

Strategies for planning and designing medical curricula and clinical teaching

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Abstract

Student learning is an active and constructive process. The role of a teacher is to provide an environment in which students are able to actively engage with subject matter in order to learn it. This article examines the principal features of good curriculum, course and lesson design and discusses ways in which doctors, in their roles as teachers of medical students and medical trainees can ensure that their teaching prompts learners' engagement in the learning process.

Introduction

Medical education of students preparing for initial registration, trainees on vocational programmes and those taking part in continuing medical education takes place under the auspices of a range of authorities, including universities, medical councils, professional bodies and colleges. Regardless of the purpose of the education, the controlling authority or the site of its delivery educational processes from curriculum design through to delivery and assessment need to be based on sound teaching and learning practices and underpinning theories. This article considers how recent understandings of learning and trends in medical curriculum design impact on the design of effective courses and their delivery in a range of settings, including that of the clinical workplace.

Theoretical underpinnings

The role of the teacher

“One of the main functions of university education is to induct students into ways of thinking that are required if students are to become competent professionals in their chosen field ...” (Entwistle, 2007, p. 3). While this quote is applied to university settings it can be more broadly applied across all levels of medical education to enable learners to develop critical thinking, reflective and problem solving skills to be effective future practitioners. The role of the medical teacher is to create the conditions in which learners are successfully inducted into these ways of thinking and doing – that is to incite students and trainees to learn and develop confidence and fluency with worthwhile activities (Hattie, 2010).

People learn when they “acquire new information, develop and practice new skills, reconfigure what they already know, and recognise what they have learned” (Grunert O'Brien *et al.*, 2008, p. 4). Teaching is about changing the learner's perspective and the way they see the world. Creating such a conceptual change is not just about learners acquiring information – learners need to structure the information and be able to think with it and use it (Biggs & Tang, 2007).

Outcomes-based education and constructive alignment

It is now common for education at all levels to be described in terms of the expected outcomes of teaching and learning processes. Sometimes incorrectly identified with

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competency-based education, outcomes-based education moves us away from 'topic-based' teaching, towards building the curriculum on a series of statements of outcomes – statements of what a learner will be able to do having successfully completed a set of learning. Outcomes can be created at a number of levels – the level of a whole programme (such as a degree or training programme, where outcomes may be described as a 'graduate' profile or benchmark statement), at the level of a course (a component of a programme) and at the level of an individual lesson or teaching event (at the course or lesson level the outcomes are frequently referred to as learning outcomes).

As well as telling us what and how well a learner should be able to do something, outcomes provide essential guidance to the teacher about the level of learning required, the approaches to take when designing teaching and learning activities which guide learners to achieving the outcomes, and importantly, the way in which assessments should be designed to measure the extent to which the outcome has been achieved. Such 'constructive alignment' (Biggs, 1996) emphasizes the importance of developing learning activities aimed at 'activating' the verb that starts the learning outcome (see below). A commonly used example of this is learning to drive (where the learning outcome might be 'drive a car safely in typical driving conditions'). The teaching focuses on the activity itself – that is driving (rather than

didactic teaching about the driving). Finally the assessment task ensures that the verb in the outcome statement is present – i.e. the assessment will involve the learner driving (rather than, say, writing about driving) (Biggs & Tang, 2007).

The idea of *constructive* alignment is based on constructivist theories of learning. That is, an understanding that knowledge is 'constructed' by learners using their own activity, it is not 'instructed' by the teacher; students organise and synthesise what they read, hear and do, linking new information to knowledge structures that are held in the long-term memory so that learners make personal sense of new information, structuring it so that it is usefully stored in the long-term memory.

Curriculum developments in medical education

The development of the learning-centred approaches in higher education described above has been mirrored in medical education at all levels, which has moved from an emphasis on teaching to an emphasis on learning.

Figure 1 summarizes trends over time in medical curricula. It is likely that today's programmes have elements of both Flexner and Harden in their design (e.g. they may still have significant hospital components, and not all modern curricula are problem-based) however they all pay greater heed to the learner-centredness described above.

Figure 1 : Trends in Medical Education Curriculum Development

Flexner (1910)	The SPICES model Harden (1984)
Teacher-centred	Student-centred
Knowledge giving	Problem-based
Discipline led	Integrated
Hospital oriented	Community oriented
Standard programme	Electives (and core)
Opportunistic (apprenticeship)	Systematic

Medical educators have devised a number of curriculum strategies to enable the achievement of more learner-centred and community-oriented approaches. The primary focus has been on finding ways to conceptualized, 'package' and integrate learning from a range of subject discipline areas so that learners can see how the learning relates to the clinical context and their developing professional practice.

This challenge has led to different curriculum design strategies being employed. We have described above how 'outcomes based education' (Harden *et al.*, 1999) has been highly influential and although there has been long debate over the nature and specificity of outcomes, objectives and competencies, there is now broad agreement that curricula should be defined in terms of what learners should be able to achieve at any stage of education or training (Prideaux, 2000).

The shift towards learner-centeredness also reflected an emerging understanding that effective learning needs to be contextualized or 'situated' (Reynolds & Skilbeck, 1976). Traditional models of medical education which temporally and geographically separated biomedical sciences from clinical practice as part of a pre-clinical – clinical curriculum design, came under increasing scrutiny and criticism (e.g. General Medical Council, UK, 2003). In response to these debates, many medical curricula became more integrated with earlier clinical experience and 'scientific' learning extended into the clinical years (Harden *et al.*, 1984). The integrated approaches are still subject centered but transcend traditional discipline based boundaries. Teaching units are often fused around meaningful organizing themes or concepts such as body systems, clinical 'problems', communication skills or community medicine. In medical education, the term 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. For example, a cardiovascular systems course might be taught by both scientists and clinicians and include the anatomy, physiology, biochemistry, pathology, clinical medicine, sociology and epidemiology (McKimm & Barrow, 2009).

Case example: Yong Loo Lin School of Medicine, National University of Singapore

In 2008, Yong Loo Lin School of Medicine (YLL SoM) implemented the five year revised undergraduate medical curriculum. This is the second revision, a process which began in 1997 and is based on the following six graduate outcomes adapted from Accreditation Council for Graduate Medical Education, USA (ACGME):

The graduates will:

- be equipped with sound medical knowledge
- be able to provide quality patient care
- engage in continual practice-based learning & improvement
- demonstrate excellent interpersonal and communication skills
- uphold high standards of professionalism
- engage in systems-based practice

Phase I (year 1) and the second semester of Phase II (year 2) teaching-learning activities are delivered through seven body system-based modules. To attain the stated six

outcomes, four longitudinal tracks addressing the "non-domain specific" curricular content were designed and implemented. These tracks are: Health Ethics, Law and Professionalism (HeLP); Patient Based Program (PBP); Medicine and Society; Information Literacy, Critical Thinking, Evidence-Based Medicine and Research Methodology.

Assessment and teaching learning activities have been constructively aligned to the expected graduate outcomes at each Phase (year) of training through a process of blueprinting. Beginning from 2010, specialty training in Singapore changed to US has been residency style training format incorporating the six ACGME outcomes and the ACGME was charged with accrediting the designated institutions for identified specialties. This has further enhanced the constructive alignment between the undergraduate medical curriculum and the postgraduate specialty training programs in Singapore.

Problem-based learning (PBL) has also been a highly influential curriculum and learning approach. Some medical schools have taken a more 'purist' approach to PBL as a guiding educational philosophy, whereas others have included PBL as part of a mixture of learning and teaching methods within a 'hybrid' curriculum. As part of the first phase of YLL SoM curricular revision, PBL was introduced as a teaching learning method. This approach was further improved in 2008 by incorporating student centred simulation learning, team based learning, student seminars and small group clinical learning in PBP especially during the early years of YLL SoM undergraduate curriculum.

The more integrated approaches to curriculum design are often structured around a spiral curriculum model, with clinical placements interspersed with 'content' based learning, emphasizing reinforcement, structured repetition and application of learning to clinical medicine.

In addition to the more learner-centered approaches described above, medical curricula are moving towards a more community-focused approach "within an increasingly diffuse and dynamic health system where health care is only one part of the wider public service agenda" (McKimm, 2010). Workforce demands and reskilling of the health and public sector workforce have led to the emergence of new roles, of

extended scopes of practice for existing health practitioners and a revisiting of medical education and training. Two main models of undergraduate medical education exist: the graduate entry, typically four year model for graduates with a relevant, good first degree and the 'traditional' five or six year model for school leavers. The 'symbiotic curriculum'

(Bligh *et al.*, 2001) with partnerships with local communities and a shift of location of clinical teaching has been a highly influential model in many medical schools, predominantly in Australia, Canada and the UK, aimed at producing and retaining doctors in rural and remote areas (Figure 2).

Figure 2 : Community based approaches to medical education

PRISMS Bligh <i>et al.</i> (2001)	Community based education e.g Worley <i>et al.</i> (2006); Prideaux <i>et al.</i> (2007)
Practice based (linked with professional development)	Based on four fundamental relationships:
Relevant to students and communities	1 A personal – professional relationship
Interprofessional and interdisciplinary	2 A clinician – patient relationship
Shorter courses taught to smaller units	3 A university – health service relationship
Multi site locations	4 A government – community relationship
Symbiotic (organic whole)	

Putting theory into practice

The big picture

For many educators, developing a course or individual teaching session can feel far removed from the overall programme of curriculum design and structure. However, an understanding and appreciation of the overall approaches being taken to curriculum design and planning can assist at any level. An awareness of the need to define learning outcomes, understand how learners learn, and ensure that teaching and learning methods and assessments are carefully aligned to facilitate learning are all important principles for teachers. Understanding how the overall programme is structured within broader workforce developments can help plan individual teaching events in the light of the student journey. Developing an understanding of the teaching, learning and assessment strategies used in a curriculum or study programme (such as PBL, community based education or objective structured clinical examinations [OSCEs]) can also help to identify teachers' training or development needs in these areas.

Assessment blueprints and curriculum maps may be maintained to ensure that learners are given opportunities to learn the knowledge, skill and attitudes across clinical and non-clinical aspects of the programme in order that they are able to pass appropriate assessment events. Well designed programmes will demonstrate the sort of curriculum alignment described above and will include a variety of

appropriate learning, teaching and assessment methods.

Medical student education is primarily conducted under the auspices of universities, where programme designers have to balance the demands of each university's requirements with the demands of accrediting and professional bodies such as medical councils which have a role in defining what they require of medical programmes with respect to graduate outcomes. Well designed medical programmes will demonstrate alignment from overall programme outcomes (the graduate profile) to outcomes of individual courses or units and assessment related to these. At post-qualifying levels, teachers need also to pay attention to the overall standards and competencies that trainees need to achieve, whether preparing for College examinations or as part of revalidation or continuing medical education, and design learning events that help learners achieve these competencies.

Facilitating learning

A number of conditions are needed for learning to occur (Biggs & Tang, 2007; Grunert O'Brien *et al.*, 2008). When accounted for in the design of learning activities the following factors will encourage learners to adopt desirable learning approaches, engage with tasks in a meaningful way and build on prior knowledge and understanding to focus on the main underlying ideas, themes, principles and applications. They will also help learners avoid surface approaches (where these are not appropriate) which are characterized by

superficial learning without appropriate understanding.

- The intended outcomes of learning need to be clear to teacher and learner, which suggest adopting forms of outcomes-based teaching. Well formulated outcomes, properly used, help learners think about their learning and monitor their own progress – a metacognitive skill that will assist learners beyond the immediate learning situation;
- Students and trainees need to be motivated to learn. This is inextricably bound with their having some control and choice about their learning within a programme, course or lesson;
- Learners need to be free to focus on the learning, not distracted by the use of tests or exams designed to catch them out;
- Dialogue, collaboration and interaction with peers, teachers and patients will help deepen understanding;
- Activity by learners coupled with the teacher connecting activities to relevant abstract concepts will assist learning;
- Acknowledging the concepts and previous experiences that learners bring with them to a class or clinic and organising teaching approaches and activities to enable them to connect new concepts and skills with existing experience and knowledge will lead to better integration and deep approaches;
- Obtaining learners' feedback in a structured and planned way, regarding how well their learning is progressing as well as the robustness of the scheduled learning activities (Samarasekera *et al.*, 2006).

Good teaching

Brookfield (2006) notes that good teaching is a highly variable process, changing as a result of any number of contextual factors – from the places in which it is delivered to the people to whom it is delivered. However, regardless of context he posits three core assumptions about teaching. First that skilful teaching is whatever helps learners to learn. Given the diversity of learners and the range of situations in which we are teaching them, operationalising such a statement is a complex undertaking involving taking our intuitive understandings of how people might learn and moulding them into approaches and practices

that the literature suggests help learners. Second, skilful teachers reflect on what they are doing, and take informed action when it is clear that their practices are not helping students or trainees to learn in the contexts we are teaching them. Thirdly, skilful teachers are constantly aware of how learners perceive their actions and how they are experiencing learning.

The clinical context

Clinicians teaching in clinical settings are often far-removed from those who set the standards or define the curriculum. When considering learning outcomes they believe might be appropriate to their clinical setting, teachers need to consider how these relate to the programme in which the student or trainee is enrolled and the assessment (controlled by the university or by the licensing, professional or accrediting body) to which the learner will be subject. The learning outcomes or competencies need to be interpreted in a way that makes sense in the particular clinical context in which they are teaching. This may mean reformulating the outcomes to

- specify the minimum acceptable standard for a learner to be considered to be performing adequately in the particular clinical context, when considering the level of education or training;
- ensure the outcomes start with explicit action verbs and contain an indication of expected level of attainment so that learners are able to demonstrate that they have learned or achieved the outcome;
- contain a mix of outcome types, associated with cognitive, affective and psychomotor outcomes appropriate to the setting.

Having carried out this task then it is possible to think further about aligning the sorts of opportunities the student or trainee is likely to have in the clinical setting to build on what they already know to meet the outcomes. That is, designing structured learning experiences so that learners are able to operate with a greater degree of autonomy, to monitor their own progress (with the assistance of appropriate feedback and supportive formative assessment) and to interact with their peers, colleagues and senior clinicians in a way that enables them to deepen their understanding of and achieve the programme outcomes.

Just as the 'symbiotic curriculum' suggests that practice and professional development

need to be closely linked, theories of workplace based learning and communities of practice also emphasise the need for clinical educators to create opportunities for professional development of learners through participation in workplace activities (Billett, 2004; Bleakley, 2006). Lave and Wenger suggest that through it is through active 'legitimate peripheral participation' that 'novices' become part of a 'community of practice', learning to acquire appropriate knowledge, skills and behaviours as they move on the inbound trajectory towards becoming 'expert' (Lave & Wenger, 2003). Morris notes that in the clinical context, this involves seeing workplace-based learning as about participation in a learning community rather than about simply acquiring knowledge; as seeing teaching and learning as integrated into day-to-day clinical activities (learners learn how to do the job by actually 'doing' the job, not simply by being taught how to do it) and about making learning more explicit, as part of clinical practice, not classroom based activity (Morris, 2009). Teaching, learning and assessment strategies which might flow from such approaches include labeling learning opportunities; establishing prior experience and a learning goal; priming for learning through structured observation of practice; thinking aloud as you are performing a clinical procedure or making a diagnosis, and introducing assessment opportunities in the workplace such as case based discussion, clinical skills assessments or reflective portfolios (Morris, 2009). Such strategies make the workplace more invitational for learners and pull together some of the educational theories and curriculum design activities we have discussed.

Conclusions

This article has considered some of the current trends in medical education curriculum and course design, locating these within contemporary educational theory. Medical education plays a key role in equipping the health workforce with the doctors that it requires and the way in which curricula are designed and teaching, learning and assessments are planned and delivered are immensely influential. Medical curricula and teaching and learning strategies need to be dynamic and responsive if they are to ensure that the doctors of the future have the knowledge, skills and attitudes required by the communities which they serve. An understanding of wider educational theories about the learning process and curriculum

design can help medical educators improve the quality of medical education.

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