

Outcome-based Education

An extended summary of AMEE Medical Education, Guide No.14

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- Part 2: Smith SR & Dollase R (1999). Planning, implementing and evaluating a competency-based curriculum, *Medical Teacher* 21(1): 15-22
- Part 3: Friedman Ben-David M (1999). Assessment in outcome-based education, *Medical Teacher* 21(1): 23-25
- Part 4: Ross N & Davies D (1999). Outcome-based learning and the electronic curriculum at Birmingham Medical School, *Medical Teacher* 21(1): 26-31
- Part 5: Harden RM, Crosby JR, Davis MH & Friedman M (1999). From competency to meta-competency: a model for the specification of learning outcomes. *Medical Teacher* 21(6): 546-552

Guide Overview

This guide explores the concept of Outcome-based Education and discusses some of the background and the advantages of adopting the approach. The Dundee three circle model for considering the learning outcomes in medicine is described, offering a practical and user-friendly approach to the concept and encouraging a holistic approach to medical practice.

The full text of this guide comprises 45 pages and 62 references and is available from:

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Preface: Medical education and the goals of medicine

Daniel Callahan

It has been an odd fact of contemporary medicine that there has been comparatively little discussion or debate on the goals of medicine. A literature search on the topic will turn up few items. It seems to have been assumed either that everyone knows what the goals are and that discussion is thus not needed, or that the topic is too elusive and general to be worth exploration. Whatever the reasons, one result of the neglect is that too many issues of vital importance for the future of medicine and health care are treated as technical issues only, matters of means not ends. But the ends and goals of medicine require careful thought. The Hastings Center international project on 'The Goals of Medicine: Setting New Priorities' identified the deficiencies of the 'diagnose and treat' model, and the need to introduce students, from the outset of their education, to the full range and complexity of health, disease, illness and sickness.

The report also identified the problems associated with an excessively reductionistic, scientific approach to illness and disease. A good medical education can foster an ability to move back and forth between a narrowly focused scientific approach and a wide-angle lens perception of the human and social context of illness and disease.

Introduction: Outcomes in medical education must be wide, long and deep

John D Hamilton

Clarity of intended education outcome is essential and must underlie curriculum, student assessment, programme evaluation and student selection. But we need to move out into the real world to find the full scope of outcomes necessary for optimal contribution to healthcare and to fulfill the expectations of our patients and community. We must also look far ahead to identify outcomes to match our expectation of the future. The task for the future is to ensure that we address outcomes that widen the scope of role and responsibility of graduates, are long in their time line and deep in their relevance to professional development.

Part 1: An introduction to outcome-based education

RM Harden, JR Crosby & MH Davis

Outcome-based education 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. It is a performance-based approach at the cutting edge of curriculum development, offering 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 (Figure 1).

- 1 The inner circle represents what the doctor is able to do, eg the physical examination of a patient. This can be thought of as “doing the right thing”
- 2 The middle circle represents the way the doctor approaches the tasks in the inner circle eg with scientific understanding, ethically, and with appropriate decision taking and analytical strategies. This can be thought of as “doing the thing right”
- 3 The outer circle represents the development of the personal attributes of the individual – “the right person doing it”.



Figure 1: A three circle model representing educational outcomes

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. The arguments for introducing outcome-based education and evaluating its role in medical education are strong.

Part 2: Planning, implementing and evaluating a competency-based curriculum

Stephen R Smith & Richard Dollase

The leadership at Brown's Medical School assert that by clearly specifying the educational outcomes in behaviorally measurable ways it is possible to change the way faculty teach and students learn. Instead of solely determining whether students graduate based on the accumulation of course credits, graduation should be contingent upon demonstrating mastery of a defined set of competencies.

At Brown University it is believed that competency-based education represents the model for medical education in the next century. Brown's approach to the education of medical students begins with the tasks that will be expected of the physician practising in the twenty-first century, then builds a curriculum designed to equip its graduates with those attributes needed to perform those tasks competently.

Nine abilities were identified which describe a successful doctor (Table 1):

Table 1

1	Effective communication
2	Basic clinical skills
3	Using basic science in the practice of medicine
4	Diagnosis, management and prevention
5	Lifelong learning
6	Self-awareness, self-care and personal growth
7	The social and community contexts of health care
8	Moral reasoning and clinical ethics
9	Problem solving

Each of the nine abilities were translated 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.

A core knowledge base was agreed which complemented the nine abilities. This did not rely on a traditional disciplinary approach. For basic science it 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:

- Organization & structure
- Maintenance & someostasis
- Defense against disease & injury
- Mechanisms of and response to disease & injury
- Therapies & Interventions

The clinical medicine matrix focused on the five different types of encounters that occur between doctors and patients on the horizontal axis:

- Preventive/Developmental
- Acute
- Emergency
- Chronic
- Behavioral

Stages of life were identified on the vertical axis:

- Fetus/neonates
- Children
- Adolescents
- Adults
- Elders

Part 3: Assessment in outcome-based education

Miriam Friedman Ben-David

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 students are entitled to learning experiences which will adequately represent the assessment methods.

Outcome-based education 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. In outcome based programmes, a comprehensive assessment should be integrated with all stages of the curriculum from its initial conception and assessment activities integrated with learning to enhance student learning from their own assessment experience. 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.

Part 4: Outcome-based learning and the electronic curriculum at Birmingham Medical School

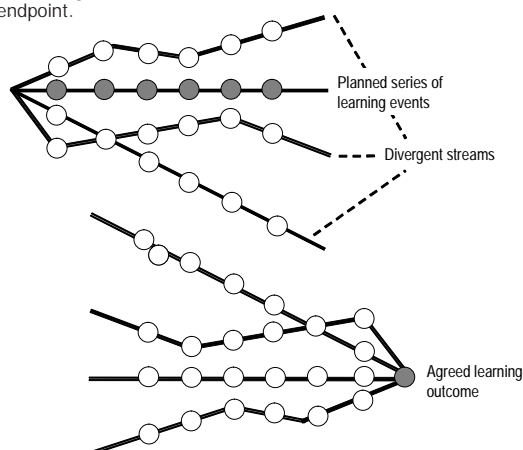
Nick Ross & David Davies

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. A number of factors led the University of Birmingham School of Medicine to develop an outcome-led curriculum for a new undergraduate medical course as shown in Figure 2 (page 5).

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. 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. 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 electronic curriculum can be accessed on the web by students, clinical and non-clinical teaching staff and support staff.

Figure 2

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



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.

The University of Birmingham School of Medicine developed a 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 were able to take a greater level of responsibility for their own learning. These detailed outcomes formed 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. A set of 24 broad outcomes outlined the learning to be achieved at the end of the course. Each of these broad outcomes had 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'.

It was the belief that a detailed outcome-led curriculum is of value, but requires electronic management if it is to be user friendly.

The electronic curriculum reflects the changing relationship between taught content and outcome during the span of the course which is itself reflective of ongoing change in learning style and intellectual and professional development.

Part 5: From competency to meta-competency: a model for the specification of learning outcomes

RM Harden, JR Crosby, MH Davis & M Friedman

The Dundee three circle outcome model as described in Part 1 offers an intuitive, user-friendly and transparent approach to communicating learning outcomes as shown in Figure 3 (page 6). 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 emphasises the relevance and validity of outcomes to medical practice. Outcomes in each of the three areas have distinct underlying characteristics as shown in Figure 4 (page 7). They move from technical competences or intelligences to meta-competences including academic, emotional, analytical, creative and personal intelligences.

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'	
Technical intelligences							Intellectual Intelligences	Emotional Intelligences	Analytical and creative intelligences	Personal Intelligences	
Clinical skills	Practical procedures	Patient investigation	Patient management	Health promotion and disease prevention	Communication	Appropriate information handling skills	Understanding of social, basic & clinical sciences & 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"> History Physical examination Interpretation of findings Formulation of action plan to characterise 	<ul style="list-style-type: none"> Cardiology Dermatology Endocrinology Gastroenterology Haematology Musculo-skeletal Nervous System Ophthalmology Otolaryngology 	<ul style="list-style-type: none"> General principles Clinical Imaging Biochemical medicine Haematology Immunology 	<ul style="list-style-type: none"> General principles Drugs Surgery Psychological Physiotherapy Radiotherapy Social Nutrition Emergency medicine Acute care 	<ul style="list-style-type: none"> Recognition of causes of threats to health and individuals at risk Implementation where appropriate of basics of prevention Collaboration with other health professionals in health promotion and disease prevention 	<ul style="list-style-type: none"> With patient With relatives With colleagues With agencies With media/press Teaching Managing Patient advocate Mediation and negotiation By telephone In writing 	<ul style="list-style-type: none"> Patient records Accessing data sources Use of computers Implementation of professional guidelines Personal records (log books, portfolios) 	<ul style="list-style-type: none"> Normal structure and function Normal behaviour The life cycle Pathophysiology Psychosocial model of illness Pharmacology and Clinical Pharmacology Public health medicine Epidemiology Preventative medicine and health prevention Education Health economics 	<ul style="list-style-type: none"> Attitudes Understanding of ethical principles Ethical standards Legal responsibilities Human rights issues Respect for colleagues Medicine in multicultural societies Awareness of psycho-social issues Awareness of economic issues Acceptance of responsibility to contribute to advance of medicine Appropriate attitude to professional team and institution and health service bodies 	<ul style="list-style-type: none"> Clinical reasoning Evidence-based medicine Critical thinking Research method Statistical understanding Creativity/resourcefulness Coping with uncertainty Prioritisation 	<ul style="list-style-type: none"> Self learner Self awareness enquires into own competence emotional awareness self confidence Self regulation self care self control adaptability to change personal time management Motivation achievement drive commitment initiative Career choice 	

Figure 3: The learning outcomes for a competent and reflective practitioner, based on the three circle model

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

Figure 4: A comparison of learning outcomes in the different areas of the three circle model