

Curriculum and course design

Clinical teachers may be involved in planning and developing courses and teaching sessions for different groups of students or trainees. Understanding the principles of curriculum development and design can help teachers provide the most appropriate educational interventions for their learners.

This article introduces curriculum design and course development, highlighting some of the main approaches and recent trends in medical and health-care education. Many of the principles described apply in a range of contexts and to both large and small-scale activities.

Introduction

A curriculum defines the learning that is expected to take place during a course or programme of study in terms of knowledge, skills and attitudes. It specifies teaching, learning and assessment methods and indicates the learning resources required to support effective delivery. One of the primary functions of a curriculum is to provide a framework or design which enables learning to take place. A syllabus is the part of a curriculum that describes the content of a programme.

The written and published curriculum (e.g. course documentation including the prospectus, course guides or lecturers' hand-outs) is the official or formal curriculum. The formal curriculum should match the functional (delivered) curriculum and is distinguished from the hidden, unofficial or counter curriculum. The hidden curriculum describes aspects of the educational environment and student learning (such as values and expectations that students acquire as a result of going through an educational process) which are not formally or explicitly stated but which relate to the culture and ethos of an organization.

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The curricular cycle

In developing a new programme, or modifying an existing one, there are a number of stages which should be completed within the curricular cycle (Figure 1).

The broad context

Curriculum design needs to reflect the educational, health-care and professional context and the level of the learners and expected outcomes. In addition, educational theories (e.g. adult learning, student-centred learning, flexible learning and self-directed learning) may influence the overall programme philosophy and approach.

Table 1 indicates how medical education has moved from a more teacher-centred, didactic approach to a more student-centred and community-based approach.

Medical and health-care curricula are informed by reports and recommendations of statutory bodies, benchmarking and professional standards (e.g. *Tomorrow's Doctors*; General Medical Council, 2009), or a syllabus, learning outcomes or competency statements (e.g. those produced for postgraduate medical education). These provide templates for curriculum design and form the backdrop for audit, review and inspection.

Curriculum strategies and approaches

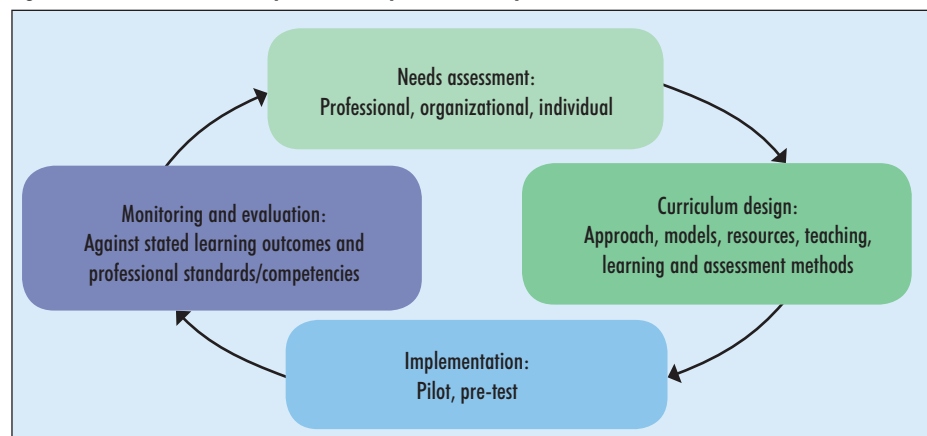
All parts of a course or programme must fit (in terms of approach, level and con-

tent) with the overall course. When designing a new course, stakeholders' needs can be addressed through careful selection of educational approaches.

Table 1. Trends in medical education

Flexner (1910)	Teacher centred
	Knowledge giving
	Discipline led
	Hospital oriented
	Standard programme
	Opportunistic (apprenticeship)
Harden et al (1984) The SPICES model	Student-centred
	Problem based
	Integrated
	Community oriented
	Electives (+ core)
	Systematic
Bligh et al (2001) PRISMS	Practice based linked with professional development
	Relevant to students and communities
	Interprofessional and interdisciplinary
	Shorter courses taught in smaller units
	Multisite locations
	Symbiotic (organic whole)

Figure 1. The curriculum development and implementation cycle.



A strategic issue to consider is whether the course design, delivery and management is centrally managed or decentralized. Centralized curricula tend to be more structured and orderly and it is easier to ensure uniformity and a standard approach to teaching and learning. They may also allow better access to a wide pool of expertise but be less sensitive to local needs. Decentralized curricula can be more appropriate to students' local needs, enable a variety of approaches to design and delivery and ensure ownership of the course by teachers.

The objectives and the process models, which represent two philosophical approaches, have influenced curriculum development and design. They are not mutually exclusive.

Objectives model

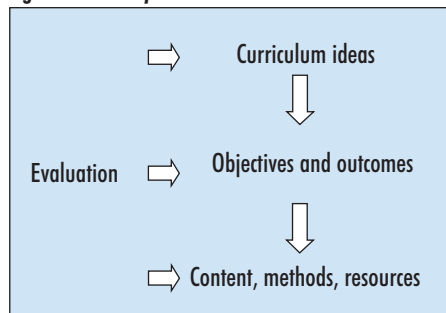
The objectives model defines learning in terms of what students should be able to do after studying the programme as learning outcomes or objectives.

Curriculum design according to this model follows four steps:

1. Reach agreement on broad aims and specific objectives for the course
2. Construct the course to achieve these objectives
3. Define the curriculum in practice by testing capacity to achieve objectives
4. Communicate the curriculum to teachers.

Objectives set at a superficial level or narrow specification limit the teacher and valuable learning experiences may be lost. Using an objectives model enables the construction of assessments which can be designed against the learning objectives. The objectives model reflects how national standards and curricula are described. It is a systematic approach to course planning and forms part of outcomes-based education (Prideaux, 2000) (Figure 3).

Figure 3. The objectives or outcomes model.



Process model

The process model sees content and learning activities as having intrinsic value, and not just as a means of achieving learning objectives. The model suggests that translating behavioural objectives is trivializing. Stenhouse (1975) suggests education comprises four fundamental processes:

1. Training (skills acquisition)
2. Instruction (information acquisition)
3. Initiation (socialization and familiarization with social norms and values)
4. Induction (thinking and problem solving).

He suggests that behavioural objectives are important only in the first two processes, that initiation and induction cannot be defined by using objectives and that behavioural objectives are inappropriate for problem-based learning, professional development or clinical problem solving.

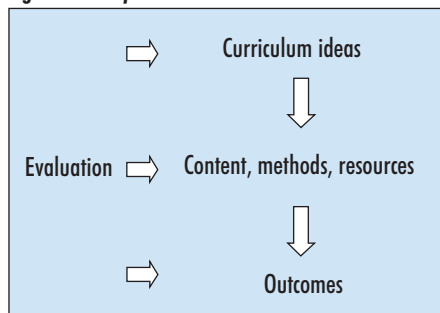
The process model encourages creative or experiential approaches where learning is situated through experiences and group dynamics and outcomes emerge through the learning process (Figure 4).

Effective curriculum design combines both approaches according to student need, teacher experience and organizational structure and resources. For example, it is useful to design the overall shape of the course, the main aims and learning objectives, broad content areas and time allocation centrally but then devolve out the detailed planning and design to teachers who deliver the course so that they have ownership.

Models of curriculum design

In medical and health-care education and training, learners are required to acquire a complex mix of knowledge, skills and attitudes, to be able to synthesize and apply their learning to new and often demanding situations and to be lifelong learners, acquiring and using skills and attitudes

Figure 4. The process model.



such as study skills and self motivation throughout their working lives.

Students need to acquire certain information or skills before they can move on to apply learning. The sequence of learning should move from simple 'building blocks' to understanding complex principles and enable the shift from 'novice' to 'expert'. The 'spiral curriculum' constructs learning as a developing process with active reinforcement and assessment at key stages coupled with the acquisition of new knowledge and skills. A learner-centred approach emphasizes adult learning methods, recognizing that learning is an active, constructive and contextually-bound activity. This takes the needs of individual and groups of learners into account, including factors such as gender, background, age and previous experience or education of the learners, learning styles or barriers to learning such as dyslexia or other disability. This approach is more resource intensive as it relies on smaller groups, more advance planning is needed by teachers and students may need preparation in the shift from more didactic teaching.

To facilitate this, when planning or delivering a course or session, the teacher might ask:

- What level of understanding and experience do the learners have?
- What should I be expecting from the group in terms of knowledge, skills and attitudes?
- What topics and course areas have they been studying before this particular course or session?
- What are they going on to do and what should I be preparing them for?
- Have I built in opportunities for flexibility to address unforeseen learning needs?
- Where will the learning take place and what opportunities do the settings open up for me?
- Does the student or trainee have any particular learning needs or difficulties?
- How will I judge the effectiveness of my teaching as it progresses so that I can adjust the approach if necessary?

In undergraduate medical education, there are a few prevailing curricular models which embody different approaches to teaching and learning.

Pre-clinical and clinical model

The traditional pre-clinical and clinical model separates (both conceptually and

temporally) pre-clinical knowledge and skills from clinical knowledge and skills. This was the prevailing model of medical education worldwide until the last 20 years and is still common across the world. Although the traditional approach has often been criticized for separating the underpinning 'science' from clinical medicine, it is often easier to develop and deliver a traditional course within the structure and organization of medical schools.

Graduate entry

Increasingly many medical courses are designed as graduate entry programmes, usually of about 4 years' duration, which build on students' earlier experiences and focus on clinical medicine. Students entering such courses would be expected to have obtained a good first degree in a relevant subject and passed an entry test.

Integrated curricula

Health-care curricula are still subject centred but the overarching curriculum transcends traditional subject boundaries. Teaching units from subject disciplines are fused together around meaningful organizing themes or concepts. Vertical integration describes the blurring of boundaries between pre-clinical and clinical courses whereas horizontal integration describes how knowledge and skills from many disciplines are clustered around themes such as body systems (e.g. a cardiovascular systems course might include anatomy, physiology, biochemistry, pathology, clinical medicine, sociology and epidemiology). Integration helps students develop a more holistic view of patients' problems. However, some subjects or topics may be omitted or over taught and organizational boundaries such as departments and funding mechanisms may create barriers to integration. Close supervision and central curriculum mapping and management is required.

Problem-based learning

Problem-based learning has been very influential within medical education. Problem-based learning aims to stimulate students to observe, think, define, study, analyse, synthesize and evaluate a problem. The 'problems' or cases are written to simulate real-life clinical problems which are multidimensional and which encourage students to think as they would in real-life clinical situations. By addressing the 'prob-

lem' students learn to place propositional knowledge into 'real world' contexts, an approach that improves the retention and application of knowledge.

In practice a combination of models and methods is often most appropriate and most modern health-care curricula synthesize different approaches.

Competencies

Clinical medicine at all levels tends to take a competency-based approach to the 'training' element of the curriculum although some critics note the reductionist approach to learning and assessment (e.g. Talbot, 2004). Competences are found in many areas of vocational training, where trainees are assessed against clearly stated competences (skills and procedures) to determine whether they are 'competent' or 'not yet competent'.

Decisions should be made on how 'threshold competence' will be determined and whether there are degrees of competence. For example, there would be widespread agreement that all medical graduates should be able to take blood or interpret an X-ray but there might be different expectations as to exactly what might be expected both from students at different stages of the course and as to the contexts and definitions of such competences. Assessments such as objective structured clinical examinations, mini clinical evaluation exercises or multisource feedback are widely used to gather evidence on which to make judgements about competence in clinical skills.

Key aspects of the curriculum

Any curriculum includes the following elements which must be 'constructively aligned' (Biggs, 1996):

- Aims
- Learning outcomes or objectives (knowledge, skills and attitudes)
- Content
- Teaching and learning methods
- Assessment methods.

Supporting elements include:

- Learning resources (teachers, support staff, funding, books and journals, IT support, teaching rooms)
- Monitoring and evaluation procedures
- Clinical placement activities
- Recruitment and selection procedures, including promotional materials
- Student support and guidance mechanisms.

Aims and learning outcomes

Aims and learning outcomes or objectives need to ensure that the goal of producing competent graduates is achieved. Aims describe what the teacher is trying to achieve (e.g. to encourage students to develop self-directed learning skills) whereas goals usually describe what the course or organization is trying to achieve (e.g. to inculcate professional values and attitudes).

Learning outcomes guide teachers on what is expected of the learners on completion of the education or training programme, indicating the level at which a performance is expected. They also guide students on what they are expected to be able to do in terms of knowledge, skills and attitudes after completion (McKimm and Swanwick, 2009).

One of the strengths of course planning using an objectives approach is that the objectives can be used as the measure for selecting teaching and learning methods and assessing student performance. Well-written objectives can be turned into assessment questions.

Curriculum content

Curriculum content comprises knowledge, skills, values and attitudes. Content should reflect the job that the learners will be asked to do after training, relate directly to learning outcomes, reflect balance between topics and theory and practice and be pitched at an appropriate level. Ideas for course content can be gathered from previous courses or existing curricula, national professional or discipline associations, textbooks, other organizations' courses on the internet and international bodies which have produced core curricula for their own subject.

Once the objectives or outcomes and broad content areas have been defined, the learning programme and timetable can be devised which allocates time for course elements and maps out a logical sequence of learning to enable student progression.

Teaching and learning methods

In many curricula, the choice of most appropriate teaching and learning methods is left up to the teacher. In others, such as problem-based learning curricula, the learning method is explicit in the curriculum design and guidelines will probably need to be produced to support teachers and students during the learning process.

Points to keep in mind are:

- How relevant are the teaching and learning methods to the content and learning outcomes?
- Where will the teaching and learning take place?
- How are practical skills going to be taught and supervised?
- How are students supported in independent learning and study (e.g. self-directed learning)?
- What resources are required and available to ensure effective teaching and learning?
- Does the teaching promote critical and logical thinking by the learner?
- What are the constraints affecting the teaching and learning process?
- Are the teaching and learning methods appropriate for the selected assessment methods?

Assessment methods

A curriculum sets out the assessment methods (as opposed to the actual assessment tasks) that will be used to measure students' performance. The starting point should always be the stated learning outcomes. Assessments must check that students have achieved the learning outcomes in various contexts and thus that the content has been covered. Teaching and learning methods must support the assessment strategy. An assessment blueprint (or matrix) maps out coverage of core content and learning outcomes against the assessment methods.

Teachers should check a number of aspects relating to assessment:

- Are the assessment methods which relate to the assessment of knowledge, skills and attitudes appropriate?
- Do the teaching and learning methods support the assessment strategy?
- Are the assessment methods reliable and valid?
- Are the assessment methods designed so that learners can achieve the minimum performance standards set in the curriculum and is there capacity for learners to demonstrate higher standards of performance (i.e. do the assessments enable discrimination between candidates)?
- Are there enough assessments or are learners being over-assessed?
- Are the regulations governing assessment procedures and awards clear and easy to follow and are they being applied appropriately and consistently?

Learning resources

The implementation of a new course usually requires additional learning resources or at least a rethink of existing learning resources. Teachers need to be aware of the resources available as part of course planning including staff, technical and administrative staff, equipment, budget and funding, books, journals and multimedia resources, teaching rooms, office space, social and study space and requirements for supervision and delivery of clinical teaching.

Implementing the curriculum

Once the curriculum has been fully developed it is ready for implementation. Those involved with implementation (usually teachers and examiners as well as students) need to interpret the curriculum in the same way as it is put into practice. Pre-testing or piloting can help to identify problems and issues and how a course works in practice. No course is perfect and one should always expect to continually modify and improve courses.

Monitoring and evaluation

Finally, the curriculum or course needs to be monitored and evaluated to ensure that it is working as planned and to identify areas for improvement. Evaluation involves ongoing formal feedback activities aimed at gathering timely information about the quality of a programme. It is important to build in evaluation activities to identify successes and failures of the curriculum with a view to correcting deficiencies, to measure if stated objectives have been achieved, to assess if the curriculum is meeting the needs of learners and the community and to measure the cost effectiveness of the curriculum. Monitoring and evaluation methods include observation, feedback questionnaires, focus groups, interviews, student assessment results and reports which the institution has to provide for internal use (e.g. absence statistics) or external agencies.

Conclusions

The act of preparing an effective course or curriculum provides an educator with a unique opportunity to consider, at the same time, the needs of patients, health-care providers and professions, and learners and the interaction among them. A good curriculum recognizes that learning is an active, con-

structive and contextual process. It will provide guidance that helps educators to enable learners to acquire new knowledge and skills and apply them in a range of contexts.

The careful alignment of aims, learning outcomes, teaching approaches and assessment methods which is inherent in excellent curriculum design places educators in the best possible position to create an environment that supports student learning. **BJHM**

Conflict of interest: Professor J McKimm was commissioned by the London Deanery to lead on the development of the suite of e-learning modules from which these articles have been derived.

- Biggs J (1996) Enhancing learning through constructive alignment. *Higher Education* **32**: 347–64
- Bligh J, Prideaux D, Parsell G (2001) PRISMS: new educational strategies for medical education. *Med Educ* **35**: 520–1
- Flexner A (1910) *Medical Education in the United States and Canada: A Report to the Carnegie Foundation for the Advancement of Teaching*. Carnegie Foundation for the Advancement of Teaching, New York
- General Medical Council (2009) *Tomorrow's Doctors 2009*. GMC, London
- Harden RM, Sowden S, Dunn WR (1984) Educational strategies in curriculum development: the SPICES model. *Med Educ* **18**: 284–97
- McKimm J, Swanwick T (2009) Setting educational objectives. *Br J Hosp Med* **70**(7): 348–51
- Prideaux D (2000) The emperor's new clothes: from objectives to outcomes. *Med Educ* **34**: 168–9
- Stenhouse L (1975) *An Introduction to Curriculum Research and Development*. Heinemann, London: 52–83
- Talbot M (2004) Monkey see, monkey do: a critique of the competency model in graduate medical education. *Med Educ* **38**: 1–7

KEY POINTS

- A curriculum is an holistic statement that addresses the needs of all those involved in learning, from professions to teachers to students.
- It provides a template for planning and evaluating learning, teaching and assessment.
- Constructive alignment of aims, learning outcomes, teaching approaches and assessment methods supports good student learning.
- A cycle of needs assessment, curriculum design, delivery, review and evaluation results in a curriculum that keeps pace with the evolving needs of all stakeholders.
- Curriculum development principles can be applied at all levels of planning and design.