

TWELVE TIPS

Twelve tips for developing an integrated curriculum

ALAM SHER MALIK & RUKHSANA HUSSAIN MALIK

Universiti Teknologi MARA, Malaysia

Abstract

Background: Integration of curriculum is meant to make the teaching/learning activities meaningful; however, the interpretation of 'integration' varies in different institutions and among individuals. Many medical schools find it hard to change their existing curriculum or develop a new integrated curriculum mainly because of lack of will, infrastructure and understanding the process of change.

Aim: Drawn from experience, these 12 tips relating to staff development, establishing working groups, organizing the teaching/learning materials under themes and developing some innovative teaching/learning and assessment strategies, are the techniques that a teaching institution can use to change the existing curriculum to an integrated one or develop a new curriculum.

Conclusion: Knowing about the different levels of integration and steps for developing an integrated curriculum can make it easier to integrate an existing curriculum or develop a new one.

Introduction

Integration is the organization of teaching matter to interrelate or unify subjects frequently taught in separate academic courses or departments (Harden et al. 1984). Integrated curriculum is also referred to as interdisciplinary teaching, thematic teaching and synergistic teaching. An integrated medical curriculum helps graduates to put together the learned facts so as to get the whole picture and adopt a holistic approach while treating a patient or planning a health care strategy (e.g. planning the preventive measures of an impending outbreak of an infectious disease). The need for integration has been advocated in many reports on medical education (Association of American Medical Colleges 1984; Anderson & Swanson 1993; General Medical Council 2009).

Programmes described as 'integrated teaching programmes' are often, in practice, programmes which are 'temporally coordinated' (Harden 2000). In these 'parallel' or 'concurrent' teaching programmes, the timetable is adjusted so that the related topics within the disciplines are scheduled at the same time. Similar topics, e.g. structure of the kidney in anatomy and functions of the kidney in physiology, are taught on the same day or week; but still remain part of a subject-based teaching and students are left to themselves to uncover the relationships. The implementation of a temporally coordinated programme introduces some of the advantages of integrated teaching and is a good stepping-off point for a more integrated curriculum.

Problem-based learning (PBL) is a very useful way of integrating learning (Barrows 1985). The vertical integration between basic sciences and clinical medicine in a PBL setting has been found to stimulate deep rather than superficial

learning, and thereby stimulates better understanding of important biomedical principles (Dahle et al. 2002). Though the prevailing trend in basic sciences curriculum is a change towards integration, often including PBL as an integrative function (Wilkerson et al. 2009), the integrated teaching does not necessarily require the adoption of a problem-based approach to learning (Harden et al. 1984) and many effective integrated programmes are not problem-based. The integration can be organised around themes in PBL, case-based learning and traditional curriculum.

The purpose of this article is to discuss how integration can be achieved avoiding commonly committed mistakes. The following tips, which are based on our own experience of enhancing the integration from harmonization to interdisciplinary level (Harden 2000) at the Faculty of Medicine, Universiti Teknologi MARA, Malaysia, can be used to integrate the existing curriculum or for developing a new curriculum. While the tips are presented in a linear fashion, the process of integration should be seen as an iterative one in which each step (or tip) should inform and affect other steps.

Tip 1

Train the staff members

Integration of the curriculum entails a lot of time and work in respect of planning, organization and execution. The teachers have to be deeply involved, enthusiastic and cooperative, especially over departmental borders, which will produce positive spin-off effects in teaching and research but may also generate conflicts that must be resolved.

Correspondence: A. S. Malik, Medical Education Research and Development Unit (MeRDU), Faculty of Medicine, Universiti Teknologi MARA, Level 20, Tower 1, Science and Technology Complex, Shah Alam 40000, Selangor, Malaysia. Tel: 0060355442834. H/P: 0060169189452; fax: 0060355442831; email: alamshermalik@hotmail.com

Some form of staff development will almost certainly be needed. The aim should be to: (1) familiarize the staff with the objectives of an integrated programme and allow them to explore its advantages, (2) identify the local barriers to increased integration as an initial step and address them effectively and (3) explain the staff members how the integrated teaching/learning programme will be delivered and their roles and responsibilities in it. This also includes explaining the role of the study guides and logbooks, the range of learning situations and the approach to the assessment process.

Tip 2

Decide on scope of integration

It may be ideal to change to a whole new integrated curriculum, but that may be too challenging for some of the academics and the existing infrastructure and facilities may not be adequate for a rapid change. To start with, the scope of integration may be limited to only a module or a phase (consisting of several modules). This will help to adapt to a change gradually, would be less stressful and will provide an opportunity to learn from the experience.

Tip 3

Choose the level of integration

In the SPICES model for educational strategies, integration is represented as a continuum with full integration at one end; discipline-based teaching at the other and with intermediate steps between the two ends (Harden et al. 1984). Fogarty (1991) described 10 levels of curriculum integration. Harden (2000) described these intermediate points and presented a ladder with 11 steps in the level of integration from isolation to trans-disciplinary level.

A number of factors, such as the aims of the curriculum, the organizational structure, staff and resources and assessment methods need to be considered before deciding the level of integration (Fogarty 1991; Harden 2000). Even after taking account of all these factors, it may not be possible to have a uniform level of integration throughout the curriculum. The level of integration may vary from module to module or even within a module.

Many educationists feel that there is a need for both subject-based and integrated experiences in the curriculum. It may not be possible or even advisable to have a completely integrated curriculum where the disciplines completely lose their identity.

Tip 4

Go for both vertical and horizontal integration

Integration may be described as horizontal integration or vertical integration or both. The horizontal integration is integration between parallel disciplines, such as anatomy, physiology and biochemistry or medicine, surgery and

therapeutics traditionally taught in the same phase of the curriculum.

The vertical integration is integration between disciplines traditionally taught in different phases of the curriculum. It can occur throughout the curriculum with the basic medical and clinical sciences beginning together in the early years of the curriculum and continuing until the later years. More emphasis may be placed on the basic medical sciences in the earlier years and on clinical sciences and the practice of medicine in the later years.

To gain the maximum benefit, one needs to integrate the curriculum both horizontally and vertically. The 'temporally-coordinated' curriculum mentioned above is an example of an incomplete horizontal integration as the teaching sessions are being merely coordinated and no connections are being made. It is imperative that lecturers refer to the contents of other teaching sessions and link and build on what was taught in the other disciplines. Therefore, it is crucial that the contents of all teaching sessions are known to all lecturers who should make a conscious effort to make links while preparing their own lesson plans.

Vertical integration brings more relevance and excitement in learning. To involve clinicians in preparation of basic medical science modules and *vice versa* is vital to develop vertical integration. Sessions such as early clinical exposures and use of clinical examples in teaching sessions of basic medical sciences generate interest among the learners and help them to see why it is important to learn basic sciences. It also helps to involve clinicians in the identification of the core contents of basic medical science modules.

Inclusion of some introductory clinical topics in basic medical science modules and *vice versa* would help to achieve higher levels of vertical integration. For example, a session on 'dyspnoea' in the respiratory module and inviting surgeons to teach applied anatomy will help to accomplish desired benefits of integration.

Tip 5

Establish working groups and elucidate their responsibilities

It is vital to set up different working groups and define their responsibilities. Each module should have its own Module Integration Committee (MIC) which may be led by the module coordinator (MC). The Faculty Integration Committee (FIC) should be led by a senior academician preferably by one who also holds a key post such as deputy dean academics.

The membership of the working team would depend upon the module to be integrated. For a pre-clerkship module, apart from representatives of all the basic medical science disciplines (e.g. Anatomy, Physiology, Biochemistry, Microbiology, Parasitology, Pathology and Pharmacology) the team should include a medical educationist and at least one relevant clinical teacher as a member. For a clerkship module, the majority of the members would be clinicians with adequate representation of the relevant basic medical science teachers. Each team should choose their secretary and scribe and specify their roles.

FIC should comprise the senior faculty members. The representatives from different relevant disciplines may be invited as and when required.

The MCs would present their integrated modules to the FIC where each module should be examined thoroughly and critically, mainly emphasizing on:

- Learning outcomes
- Contents
- Relationship of contents to the learning outcomes and themes
- Sequencing of topics
- Teaching/learning methods for each topic
- Contents of each topic and their relation to the learning outcomes
- Assessment methods

Tip 6

Determine learning outcomes

Learning outcomes are the statements that describe significant and essential learning that learner's would have achieved and could reliably demonstrate at the end of the course (Spady 1994).

The learning outcomes should be short statements that are easy to communicate and usually begin with an action verb. They must be well developed as they not only specify what is to be achieved at the end of a module, but also guide in the identification of the curriculum content, the teaching/learning methodologies and assessment methods. The learning outcomes of the module should be identified by the MIC and approved by FIC.

The learning outcomes of each module may be general which are broad statements and specific which accurately and specifically identify the knowledge, skills and attitudes to be achieved in a particular module. For example, the ability of students to explain the mechanism of urine formation will be a general outcome whereas their ability to draw and label a glomerulus would be a specific outcome.

Tip 7

Identify the contents (knowledge, skills and attitude)

Each discipline needs to map their curriculum content, i.e. list down the topics to be covered (e.g. fluid and electrolyte homeostasis), skills to be learned (e.g. measuring the specific gravity of urine) and attitudes to be developed (e.g. appreciate the need of explaining to the patient how to collect midstream urine sample for culture).

The contents of each teaching/learning session (or topic) need to be clearly written. For enhancement of the integration between the basic and clinical sciences, the content should be created with the involvement of relevant clinicians, e.g. orthopaedic surgeon can help in identifying the content for musculoskeletal module. The contents should be enough to keep the students engaged during the activity. Too many contents may overwhelm the students and too few may not

satisfy their curiosity. The sequence in which they should be learned would be decided by the theme of the week ('Tip 8').

The mapped curriculum should address all the learning outcomes – some topics may be dropped, others added depending upon the learning outcomes. For example, if the outcomes include explanation of jaundice in a newborn, the metabolism of bilirubin needs to be included in the curriculum. If the outcomes say that student should be able to measure the blood pressure, the surface anatomy of arteries needs to be included in the curriculum.

Tip 8

Create themes

Themes unite the disciplines and blur the boundaries among them. The theme of the week acts as a magnet for all the teaching/learning activities during that week. 'A fertile theme is webbed to curriculum contents and disciplines or subjects use the theme to sift out appropriate concepts, topics or ideas' (Fogarty 1991).

Focusing on 'themes' enables teachers to meaningfully link different disciplines so that students will see the 'big' picture and appreciate the relevance of (e.g. basic sciences) learning to their future practice.

Themes can vary in nature and scope; however, they should be motivating to students and relevant to the modules. In a modular, case-based or traditional system, a theme can be identified for each week. For example in the endocrine system module, diabetes mellitus can be a theme for 1 week. During this week, physiology and biochemistry may contribute to insulin synthesis and its regulation, medicine to the clinical manifestations and investigations of diabetes mellitus, pathology to the underlying disease processes and pharmacology to the action of hypoglycaemic and related drugs.

We prefer to have themes related to clinical problems (e.g. dyspnoea) and not biological functions (mechanism of breathing). Different tasks, problems, topics or issues as the focus for the students' learning can also be used to link different disciplines.

Tip 9

Prepare a comprehensive timetable

Choose the themes carefully as they will also determine the sequence of teaching/learning sessions. The theme for the first week should reflect the topics that need to be covered in the early part of the module. The flow of the topics should be logical and each new topic should build on the previous knowledge. The PBL tutorial for the week should also follow the theme.

For each topic (knowledge and skills), choose the most appropriate teaching/learning method, such as didactic lecture, small group learning or self-study. Some of the topics are best taught in joint sessions or symposia not only to avoid overlap and duplication, but also for integration. The teaching/learning methods also need to be consistent with the learning outcomes. If at the end of the module the student is expected

Week: 14
Semester: 1
Module Week: 1

Module:
MUSCULOSKELETAL SYSTEM

Module Coordinator:
Dr. Rukhsana Hussain Malik

		THEME: "muscle cramps"								
		8.00	9.00	10.00	11.00	12:00	1.00	2:00	3.00	4.00
MON 05/10/09			PBL rooms PBL - 1 (Group 1-10)	PPD Principles in Professionalism	LEC PBL rooms PBL - 1 (Group 11-20)			SDL	ME Becoming an Effective Learner Session 1-Group A	SDL – Group B
			ECE (Group 11-20)	LH-D SGS rooms LEC PHY	SR SGS rooms LEC PHY				MeRDU	
TUE 06/10/09		ANA *	SGS rooms LEC+ BMM	LH-D SR	ANA LEC PHY			SDL		
		Organization of the MSK	Formation of Acetyl CoA From Carbohydrates		Muscles of Upper Limb	Neuromuscular Transmission				
WED 07/10/09		LH-D** PHY	NLS++ LH-D	JVG DSL	LH-D ANA	AK LEC PHY	HSL LEC	ANA		PRC
		Neuromuscular Junction			Nerves and Vessels of Upper Limb	Mechanism of Skeletal Muscle Contraction				GROSS ANATOMY PRACTICAL: Muscles, Nerves and Vessels of Upper Limb
THR 08/10/09		COM LAB PATH	PHY Staff LEC	LH-D HSL LEC	LH-D AK	LH-D BMM	HSL LEC	NEW & OLD LAB PHPM	ANA Staff & Surgeons LEC	BMM
		Diseases of Muscles and NM Junction	Cholinergic Drugs	SDL	Breakdown of Acetyl CoA			Measures of Central Tendency	SDL	Formation of Acetyl CoA From Fatty Acids
FRI 09/10/09		LH-D ME	NSB LHD	II	LH-D JVG	LH-D JVG		LH-D AMD	PBLrooms PBL - 2 (Group 11-20)	SDL
		Becoming an Effective Learner Session 1-Group B	SDL – Group A	PHM LEC Cholinergic Blocking Drugs	PBLrooms PBL - 2 (Group 1-10)					
	MeRDU	SA LH-D	II						SDL (Group 1-10)	

* Discipline + Teaching/learning method ** Venue of teaching/learning session ++ Name of the lecturer/facilitator

Figure 1. Comprehensive timetable.

to perform certain procedures, then he/she should be given the opportunity to practice those procedures. The contents covered in small group sessions or self-study should not be repeated in didactic lectures.

Appropriate time needs to be allocated for each teaching/learning session. A didactic lecture should not be given more than 1 h including generous time for question/answer session. The student-centred teaching/learning sessions should be given generous time so that students have enough time to thoroughly go through the topic.

We recommend that 20–30% of the scheduled time be given to self-study so that students have enough time for literature search and study their learning needs arising from PBL tutorials.

Prepare a timetable that provides all the relevant information comprehensively – theme of the week, sequence of topics, teaching/learning methods and duration of each session. The four corners of the box should be used to impart information about the type of teaching/learning session such as 'LEC' or 'SDL', the discipline responsible such as 'ANA' or 'PHY', the name of the lecturer giving that session and the venue where the session will take place (Figure 1).

Tip 10

Select assessment methods

What is assessed and which methods are used will play a significant part in what is learnt (McAleer 2001) and how it is learnt. The success of integrated curriculum depends on the implementation of integrated assessment. Having mismatch between teaching/learning strategies and assessment methodologies is an effective recipe for failure of implementation of any curriculum.

Plan the assessment at the same time while preparing the integrated modules. The assessment tools must adequately test the achievement of desired outcomes. Use assessment tools that assess the higher levels of cognition, such as understanding, comprehension, interpretation, analysis and decision-making skills rather than simple recall of knowledge.

Integrate assessment to reflect integrated curriculum. The examination questions should be constructed by a group of lecturers representing different contributing disciplines. Modified essay questions (MEQs), problem-based questions (PBQs), best answer questions (BAQs), objective structured clinical examination (OSCE) and objective structured practical examination (OSPE) are the preferred tools of assessment in an integrated curriculum.

Tip 11

Communicate with students and staff

Well-informed staff members and students ensure the successful implementation of the curriculum. Each integrated module or any change to it should be presented to the Curriculum Committee and the faculty meeting for the members to give their comments and approval before being sent to the Senate for final endorsement.

At the beginning of each module, give a briefing to the students about the structure and learning outcomes of the module. Also distribute study guide-books containing all the relevant information and expectations. This information helps students to identify their roles and what is expected of them during the module and in the examination. Information can also be disseminated through other means such as website or news letters. Regular communications between faculty and students are useful to allay fears and to stop inaccurate rumours circulating.

Tip 12

Commit to re-evaluation and revision

Willingness to accept the shortcomings in the curriculum or its implementation and to make the appropriate changes should be an ongoing process.

Draw a plan for re-evaluation of the curriculum and design a mechanism to institute changes if required. The re-evaluation may be based on students' and staff feedback at regular intervals, external examiner comments and students performance in assessment exercises.

It is crucial to have a proper mechanism or standard operative procedure of making any change in the curriculum. The changes should not be made on *ad hoc* basis and must be approved by the Curriculum Committee before implementation. The change and its basis should be recorded for future reference.

Conclusion

Although the move towards adopting integrated curriculum is gathering momentum world-wide, there are several medical schools that are still unaware of this movement or finding it hard to make the change. Interpretation of 'integration' varies in different institutions and among individuals; however, knowledge about the different levels of integration and steps for developing an integrated curriculum will make it easier to make the change.

The process of change will be relatively difficult in institutions with established curricula mainly, because it needs to change the mindset of the faculty. The training of faculty through discussions and workshops should be an initial step in this situation. The 12 tips described in this article are the techniques that teaching institutions can use to change their existing curriculum or develop a new curriculum. It is hoped that these tips will facilitate more and more institutions to opt for this positive change in approach to teaching and learning.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

Notes on contributors

ALAM SHER MALIK, MBBS, DTCH, DipMedEd is professor of Paediatrics and coordinator of Medical Education Research and Development Unit, at Faculty of Medicine, Universiti Teknologi MARA, Shah Alam, Malaysia.

He has helped a number of medical schools locally and abroad in developing their curricula.

RUKHSANA HUSSAIN MALIK, MBBS, MMedED is a senior lecturer and curriculum coordinator at the Faculty of Medicine, Universiti Teknologi MARA, Shah Alam, Malaysia. She has played an active role in the development of curricula of a number of medical schools in Malaysia and abroad.

References

- Anderson MB, Swanson AG. 1993. Educating medical students: The ACME-TRI report with supplements. *Acad Med* 68(suppl):S1-S46.
- Association of American Medical Colleges 1984. Physicians for the twenty-first century: Report of the project panel on the general professional education of the physicians and college preparation for medicine. *J Med Educ* 59:1-28.
- Barrows HS. 1985. How to design a problem based curriculum for the preclinical years. New York: Springer.
- Dahle LO, Brynhildsen J, Fallsberg MB, Rundquist I, Hammar M. 2002. Pros and cons of vertical integration between clinical medicine and basic science within a problem-based undergraduate medical curriculum: Examples and experiences from Linköping, Sweden. *Med Teach* 24:280-285.
- Fogarty R. 1991. How to integrate curricula. Palatine, Illinois: IRI/Skylight Training and Publishing, Inc.
- General Medical Council 2009. Tomorrow's doctors: Outcomes and standards for undergraduate medical education. London: General Medical Council.
- Harden RM. 2000. The integration ladder: A tool for curriculum planning and evaluation. *Med Educ* 34:551-557.
- Harden RM, Sowden S, Dunn WR. 1984. Some educational strategies in curriculum development: The SPICES model. ASME Medical Education Booklet number 18. *Med Educ* 18:284-297.
- McAleer S. 2001. Choosing assessment instruments. In: Dent JA, Harden RM, editors. A practical guide for medical teachers. Edinburgh: Churchill Livingstone. pp 303-313.
- Spady W. 1994. Choosing outcomes of significance. *Educ Leadersh* 51:18-22.
- Wilkerson L, Stevens CM, Krasne S. 2009. No content without context: Integrating basic, clinical, and social sciences in a pre-clerkship curriculum. *Med Teach* 31:812-821.

Copyright of Medical Teacher is the property of Taylor & Francis Ltd and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.