes, the more opportunities there are for elements of its content to become obsolete and the shorter will be the period of time for which it constitutes an accurate reflection of the course. The electronic curriculum can be continuously revised, so that all users have a single source of up-to-date information. Since students who will use the electronic curriculum are interested in their own course, historical accuracy is as important as currency. For example, students in their second year this year will want to look at last year's first year programme, rather than this year's first year programme. Figure 3 shows how this will eventually require 15 years worth of information (the equivalent of 3600 pages of paper documentation) to be held in the electronic curriculum and how this will, in turn, enable the process of review/research in course development.

Reduction in cost and improved accuracy are major factors in enabling access to course information for all legitimate audiences. There is a need to limit access to particular information: to decide who is allowed to see what (e.g. forthcoming examination questions), but there is also a need to ease the route of any enquirer to the information they want. If we wish to broaden access we need to recognise that different audiences may be:

- using the document for different purposes
- working from different starting points
- working in different directions through the data
- wanting to get to different data in a different form.



**Figure 3.** Fifteen years of curriculum information are required to provide current and historical accuracy. In addition the same information can provide data for the study of longitudinal curriculum change. (The database will not be fully populated until 2002).

Navigating through the mass of available detail is facilitated in a number of ways. In addition to the nested outcomes, the electronic curriculum holds information about course content as a series of layers. For example, data is held about:

- components in each year
- list of taught sessions in each component
- content of individual session
- supporting information/learning resources.

This means that an individual accessing the curriculum would be able to work their way towards detailed information about a particular session without having to negotiate a morass of detail that is irrelevant to their current enquiry. Although much easier than using a paper document, this process is still only the equivalent of looking a topic up in the index of a book, finding the relevant chapter and working through headings to get to the information that you need. The electronic curriculum goes further.

Paper documentation is, by its nature, mono-directional. The data it contains is organised in a single set way. Where documentation has traditionally been part of a validation or review process, the information is organised for the type of enquiry which review involves. The specific organisation does not matter. It is the fact of its set nature that can be a problem. Although the paper document presents material in an organisation that is entirely logical for and appropriate to its original purpose, the content can appear very complex when a different type of interrogation works 'across the grain' of its original structure.

The electronic curriculum prepares and presents the data on the basis of the nature of the specific enquiry. So, for example, if an enquirer wished to look at a particular year outcome, they could look at it in relation to:

- the whole set of year outcomes
- the equivalent outcomes in other years
- the contributing outcomes from a particular module
- the contribution to that outcome from all modules in the year.



The electronic curriculum consists of a matrix of three types of data (Figure 4). In addition to learning outcome information and taught content information already described, users can search the database using key terms. This provides an additional navigational tool working within and between the outcome and content data. As with previous curriculum databases (Mattern *et al.*, 1992), MeSH terms are used as a first preference, although the breadth of our medical curriculum means that in some areas (e.g. ethics, law, social policy) other terms have to be used to provide sufficiently detailed signposting. An enquirer can work across all three dimensions of the matrix, changing 'direction' as often as they want in order to get the information they require in the form which is most helpful (Figure 5 and Box 1).

The electronic curriculum reflects the changing relationship between taught content and outcome during the span of the course which is itself reflective of ongoing changes in learning style and intellectual and professional development. Students entering the course through the normal science-focused 'A'-level route are focused on fact, have a simple dualistic belief in right and wrong answers (Perry, 1970) and are in the habit of passively absorbing those right answers through didactic teaching. In professional practice and continuing medical education, those qualifying from undergraduate medical education must recognise that 'truth' is relative, that evidence is rarely overwhelming and that the professional judgement called for needs to be supported by active, independent learning. The undergraduate medical course should not simply be a period during which this transformation takes place; it should be a tool which facilitates the transformation.

In the early part of the course, it is recognised that students are likely to enter the electronic curriculum matrix through the details of taught content and that outcomes will be used as much to navigate between lectures as for their own value. However, as they use them to navigate the curriculum, students recognise outcomes as a means to facilitate integration. They are thus built in to their

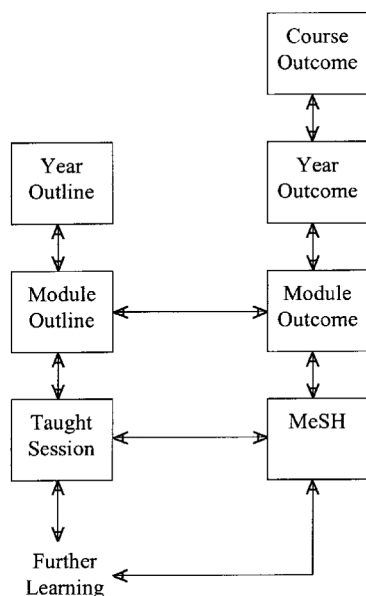


Figure 4. The structure of the Electronic Curriculum.

Behind the scenes, the Electronic Curriculum is driven by a series of related Filemaker Pro databases. The version of Filemaker Pro we have chosen (4.0) contains its own built-in web server so the Electronic Curriculum system can run as a self contained system. The added advantage that Filemaker Pro runs on both the Macintosh and Windows made it an ideal choice for this application. Clients can query the Electronic Curriculum either directly using Filemaker Pro's built-in peer-to-peer networking (allowing a mix of Mac and PC clients via TCP/IP) or via the World Wide Web (WWW). As the Electronic Curriculum is deliverable via the WWW, distribution of curriculum data to remote clinical teaching sites, primary care centres, etc in real time is now effortless.

The tables of related data within Filemaker Pro were constructed to represent the structure of the curriculum (see Figure 2 and Figure 4). This database structure also simplifies data entry and query. Modules and sessions within the database are linked to Further Learning Resources; external teaching aids such as web-based self assessment, online tutorials, remote web sites, etc.

**Box 1.**

developing professional conceptual framework. At this stage, no learning outcome is included which does not have an identifiable contribution from a taught session. Independent learning may also be needed, but it is never expected to stand alone. By the time students are in the third year, the standard route of entry into the curriculum database is via the detailed learning outcomes. Formal teaching is still a major component of the course, but many of the outcomes rely entirely on independent learning. Students may use the outcomes to identify the taught contribution, but that only forms a skeleton around which they must then structure their own learning. By the time students are in the fifth year, they will be familiar with using the learning outcomes to formulate their own learning plan which incorporates the limited formal teaching provided. The expectation is that by the time these students become house officers, they will be fully prepared to identify their own learning requirements: to write their own personal outcomes as it were and to seek out means to achieve them.

**Notes on contributors**

NICK ROSS, BA (Arch); RGN; Dip N. (Lon); Cert. Ed. FE; MA (CDHFE) has been involved in the development of the new MBChB programme at the University of Birmingham for 4 years and has recently been appointed Senior Lecturer: Medical Education. He has a background in nursing and nursing education and an M.A. in Curriculum Development.

DAVID DAVIES, Ph.D., is lecturer in physiology and biomedical computing. When not actively involved in teaching physiology he is responsible for co-ordinating the Medical School's computer assisted learning programme and developing new initiatives such as the electronic curriculum.

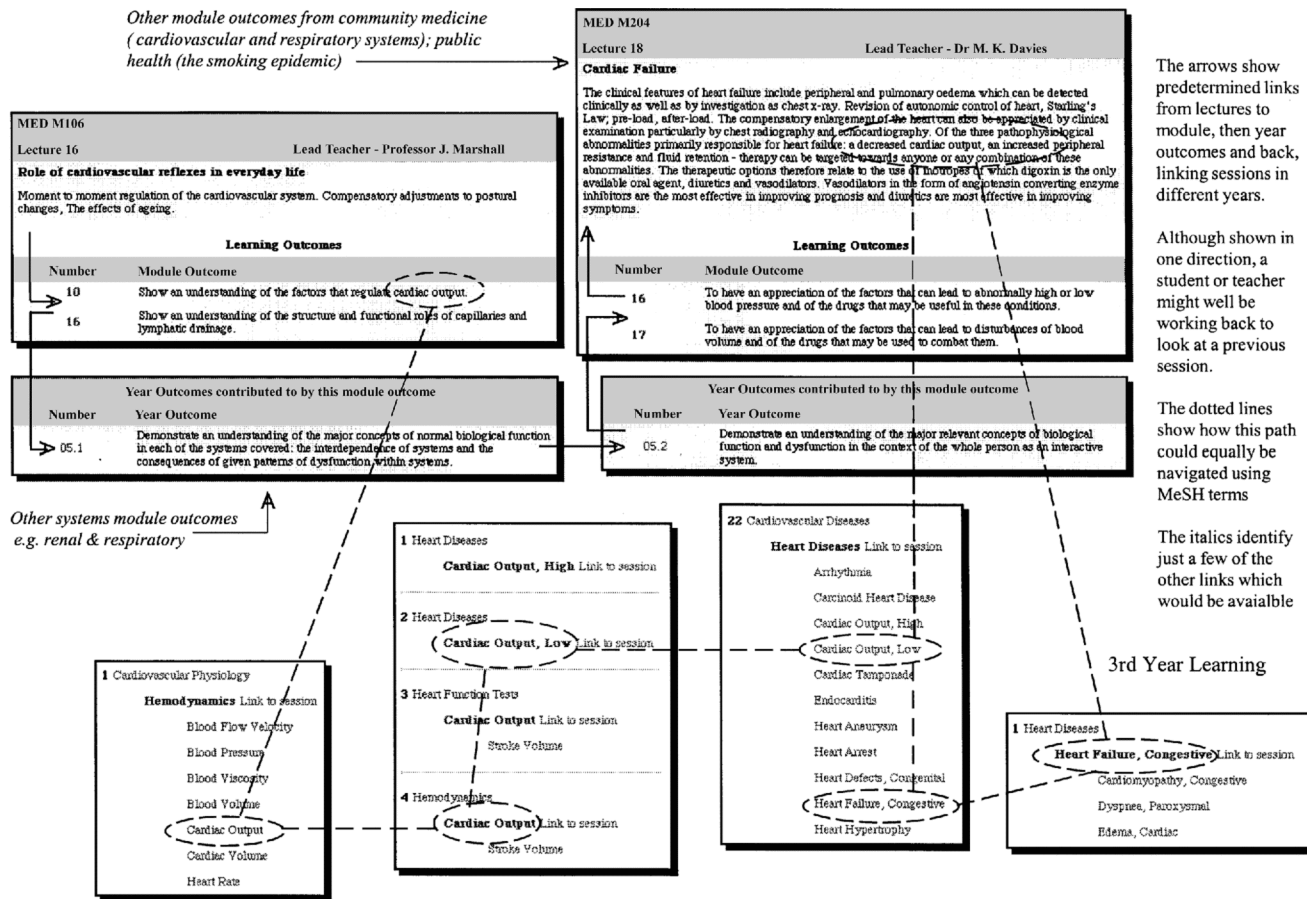


Figure 5.

References

BROWN, S. & KNIGHT, P. (1994) *Assessing Learners in Higher Education* (London; Philadelphia, Kogan Page).

GENERAL MEDICAL COUNCIL (1993) *Tomorrow's Doctors: Recommendations on Undergraduate Medical Education* (London, General Medical Council).

LAWTON, D. (1973) *Social Change, Educational Theory and Curriculum Planning* (London, Hodder and Stoughton).

LOWRY, S. (1993) *Medical Education* (London, BMJ Publishing Group).

MATTERN, W.D., ANDERSON, M.B., AUNE, K.C., CARTER, D.E.,

FRIEDMAN, C.P., KAPPELMAN, M.M. & O'CONNELL, M.T. (1992) Computer databases of medical school curricula, *Academic Medicine*, 67, pp. 12-16.

PERRY, W.G. (1970) *Forms of Intellectual and Ethical Development in the College Years* (New York; London, Holt, Rinehart & Winston).

QUALITY ASSURANCE AGENCY (1997) *Subject Review Handbook: October 1998-September 2000* (London, The Quality Assurance Agency for Higher Education).

SCHWARTZ, P.L., HEATH, C.J. & EGAN, A.G. (1994) *The Art of the Possible: Ideas from a Traditional Medical School Engaged in Curricular Revision* (Dunedin, University of Otago Press).

# AMEE Guide No. 14: Outcome-based education: Part 5—From competency to meta-competency: a model for the specification of learning outcomes

R.M. HARDEN, J.R. CROSBY, M.H. DAVIS & M. FRIEDMAN

Centre for Medical Education, Tay Park House, 484 Perth Road, Dundee DD2 1LR, UK

**SUMMARY** Increased attention is being paid to the specification of learning outcomes. This paper provides a framework based on the three-circle model: what the doctor should be able to do ('doing the right thing'), the approaches to doing it ('doing the thing right') and the development of the individual as a professional ('the right person doing it'). Twelve learning outcomes are specified, and these are further subdivided. The different outcomes have been defined at an appropriate level of generality to allow adaptability to the phases of the curriculum, to the subject-matter, to the instructional methodology and to the students' learning needs. Outcomes in each of the three areas have distinct underlying characteristics. They move from technical competences or intelligences to meta-competences including academic, emotional, analytical, creative and personal intelligences. The Dundee outcome model offers an intuitive, user-friendly and transparent approach to communicating learning outcomes. It encourages a holistic and integrated approach to medical education and helps to avoid tension between vocational and academic perspectives. The framework can be easily adapted to local needs. It emphasizes the relevance and validity of outcomes to medical practice. The model is relevant to all phases of education and can facilitate the continuum between the different phases. It has the potential of facilitating a comparison between different training programmes in medicine and between different professions engaged in health care delivery.

## The importance of outcomes

Outcome assessment has become the buzzword of the 1990s (Tamblyn, 1999) and outcome-based education offers a powerful and appealing way of reforming and managing medical education (Harden *et al.*, 1999). Much of the focus in medical education has moved from the 'how' and 'when' to the 'what' and 'whether'. Identifying, defining and communicating the skills and qualities we want doctors to have is fundamentally important. It is a process we must go through if we are to be clear what our medical school or training programme is for and on which issues we shall be judged.

What sort of doctor are we aiming to produce? What are the expected learning outcomes? Doctors have a unique blend of different kinds of abilities that are applied to the practice of medicine. What is needed or valued at any time depends on the context—at times it may be a practical intervention, at other times, diagnostic abilities and at other times a caring attitude and understanding.

Learning outcomes are increasingly used as a focus for curriculum planning (Otter, 1995). How they are

conceptualized and presented is important. This paper presents a useful model that offers a number of advantages when applied in practice.

## Criteria for specification of outcomes

Statements of learning outcomes can be judged against a number of criteria. Outcomes should be expressed in such a way that they:

- (1) *reflect the vision and mission* of the institution as perceived by the various stakeholders; the institution, the commissioners of the education and the public:
  - What sort of doctor is envisaged as the product of the educational programme encompassed by the set of learning outcomes?
- (2) *are clear and unambiguous*:
  - Can we look at the list of outcomes and know what attributes we expect to find in the doctor? Can the list of outcomes be easily understood and serve, for those who read it, as an overview of the curriculum?
- (3) *are specific* and address defined areas of competence:
  - Does the list have sufficient detail to allow a clarity of focus or is it so general that it is unhelpful in planning the curriculum and communicating the learning outcomes expected?
- (4) *are manageable* in terms of the number of outcomes:
  - Is the list sufficiently short that it can make a practical contribution to curriculum planning and serve as a framework for the organization of learning resources such as study guides and as a basis for the assessment, or will the learner and teacher feel overwhelmed by the details?
- (5) *are defined at an appropriate level of generality*:
  - Are the outcomes adaptable to the phases of the curriculum, to the subject-matter, to the instructional methodology and to the students' learning needs?
- (6) *assist with development of 'enabling' outcomes*:
  - Does the list of exit outcomes allow a 'designing-down' approach from the exit outcomes, so that one can see,

for example, a progression from the enabling outcomes at the end of year 4 to the exit outcomes at the end of year 5?

(7) indicate the *relationship between different outcomes*:

- Does the way in which the outcomes are expressed contribute to an understanding of how one outcome relates to another with a holistic approach to medicine or is each outcome seen in isolation?

### The three-circle model

Harden *et al.* (1999) described a three-circle model for classifying learning outcomes (Figure 1). It is based on the three dimensions of the work of a doctor.

- (1) The inner circle represents what the doctor is able to do, e.g. the physical examination of a patient. This can be thought of as 'doing the right thing'. It can be equated with technical intelligence, in line with Gardner's multiple intelligences model (Gardner, 1983).
- (2) The middle circle represents the way the doctor approaches the tasks in the inner circle, e.g. with scientific understanding, ethically, and with appropriate decision taking and analytical strategies. This can be thought of as 'doing the thing right' and includes the academic, emotional, analytical and creative intelligences.
- (3) The outer circle represents the development of the personal attributes of the individual—'the right person doing it'. It equates with the personal intelligences.

This model provides the basis for the development of the learning outcomes in medical education. The three categories that make up the three-circle model represent the first level in the outcome framework given in Table 1. The 12 key learning outcomes make up the second level. Seven of these are in the inner circle, three in the middle circle and two in the outer circle (Table 1).

The three dimensions in the three-circle model can be distinguished in a number of respects. Some fundamental differences are summarized in Table 2. We have likened the three-circle model to Handy's inside-out doughnut, with the dough in the centre representing the core of what the doctor has to be able to do—finite, well defined, explicit and visible and a mastery requirement for all doctors (Harden *et al.*, 1999). Surrounding this is the unbounded space of the hole on the outside representing what we could do or could be—less well defined and explicit and more open-ended and yet core. It is particularly in this area that doctors may

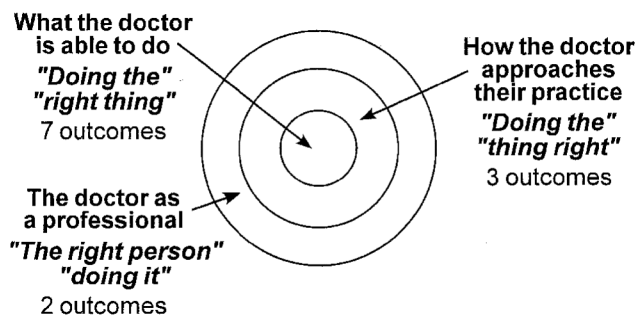


Figure 1. The three-circle model for outcome-based education.

excel and where one can distinguish the star performers from others. Outstanding professionals usually have special personal attributes. Goleman (1998) cites Ruth Jacobs—a senior consultant at Hay/McBer in Boston—“Expertise is a baseline competence. You need it to get the job and get it done, but how you do the job—the other competencies you bring to your expertise—determines performance.” He concludes that data from a number of studies suggest that, in general, “emotional and personal competencies play a far larger role in superior job performance than do cognitive abilities and technical expertise”. He emphasizes five basic competences: self-awareness, self-regulation, motivation, empathy and social skills.

A student or trainee may have all the technical competences in the inner circle, but not be a good doctor. The outcomes in the middle and outer circles mean that the student has to think as a doctor. Spady (1994) has recognized the importance of these higher-level outcomes:

To be a successful role performer, individuals must possess deeply internalized performance abilities that allow them to operate across a broad range of situations over extended periods of time. Developing these complex, broadly generalized performance abilities requires years of practice with a diversity of content in a variety of circumstances. It is not something a person accomplishes in a specific course or program. Increasingly, those implementing OBE are defining exit outcomes in terms of these complex kinds of role performance abilities because they see them as the forms of learning that do truly matter for students, their parents and society in the long run.

Professionalism and certain personal attributes are necessary in all doctors. “An important revolution is under way in UK medicine”, suggests Sir Donald Irvine, President of the General Medical Council (1999). “Concerted efforts are being made to find a modern expression of professionalism which if successful should bring the public and the medical profession closer together.” Implicit in this statement is the need to indicate the expected learning outcomes of a medical school and how professionalism features in these.

There is a danger that learning outcomes reflect only routine or lower level competences (as included in the inner circle in the model) and that personal qualities such as probity or values may be neglected (Ellis, 1995). Ellis cites the work of Edmonds & Teh (1990) in relating higher-level competences to outcome-based education in management. Personal qualities were identified which were seen as central to effective performance by the individual manager. Fleming (1991) has argued that many higher-level competences are in the nature of meta-competence, acting on other competences to produce flexibility and to utilize the competence in new situations. In the three-circle model the competences implicit in the outcomes in the middle and outer circles (columns B and C in Tables 1 and 2) transcend and act on or work through the competences identified in the outcomes in the inner circle (column A in Tables 1 and 2).

The model also reflects the response to change. The outcomes in the inner circle are anchored in the past and in the present and may have to be unlearned when circumstances change. The outcomes in the middle circle look to the future and give the doctor the flexibility to cope

**Table 1.** The learning outcomes for a competent and reflective practitioner, based on the three-circle model.

	A			B			C								
	What the doctor is able to do—'doing the right thing'			How the doctor approaches their practice—'doing the thing right'			The doctor as a professional—'the right person doing it'								
	<i>Technical intelligences</i>			<i>Intellectual intelligences</i>			<i>Emotional intelligences</i>			<i>Analytical and creative intelligences</i>			<i>Personal intelligences</i>		
	1	2	3	4	5	6	7	8	9	10	11	12			
Clinical skills	Practical procedures	Patient investigation	Patient management	Health promotion and disease prevention	Communication	Appropriate information handling skills	Understanding of social, basic and clinical sciences and underlying principles	Appropriate attitudes, ethical understanding and legal responsibilities	Appropriate decision-making skills, and clinical reasoning and judgement	Role of the doctor within the health service	Personal development				
<ul style="list-style-type: none"> <li>History</li> <li>Physical examination</li> <li>Interpretation of findings</li> <li>Formulation of action plan to characterize problem and reach a diagnosis</li> </ul>	<ul style="list-style-type: none"> <li>Cardiology</li> <li>Dermatology</li> <li>Endocrinology</li> <li>Gastroenterology</li> <li>Haematology</li> <li>Musculo-skeletal</li> <li>Nervous system</li> <li>Ophthalmology</li> <li>Otolaryngology</li> <li>Reproduction</li> <li>Respiratory</li> <li>Surgery</li> <li>General</li> </ul>	<ul style="list-style-type: none"> <li>General principles</li> <li>Clinical</li> <li>Imaging</li> <li>Biochemical medicine</li> <li>Haematology</li> <li>Immunology</li> <li>Microbiology</li> <li>Pathology</li> <li>Genetics</li> </ul>	<ul style="list-style-type: none"> <li>General principles</li> <li>Drugs</li> <li>Surgery</li> <li>Psychological</li> <li>Physiotherapy</li> <li>Radiotherapy</li> <li>Social</li> <li>Nutrition</li> <li>Emergency medicine</li> <li>Acute care</li> <li>Chronic care</li> <li>Rehabilitation</li> <li>Alternative therapies</li> <li>Patient referral</li> </ul>	<ul style="list-style-type: none"> <li>Recognition of causes of threats to health and individuals at risk</li> <li>Implementation where appropriate of basics of prevention</li> <li>Collaboration with other health professionals in health promotion and disease prevention</li> </ul>	<ul style="list-style-type: none"> <li>With patient</li> <li>With relatives</li> <li>With colleagues</li> <li>With agencies</li> <li>With media/press</li> <li>Teaching</li> <li>Managing</li> <li>Patient advocate</li> <li>Mediation and negotiation</li> <li>By telephone</li> <li>In writing</li> </ul>	<ul style="list-style-type: none"> <li>Patient records</li> <li>Assessing data sources</li> <li>Use of computers</li> <li>Implementation of professional guidelines</li> <li>Personal records (log books, portfolios)</li> </ul>	<ul style="list-style-type: none"> <li>Normal structure and function</li> <li>Normal behaviour</li> <li>The life cycle</li> <li>Pathophysiology</li> <li>Psychosocial model of illness</li> <li>Pharmacology and clinical pharmacology</li> <li>Public health medicine</li> <li>Epidemiology</li> <li>Preventive medicine and health promotion</li> <li>Education</li> <li>Health economics</li> </ul>	<ul style="list-style-type: none"> <li>Attitudes</li> <li>Understanding of ethical principles</li> <li>Ethical standards</li> <li>Legal responsibilities</li> <li>Human rights issues</li> <li>Respect for colleagues</li> <li>Medicine in multicultural societies</li> <li>Awareness of psychosocial issues</li> <li>Awareness of economic issues</li> <li>Acceptance of responsibility to contribute to advance of medicine</li> <li>Appropriate attitude to professional institution and health service bodies</li> </ul>	<ul style="list-style-type: none"> <li>Clinical reasoning</li> <li>Evidence-based medicine</li> <li>Critical thinking</li> <li>Research method</li> <li>Statistical understanding</li> <li>Creativity/ resourcefulness</li> <li>Coping with uncertainty</li> <li>Prioritization</li> </ul>	<ul style="list-style-type: none"> <li>Understanding of healthcare systems</li> <li>Understanding of clinical responsibilities and role of doctor</li> <li>Acceptance of code of conduct and required personal attributes</li> <li>Appreciation of doctor as researcher</li> <li>Appreciation of doctor as mentor or teacher</li> <li>Appreciation of doctor as manager including quality control</li> <li>Appreciation of doctor as member of multi-professional team and of roles of other healthcare professionals</li> </ul>	<ul style="list-style-type: none"> <li>Self-awareness</li> <li>Self-enquiries into own competence</li> <li>emotional awareness</li> <li>self-confidence</li> <li>Self-regulation</li> <li>self-care</li> <li>self-control</li> <li>adaptability to change</li> <li>personal time management</li> <li>Motivation</li> <li>achievement drive</li> <li>commitment</li> <li>initiative</li> <li>Career choice</li> </ul>				

**Table 2.** A comparison of learning outcomes in the different areas of the three-circle model.

	<b>A What the doctor is able to do</b> <i>'What to do'</i>	<b>B How the doctor approaches their practice</b> <i>'How to do it'</i>	<b>C The doctor as a professional</b> <i>'What to be'</i>
(1) <b>The theme</b>	Doing the right thing	Doing the thing right	The right person doing it
(2) <b>Intelligences</b>	Technical intelligences	Academic, emotional, analytical and creative intelligences	Personal intelligences
(3) <b>Definition</b>	Well defined and understood	Less well defined and understood	Poorly defined and understood
(4) <b>Scope</b>	A programme with a finite end Basic threshold competences Training learner to follow prescriptions	A continuous process of learning Additional outcomes related to competent performance and quality care Teaches learner to makes choices	Metacognition and personal development
(5) <b>Level of attainment</b>	Mastery requirement for all doctors	Core competences but open-ended—distinguishes star performers from others	Personal attributes greatest in outstanding practitioners
(6) <b>Observability</b>	Explicit—visible Actions	Explicit but less visible Thoughts and feelings	Implicit—implied Personal development
(7) <b>Discreteness</b>	Components of competence	Clinical performance	Overall professional performance 'Adaptable' practitioners
(8) <b>Response to change</b>	Anchored in past Has to be unlearned when circumstances change	Looks forward to future. Can be built upon in changing circumstances	
(9) <b>Focus for attention</b>	The clinical task	Interaction of task and doctor	The doctor
(10) <b>Knowledge</b>	Embedded in competences	Basis for understanding	Basis for further development
(11) <b>Teaching/Learning</b>	Acquisition of knowledge and skills, e.g. through lectures and clinical teaching	Reflection and discussion, e.g. with small-group work and problem-based learning	Role modelling and student-centred approaches to learning. May be the hidden curriculum
(12) <b>Assessment</b>	Assessment of mastery at points in time in specific areas	Developmental assessment of student change and growth over time	Overall developmental assessment of student professional growth

with changing circumstances. This is embraced by the notion of the 'adaptable' practitioner, which is reflected by the outcomes in the outer circle.

Knowledge is embedded in the seven outcomes in the inner circle, e.g. what the doctor needs to know to measure a patient's blood pressure or to manage a patient with thyrotoxicosis. In the middle circle, knowledge is a basis for understanding and for the caring reflective practitioner. In the outer circle, knowledge is a basis for the doctor's further development. A detailed discussion of the relation between knowledge and outcomes is beyond the scope of this paper. Davidoff (1996) describes how, in the USA, "the Residency Review Committee makes clear that it has moved beyond the traditional 'learning objectives' definition of curriculum of the classroom educator, and has faced up to the realities of clinical education . . . . They [the learners] need to 'put it all together', to perform at a high professional level."

The three-circle model also acknowledges the need for a range of strategies and approaches to both teaching and assessment. Approaches to learning, such as problem-based

learning (Davis & Harden, 1999), which encourage reflection and discussion, can contribute to the achievement of the learning outcomes in the middle circle, and role modelling and student-centred approaches such as portfolio assessments are important for the achievement of outcomes in the outer circle.

Thus the 12 criteria in Table 2 provide the conceptual justification for the grouping of the 12 outcomes into the three circles. The better the understanding of the underlying characteristics the better is likely to be the adaptation of this outcome model to local needs. Similar work was done in designing the Australian competence standards framework. Five criteria were developed to differentiate among eight levels of competence: discretion in the work, application of theoretical knowledge, complexity of tasks, supervision and responsibility for others and need for creativity and design (Curtain & Hayton, 1995). The underlying criteria for the Dundee three-circle model provide an educational continuum for the separate outcomes that in turn assist faculty in defining the outcomes for each of the three circles.

### Development of the outcome model

The outcome model was developed in Dundee over a period of 12 months, with input from a number of sources, including:

- an analysis of learning outcomes as defined by bodies such as the General Medical Council in the UK (General Medical Council, 1993);
- a review of the approach adopted by the Association of American Medical Colleges (1998) and institutions such as Brown University (Smith & Dollase, 1999);
- a literature survey for reports of outcomes in medicine and other fields of professional practice;
- informal discussions with colleagues within and outwith Dundee;
- formal discussions in an outcome-based education working group within the context of the new Dundee Curriculum (Harden *et al.*, 1997) and discussions at meetings of the Undergraduate Medical Education Committee;
- a meeting of more than 100 National Health Service and university staff and students in Dundee at which the outcome model was presented and feedback obtained using an audience-response system.

### The twelve outcomes

The seven learning outcomes corresponding to the inner circle describe what the doctor should be able to do. They can be clearly defined and are usually visible in terms of some type of performance. They are made up of discrete components of competence and can be taught as such and evaluated in performance assessments such as the objective structured clinical examination. They are:

- (1) *Competence in clinical skills*: The doctor should be competent to take a comprehensive, relevant medical and social history and perform a physical examination. He or she should be able to record and interpret the findings and formulate an appropriate action plan to characterize the problem and reach a diagnosis.
- (2) *Competence to perform practical procedures*: The doctor should be able to undertake a range of procedures on a patient for diagnostic or therapeutic purposes. This usually involves using an instrument or some device, e.g. suturing a wound or catheterization.
- (3) *Competence to investigate a patient*: The doctor should be competent to arrange appropriate investigations for a patient and where appropriate interpret these. The investigations are carried out on the patient or on samples of fluid or tissue taken from the patient. The investigations are usually carried out by personnel trained for the purpose, e.g. a clinical biochemist or radiographer, but may in some instances be carried out by the doctor.
- (4) *Competence to manage a patient*: The doctor is competent to identify appropriate treatment for the patient and to deliver this personally or to refer the patient to the appropriate colleague for treatment. Included are interventions such as surgery and drug therapy and contexts for care such as acute care and rehabilitation.
- (5) *Competence in health promotion and disease prevention*: The doctor recognizes threats to the health of individuals or communities at risk. The doctor is able to imple-

ment, where appropriate, the basic principles of disease prevention and health promotion. This is recognized as an important basic competence alongside the management of patients with disease.

- (6) *Competence in skills of communication*: The doctor is proficient in a range of communication skills, including written and oral, both face-to-face and by telephone. He or she communicates effectively with patients, relatives of patients, the public and colleagues.
- (7) *Competence to retrieve and handle information*: The doctor is competent in recording, retrieving and analysing information using a range of methods including computers.

The second group of outcomes correspond to the middle circle and describe how the doctor approaches the seven competences described in the first category.

- (1) *With an understanding of basic, clinical and social sciences*: Doctors should understand the basic, clinical and social sciences that underpin the practice of medicine. They are not only able to carry out the tasks described in outcomes 1 to 7, but do this with an understanding of what they are doing, including an awareness of the psychosocial dimensions of medicine and can justify why they are doing it. We have termed this the 'academic intelligences'.
- (2) *With appropriate attitudes, ethical understanding and understanding of legal responsibilities*: Doctors adopt appropriate attitudes, ethical behaviour and legal approaches to the practice of medicine. This includes issues relating to informed consent, confidentiality, and the practice of medicine in a multicultural society. The importance of emotions and feelings is recognized as the 'emotional intelligences' (Goleman 1998).
- (3) *With appropriate decision-making skills and clinical reasoning and judgement*: Doctors apply clinical judgement and evidence-based medicine to their practice. They understand research and statistical methods. They can cope with uncertainty and ambiguity. Medicine requires, in some cases, instant recognition, response and unreflective action, and at other times deliberate analysis and decisions, and action following a period of reflection and deliberation. This outcome also recognizes the creative element in problem solving that can be important in medical practice.

The last two outcomes relate to the outer circle and are concerned with the personal development of the doctor as a professional—the 'personal intelligences'.

- (1) *Appreciation of the role of the doctor within the health service*: Doctors understand the healthcare system within which they are practising and the roles of other professionals within the system. They appreciate the role of the doctor as physician, teacher, manager and researcher. It implies a willingness of the doctor to contribute to research even in a modest way and to build up the evidence base for medical practice. It also recognizes that most doctors have some management and teaching responsibility.
- (2) *Aptitude for personal development*: The doctor has certain attributes important for the practice of medicine. He or she is a self-learner and is able to assess his or her own

performance. The doctor takes responsibility for his or her own personal and professional development, including personal health and career development.

### Advantages of the outcome model

The model described offers a number of advantages.

- (1) It offers an *intuitive, user friendly and transparent approach* to communicating the learning outcomes of an education programme. In our experience it can be readily understood by both doctors and students. It has sufficient detail to convey its meaning clearly but not too much to overwhelm the user.
- (2) The model provides a compelling statement of *significant exit outcomes* and provides a macro-perspective. A criticism of many current curricula is that they cover more and more material at increasingly superficial levels with no assurance of attainment of the exit learning outcomes.
- (3) The model emphasizes a *holistic and integrated approach* to medical education and the interaction between the different outcomes. The fact that it can be represented on a single A3 sheet allows the reader to see the broader picture and to assimilate this. It can then be used as a tool in curriculum planning and assessment. It highlights areas which have been relatively neglected and where there are omissions in the curriculum.
- (4) The specification of outcomes may be *adapted to suit the local context* and while the relative emphasis given to the different outcomes and the more detailed specification of the outcomes may vary from school to school, it is likely that the key 12 outcomes will be common to all schools.
- (5) The learning outcomes are *performance based* and relate to the work of the doctor. This relevance and validity makes them more likely to be accepted by the practising clinical teacher.
- (6) The model is a useful tool for *assessment purposes*. Howie *et al.* (2000) described the use of portfolio assessment in a final medical examination, structured round the 12 outcomes.
- (7) The model helps to *reconcile tensions between vocational and academic education*. It recognizes, in outcomes 1 to 7, competences necessary for effective medical practice. The doctor, however, may have the skills to carry out the tasks of a doctor but not the capability as reflected in outcomes 8, 9 and 10. Outcome 8 adds an important academic dimension. The sciences are seen not just as an introduction to the clinical part of the medical courses, to be learned and then forgotten, but as an important underpinning for medical practice and as part of the hallmark of the good doctor.
- (8) The model recognizes the concept of *graduateness*. The outcomes highlight the attributes underpinning the discipline of medicine and emphasize the coherent nature of the programme that students require to study and understand. With the outcome interrelated, the evidence-based and reflective nature of medical practice is emphasized.
- (9) The model emphasizes the *personal development* of the doctor as a professional including the doctor as an inquirer into his or her own competence (outcomes 11 and 12).

- (10) The emphasis on the 12 outcomes and on the '*design down*' approach to more detailed specifications facilitates curriculum planning. In the past, educational practice has concentrated on the more detailed lower-level specification of learning objectives usually in terms of knowledge, skills, attitudes, with the higher levels imposed by the organization of the curriculum. Agreement is likely at the level of the 12 outcomes, even if there is disagreement at the lower levels of outcomes. This then serves as a firm foundation for further work on the curriculum.
- (11) The framework is applicable at *all phases of education* and its use in undergraduate, postgraduate and continuing medical education may facilitate the continuum of medical education and the transition from one phase to the next.
- (12) Preliminary studies suggest that a similar framework can be applied to *other healthcare professions*. This may help in an understanding of the different professional roles and could facilitate the development of a multi-professional education programme.

### Conclusion

The model described provides a useful tool when thinking about outcome-based education. The Dundee outcome model employs a broad definition of 12 outcomes. In all 12 outcomes, performance is underpinned by a number of cognitive and behavioural skills. The model encourages the holistic approach to outcome-based education with the outcome in the middle and outer circles acting through the outcomes in the inner circle. It can be of assistance in curriculum planning and offers a framework for teachers to develop outcomes relevant to their own needs. Modified appropriately, it is a powerful tool for teachers designing (or planning) and implementing the education programme, for examiners assessing the students' performance and not least for students who ultimately have the responsibility for learning.

### Notes on contributors

R.M. HARDEN is Director of the Centre for Medical Education and Teaching Dean in the Faculty of Medicine, Dentistry and Nursing at the University of Dundee. He is also Director of the Education Development Unit (Scottish Council for Postgraduate Medical & Dental Education), Dundee, UK.

J.R. CROSBY is Curriculum Facilitator and Lecturer in Medical Education at the Faculty of Medicine, Dentistry and Nursing at the University of Dundee, UK.

M.H. DAVIS is a doctor specialising in medical education, and Senior Lecturer in Medical Education, Centre for Medical Education, University of Dundee, Dundee, UK.

M. FRIEDMAN is an International Consultant in Medical Education, 129 Woodpecker Road, Jenkintown, PA, USA

### References

- ASSOCIATION OF AMERICAN MEDICAL COLLEGES (1998) *Report 1: Learning Objectives for Medical Student Education Guidelines for Medical Schools* (Washington, DC, Medical School Objectives Project, AAMC).
- CURTAIN, R. & HAYTON, G. (1995) The use and abuse of a competency standards framework in Australia: a comparative perspective, *Assessment in Education*, 2(2), pp. 205–224.



- DAVIS, M.H. & HARDEN, R.M. (1999) AMEE Medical Education Guide No 15: Problem-based learning: a practical guide, *Medical Teacher*, 21(2), pp. 130–140.
- DAVIDOFF, F. (1996) Who has seen a blood sugar? Reflections on Medical Education 11.18 and 14.18. American College of Physicians, Philadelphia, Pennsylvania.
- EDMONDS, T. & TEH, M. (1990) Personal competence: Where does it fit in?, *Competence and Assessment*, 13, pp. 6–8.
- ELLIS, P. (1995) Standards and the outcomes approach, in: J. BURKE (Ed.) *Outcomes, Learning and the Curriculum: Implications for NVQs, GNVQs and Other Qualifications*, p. 83 (London, Falmer Press).
- FLEMING, D. (1991) The concept of meta-competence, *Competence and Assessment*, 16, pp. 9–12.
- GARDNER, H. (1983) *Frames of Mind* (New York, Basic Books).
- GENERAL MEDICAL COUNCIL (1993) *Tomorrow's Doctors: Recommendations on Undergraduate Medical Education* (London, GMC).
- GOLEMAN, D. (1998) *Working with Emotional Intelligence*, p. 21 (London, Bloomsbury).
- HARDEN, R.M., DAVIS, M.H. & CROSBY, J.R. (1997) The new Dundee medical curriculum: a whole that is greater than the sum of the parts, *Medical Education*, 31, pp. 264–271.
- HARDEN, R.M., CROSBY, J.R. & DAVIS, M.H. (1999) AMEE Guide No 14: Outcome-based education: Part 1—An introduction to outcome-based education, *Medical Teacher*, 21(1), pp. 7–14.
- HOWIE, P.W., DAVIS, M.H., PIPPARD, M.J. & HARDEN, R.M. (2000) Portfolio assessment as a final examination, *Medical Teacher*, in press.
- IRVINE, D. (1999) The performance of doctors: the new professionalism, *Lancet*, 353, pp. 1174–1177.
- OTTER, S. (1995) Learning outcomes in higher education, in: J. BURKE (Ed.) *Outcomes, Learning and the Curriculum: Implications for NVQs, GNVQs and Other Qualifications*, p. 273 (London, Falmer Press).
- SMITH, S.R. & DOLLASE, R. (1999) Planning, implementing and evaluating a competency-based curriculum, *Medical Teacher*, 21, pp. 15–22.
- SPADY, W.G. (1994) *Outcome-based Education: Critical Issues and Answers* (Arlington, VA, American Association of School Administrators).
- TAMBLYN, R. (1999) Outcomes in medical education: what is the standard and outcome of care delivered by our graduates?, *Advances in Health Sciences Education*, 4, pp. 9–25.