The integration ladder: a tool for curriculum planning and evaluation

Ronald M Harden

Summary Integration has been accepted as an important educational strategy in medical education. Discussions about integration, however, are often polarized with some teachers in favour and others against integrated teaching. This paper describes 11 points on a continuum between the two extremes.

- Isolation
- Awareness
- Harmonization
- Nesting
- Temporal co-ordination
- Sharing
- Correlation
- Complementary
- Multi-disciplinary
- Inter-disciplinary
- Trans-disciplinary

As one moves up the ladder, there is less emphasis on the role of disciplines, an increasing requirement for a central curriculum, organizational structure and a requirement for greater participation by staff in curriculum discussions and planning.

The integration ladder is a useful tool for the medical teacher and can be used as an aid in planning, implementing and evaluating the medical curriculum.

Keywords *Curriculum; education, medical, undergraduate; *methods; Great Britain; programme evaluation; teaching, methods.

Medical Education 2000;34:551–557

Introduction

The need for greater integration of subjects in the medical curriculum has featured prominently in reports on medical education, including the GPEP report,[1] 'Educating Medical Students', the report of the ACME-TRI project[2] and *Tomorrow's Doctors*, the recommendations of the General Medical Council in the UK.[3] Integrated teaching offers many advantages[4] and may be a key factor in the delivery of an effective educational programme.[5] Discussions about integration, however, are often polarized with some teachers arguing in favour and others against integrated teaching. The wide range of terms used to describe integration has not helped. 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 extremes.[4] The question to be asked of teachers and curriculum designers is not whether they are for or against integration, but rather where on the continuum between the two extremes should they place their teaching. This paper describes these intermediate points and presents a ladder with 11 steps in the level of integration. This is designed to be used as an aid to planning, implementing and evaluating medical curricula.

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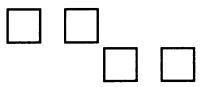
Eleven steps in the ladder

The integration ladder is shown in Fig. 1. It has 11 steps from subject-based to integrated teaching and learning. The ladder builds on previous descriptions or models of integrated curricula, notably the work of Jacobs,[6] Fogarty[7] and Drake.[8] In the first four steps on the ladder, the emphasis is on the subjects or disciplines. Moving up the ladder, the following six steps emphasize integration across several disciplines. In the final step, the student takes more responsibility for the integration and is given the tools to do so.

Step 1 Isolation



(Synonym – fragmentation, anarchy)

The first step is 'isolation'. Departments or subject specialists (represented by squares in the diagram)

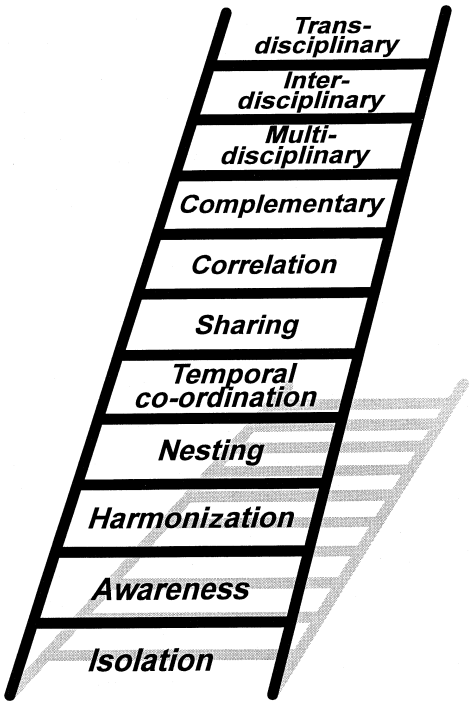


Figure 1 The 11 steps on the integration ladder.

organize their teaching without consideration of other subjects or disciplines. Each discipline looks, from the perspective of their own discipline, at the curriculum content in terms of areas to be covered, depth of coverage, sequence and timing. No attention is paid to other, or related subjects which contribute to the curriculum.

The slots in the timetable are labelled with the name of the subject, which is taught by specialists in the discipline. Each subject is seen as an entity in itself. The objectives are seen as mastery of the subject and these are tested in a subject-based assessment of the student's knowledge and understanding of the subject. The relationships between subjects are not explicitly covered and related topics from two disciplines are not intentionally correlated.

This 'isolation' approach may be found in the traditional medical curriculum with blocks of time allocated to the individual disciplines. Students attend a lecture on anatomy, and then move on to a lecture in physiology with neither lecturer being aware of what was covered in the other lecture.

Step 2 Awareness

The second step is 'awareness'. As with 'isolation', the teaching is subject-based. Some mechanisms are in place, however, whereby the teacher in one subject is made aware of what is covered in other subjects in the curriculum. This can be achieved through appropriate documentation and communication about the aims and objectives of each course and the content and topics covered in lectures and other teaching sessions.

Lecture notes or handouts may be circulated to other course teachers as well as to students. Given this information, the teacher can take account of what colleagues cover in other parts of the course when planning his or her teaching, avoiding unnecessary duplication or redundancy and cross-referring, where appropriate, to other parts of the course. At this step, however, there is no explicit attempt to help the student to take an integrated view of the subject.

Step 3 Harmonization

(Synonym – connection, consultation)

In harmonization, teachers responsible for different courses, or different parts of the same course, consult each other and communicate about their courses. The consultation process takes place through informal discussions between teachers or through more formal curriculum planning committees and meetings. The consultation may involve individual teachers or groups of teachers. The process of consultation may be overseen by a member of staff who has some overall responsibility for the curriculum and who has, as his or her remit, the facilitation or organization of discussion between teachers from different subjects. This consultation process encourages teachers to adapt their programmes so that each course makes an appropriate contribution to the curriculum and the overall curriculum objectives are more likely to be achieved.

Fogarty[7] has described this stage of integration as 'connection'. The disciplines remain separate but the teacher may make explicit connections within the subject area to other subject areas – connecting topics in one session to later or earlier sessions. 'The key to this model' suggests Fogarty 'is the effort to deliberately relate curricula within the discipline rather than assuming that students will understand the connections automatically.'

Step 4 Nesting

(Synonym – infusion)

'Nesting' is the fourth step of integration. It has been used by Fogarty[7] to describe an integrated approach

where the teacher targets, within a subject-based course, skills relating to other subjects. Content drawn from different subjects in the curriculum may be used to enrich the teaching of one subject. The term 'infusion' has also been applied to this stage of integration where teachers 'analyse the separate subject's goals and identify ways in which these generic skills can be refined into existing subjects'.[9]

An example of nesting is a pathology course which introduces aspects of clinical medicine to demonstrate the application of pathological principles, and where students develop problem-solving skills. Another example is the integration of health promotion and disease prevention into a number of major courses in the curriculum.[10] This created an environment in which students could experience their learning about disease prevention in the same manner that they should practice it – integrated throughout clinical medicine. It also avoided the necessity of addressing yet another isolated course to an already crowded curriculum.

In nesting, the individual subjects or disciplines recognize the broader curriculum outcomes and relate their teaching programme to these.[11] They may do this by arranging content specific inputs from other parts of the course into the subject's teaching programme, and by recognizing the generic competencies, such as communication and problem-solving skills, to be acquired in the programme. The teaching, however, remains subject-based and the course is the responsibility of and in the control of the subject or discipline.

Step 5 Temporal co-ordination

(Synonym – parallel teaching, concurrent teaching)

In temporal co-ordination, each subject remains responsible for it's own teaching programme. The timing of the teaching of topics within a subject, however, is done in consultation with other disciplines. The timetable is adjusted so that topics within the subjects or disciplines which are related, are scheduled at the same time. Similar topics are taught on the same day or week while remaining part of a subject-based teaching programme. Students study the concepts of the different subjects separately, and are left themselves to uncover the relationships. This approach has been described also as 'parallel' or 'concurrent' teaching.

In a basic medical science programme with temporal co-ordination, physiologists address the subject of the function of the heart at the same time as the anatomists look at the structure of the heart. Students are left to make the links between the two subjects but this is facilitated by the timetabling, with the heart being examined from the two perspectives in the same time-frame. In contrast, in a more traditional course, students might study the function of the heart in physiology, while looking at the same time at the structure of the head and neck in the anatomy course.

Programmes described as 'integrated teaching programmes' are often, in practice, programmes which are temporally co-ordinated. The implementation of a temporally co-ordinated programme introduces some of the advantages of integrated teaching and is a good stepping off point for a more integrated curriculum.

Step 6 Sharing

(Synonym – joint teaching)

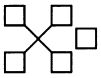
Two disciplines may agree to plan and jointly implement a teaching programme. The 'shared planning and teaching takes place in two disciplines in which overlapping concepts or ideas emerge as organising elements'.[7] The two disciplines which come together to offer such a programme are usually complementary subjects and the joint course produced emphasizes shared concepts, skills and attitudes. The focus of the course is usually in these shared elements.

An example of a shared programme is a course in community child health run jointly by a department of child health and a department of general practice. Another is a course on behavioural sciences run jointly by the department of psychiatry and the department of public health.

The impetus for shared programmes often comes from the subjects or departments themselves, through the identification of common areas of teaching or the need to include a new topic in the curriculum. The departments appreciate that together they can teach the subject better, more effectively and more efficiently, than either could alone.

Unlike temporal co-ordination which may be a step towards a more fully integrated overall programme, shared programmes are often seen as ends in themselves. They tend to be perceived as special cases which, even if they are successful, are not necessarily examples to be followed in other parts of the curriculum. Occasionally, however, this is not so and a shared programme may be a step towards more complete integration.

Step 7 Correlation

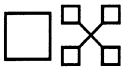


(Synonym – concomitant programme, democratic programme)

In the 'correlation' step of integration, the emphasis remains on disciplines or subjects with subject-based courses taking up most of the curriculum time. Within this framework, an integrated teaching session or course is introduced in addition to the subject-based teaching. This session brings together areas of interest common to each of the subjects.

An example of correlation is a basic medical science programme where students study topics, such as the gastrointestinal system first from the perspective of each of the subjects, and then meet on Friday afternoons for an integrated session. In this session, the discussion may focus round a patient who illustrates aspects of normal structure and function considered during the week. The contributions of the different subjects are used to illuminate the problem. Another example of correlation is a subject-based programme in which the project or assignment given to students, is designed to integrate the subjects. The students may be required to submit a written assignment or to present a report on the project at an integrated plenary session.

Step 8 Complementary programme



(Synonym – mixed programmes)

The 'complementary' approach has both subject-based and integrated teaching. The integrated sessions now represent a major feature of the curriculum. These sessions are recognized to be, in terms of time, allocated resources and assessment as important, if not more important, than the subject-based teaching.

The focus for the teaching may be a theme or topic to which the disciplines can contribute. This is discussed further in the following sections. Running alongside the integrated teaching are scheduled opportunities for subject-based teaching.

The implications of the approach for assessment are important. Examinations need to reflect the emphasis on both integration and subjects or disciplines.

Step 9 Multi-disciplinary

(Synonym – webbed, contributory)

A multidisciplinary approach brings together a number of subject areas in a single course with themes, problems, topics or issues as the focus for the students' learning. The themes selected as the focus in an integrated course may function in different ways.[12]

The themes can delineate an area in which practical decisions have to be made and which serve as a focal point of interdisciplinary thinking. Problems and the tasks to be undertaken by the professional may also be used as a focus for integrated teaching. The task may be the management of a patient with abdominal pain, screening for diabetes or the mounting of a coronary artery disease prevention programme. In task-based learning,[13] the learning is concerned not only with mastery of the tasks but with learning related to the tasks, including an understanding of the relevant basic and applied medical sciences. A course for teachers of healthcare professionals, at the Institute of Public Health in Malaysia, covers educational theory including curriculum planning, assessment, learning theory and instructional design. This theory is taught in an integrated manner round the practical tasks which will confront the teacher on completion of the course. These include small group teaching, lecturing and teaching practical skills.

The theme in a multidisciplinary programme may be a structured body of knowledge that needs to be mastered but which transcends subject boundaries. The systems of the body are used frequently as an integrating theme.[3] Courses are developed round the cardiovascular system, the respiratory system, the nervous system and so on. In the thyroid module of the endocrine system block, for example, physiology may contribute to thyroid hormone synthesis and its regulation, pathology to the underlying disease processes, pharmacology to the action of anti-thyroid drugs, surgery to the management of goitre, and medicine to the clinical manifestations and investigations of thyroid disease. The stages of the life cycle from conception through birth, childhood, adolescence, adulthood, the elderly to death may be used as an alternative to the body systems theme.

Finally, the theme may be a complex of information and skills which are relevant to medicine. Clinical methods, ethics and health promotion are examples.

The characteristic of multidisciplinary integration is that, whatever the nature of the theme, it is viewed through the lens of subjects or disciplines. The theme or problem is the focus for the student's learning but the disciplines preserve their identity and each demonstrates how their subject contributes to the student's understanding of the theme or problem. 'A discipline', suggested Drake,[8] 'is easily identifiable within the teaching strategy, and the discreteness of the procedures of the discipline can be kept intact by the teacher

who will probably approach the task from her own area of specialisation'. In multidisciplinary teaching, the contributions of the individual disciplines to the theme are stated implicitly in the curriculum documents and the timetables. In the multidisciplinary step on the integration ladder, however, the subjects and disciplines give up a large measure of their own autonomy.

The term 'webbed', was used by Fogarty[7] to describe this stage of integration. 'A fertile theme is webbed to curriculum contents, and disciplines or subjects use the theme to sift out appropriate concepts, topics or ideas.'

Step 10 Inter-disciplinary

(Synonym – monolithic)

In interdisciplinary integration there is a further shift of emphasis to themes as a focus for the learning of and to the commonalties across the disciplines or subjects as they relate to the theme. Jarvis[14] defines interdisciplinary as 'a study of a phenomenon that involves the use of two or more academic disciplines simultaneously'. In the taxonomy proposed in this paper, interdisciplinary teaching implies a higher level of integration, with the content of all or most subjects combined into a new course with a new menu.[15] In the interdisciplinary course there may be no reference to individual disciplines or subjects, and subjects are not identified as such in the timetable.

Implicit in the move from a multidisciplinary to an interdisciplinary approach may be the loss of the disciplines' perspectives.

Step 11 Trans-disciplinary

(Synonym – fusion, immersion, authentic)

Alfred North Whitehead wrote in 1929[16] 'The solution which I am arguing is to eradicate the fatal disconnection of subjects which kills the vitality of our modern curriculum. There is only one subject-matter for education, and that is Life in all its manifestations.' In trans-disciplinary, as in interdisciplinary integration, the curriculum transcends the individual disciplines. The focus with trans-disciplinary integration for learning, however, is not a theme or topic selected for this purpose, but the field of knowledge as exemplified in the real world. The teacher provides a structure or framework of learning opportunities, but the integration is done in the mind of the student, based on hi-fidelity situations in the real world of clinical care.

Trans-disciplinary education is reflected in learning described by McCombs[17] as 'an individual process of constructing meaning from information and experience, filtered through each individual's unique perceptions, thoughts and feelings.'

An example of trans-disciplinary integration is the final phase of the medical curriculum at Dundee. The curriculum in the first three years of the students' studies is integrated round the body systems.[18] In the last two years, students are attached for periods of time to a range of specialties in the hospital and in the community and experience the various contexts in which medicine is practised. A set of 113 clinical problems or tasks provides the students with a framework for integrating their experiences.[19] Students look at each of the tasks from the perspective of the different attachments. Abdominal pain can be taken as an example. Students have an acute surgical perspective in their surgical attachment, and different perspectives in the medical attachment, in the gynaecological attachment and in their community attachment in general practice. A printed or electronic study guide[20] is a key element in helping the student with the challenge of integrating these different experiences.

Another example of trans-disciplinary integration is the third year programme of integrated clerkships in ambulatory–care settings at South Dakota.[21] The students spend the year attached to clinics staffed by physicians from various specialties. 'The student is not ''on'' a given specialty for a block of time; rather the required specialties are simultaneous and integrated throughout the year.' Students have the entire year to achieve the course objectives at their own speed and by their own methods.

Thus, in a trans-disciplinary approach the disciplines become part of the learner's real world experience and through these they filter the broader aims and goals of the integrated curriculum. In this environment, the learner is driven to find out as dictated by the prescribed tasks. This stage of integration has been termed 'authentic' integration, reflecting that the learning occurs in the real world. The term 'fusion' has also been applied to this stage. As the student learns, he or she integrates internally and intrinsically and completes the mastery of the competencies related to the task. Fogarty[7] uses the term 'immersion' when 'disciplines become part of the learner's experience and through these filter the broader aims and goals'.

Discussion and conclusions

Curriculum integration is an important strategy in medical education but is a complex concept.[12] This

paper attempts to clarify the concept by presenting a taxonomy which defines 11 steps between the two extremes of subject-based and integrated teaching.

As one moves up the integration ladder there is less emphasis on the role of the disciplines in the curriculum, an increasing requirement for a central curriculum organizational structure with appropriate resources at its disposal, and a requirement for greater participation by staff in curriculum discussions and planning.

The higher up one goes on the integration ladder, the more important is the communication and joint planning between teachers from different subjects. Agreement between departments may be required concerning the outline of the teaching programme, the sequence of the teaching, the aims and objectives of the programme, the details relating to content and the method of student assessment.

The published timetable or syllabus will usually give an indication of the level of integration in the curriculum. The higher the level of integration, the less prominence will be given to disciplines.

The 'integration ladder' is a useful tool for the medical teacher or educator and can help in a number of situations. Teachers may agree about the value of integration, but may differ in their views as to the optimum balance between integrated and subject-based teaching. The demonstration of the range of options helps to avoid a polarization in the debate. The 'integration ladder', by setting out the menu of choices, encourages teachers to explore the integration options available and to discuss the extent or form of integration most appropriate in the curriculum. Such informed decision making is preferable to a debate, usually sterile, as to whether the curriculum should be integrated or not.

The most appropriate step on the integration ladder for a school will depend on many factors, including the existing curriculum, the experience and views of the teachers, the organizational structure of the medical school, and the overall aims of the curriculum. The move from a traditional subject-based to an integrated curriculum may involve major changes. Alternatively, one can start with something small and manageable such as a few integrated themes using a correlated teaching approach.[22]

In addition to its use in curriculum planning, the integration ladder may also be used as a tool to assist curriculum evaluation and to evaluate the level of integration in a curriculum.

References

1 Association of American Medical Colleges. 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* 1984;**59**, Part 2:1–208.

2 Anderson MB, Swanson AG. Educating medical students – the ACME-TRI report with supplements. *Acad Med* 1993;**68** (Suppl.):S1–46.

3 General Medical Council. *Tomorrow's doctors: Recommendations on undergraduate medical education.* London: General Medical Council, 1993.

4 Harden RM, Sowden Susette, Dunn WR. Some educational strategies in curriculum development: The SPICES model. ASME Medical Education Booklet number 18. *Med Educ* 1984;**18**:284–97.

5 Schmidt HG, Machiels-Bongaerts M, Hermans H, ten Cate TJ, Venekamp R, Boschuizen HPA. The development of diagnostic competence: comparison of a problem-based, an integrated and a conventional medical curriculum. *Acad Med* 1996;**71** (6):658–64.

6 Jacobs HH. Interdisciplinary curriculum: Design and implementation. Alexandria, Virginia: Association for Supervision and Curriculum Development, 1989.

7 Fogarty R. How to integrate the curricula. Palatine, Illinois, IRI/Skylight Training and Publishing Inc, 1991.

8 Drake SM. Planning integrated curriculum. The call to adventure. Alexandria, Virginia: Association for Supervision and Curriculum Development, 1993.

9 Glatthorn AA. Developing a quality curriculum. Alexandria, Virginia: Association for Supervision and Curriculum Development, 1994.

10 Taylor WC, Moore GT. Health promotion and disease prevention: integration into a medical school curriculum. *Med Educ* 1994;**28**:481–7.

11 Harden RM, Crosby JR, Davis MH. An introduction to outcome-based education. *Med Teacher* 1999;**21** (1):7–14.

12 Pring R. Curriculum integration, p 265–72. In: Hooper R. ed. *The Curriculum: Context Design and Development Education.* Edinburgh: Oliver and Boyd, 1970.

13 Harden RM, Laidlaw JM, Ker JS, Mitchell HE. AMEE Medical Education Guide No 7: Task-based learning: an educational strategy for undergraduate, postgraduate and continuing medical education, Parts 1 & 2. *Med Teacher* 1996;**18** (1):7–13 & 1996;**18**(2):91–8.

14 Jarvis P. An international Dictionary of Adult and Continuing Education. London and New York: Routledge, 1990.

15 Vars GF. Integrated curriculum in historical perspective. *Education Leadership* 1991;**49(2)**:14–15.

16 Whitehead AN. *The Aims of Education.* New York: The Free Press, 1929.

17 McCombs BL. Learner-Centred Psychological Principles. *Guidelines for School Redesign and Reform.* Washington DC: American Psychological Association, 1992.

18 Harden RM, Davis MH, Crosby JR. The new Dundee medical curriculum: a whole that is greater than the sum of the parts. *Med Educ* 1997;**31**:264–71.

19 Harden RM. Task-based learning: the answer to integration and problem-based learning in the clinical years. *Med Educ* 2000;**34**:391–397.

20 Laidlaw JM, Harden RM. What is ……. A study guide? *Med Teacher* 1990;**12** (1):7–12.
21 Hansen LA, Talley RC. South Dakota's Third year Program of Integrated Clerkships in Ambulatory-care Settings. *Acad Med* 1992;**67**:817–9.
22 Willis S. Refocusing the curriculum: making interdisciplinary efforts work. *Assoc for Supervision Curriculum Dev Update* 1995;**37**:1.

Received 13 *July* 1999; *accepted for publication* 14 *July* 1999