Perspective: Deconstructing Integration: A Framework for the Rational Application of Integration as a Guiding Curricular Strategy

Ellen Goldman, EdD, and W. Scott Schroth, MD, MPH

Abstract

In response to historical criticism, evolving accreditation standards, and recent reports on curricula, medical educators and medical schools have been eagerly pursuing integration as a goal of curricular reform. The general education literature broadly considers integration to be the deliberate unification of separate areas of knowledge, and it provides support for the concept that integration better meets the needs of adult learners in professional education.

The use of integration as a curricular goal is not without its critics, however, nor is it free of difficulties in implementation. In this perspective, the authors propose that most of these difficulties arise from a failure to recognize that integration is a strategy for curricular development rather than a goal in itself, and they argue that adopting a systematic approach to integration offers many potential benefits. They articulate the conceptual and practical issues that they

believe are critical to consider in order to achieve successful curricular integration, and they suggest that integration should be approached as a subset of broader curriculum development decisions. They propose a three-level framework for applying integration as a guiding curricular strategy, in which decisions about integration must follow curricular decisions made at the program level, the course level, and then the individual session level.

Calls for integration across the medical curriculum have been voiced for more than 25 years.[1] Among the most recent of these calls is the Carnegie Foundation report *Educating Physicians: A Call for Reform of Medical School and Residency*,[2] whose recommendations include "strengthening connections between formal and experiential knowledge across the continuum of medical education, specifically by incorporating more clinical experiences earlier in medical school and providing more opportunities for knowledge building later in medical school and throughout residency."[3] In *Academic Medicine*'s 2010 compendium of medical education reports from U.S. and Canadian medical schools, 82% of reporting schools mentioned

Dr. Goldman is assistant professor of human and organizational learning, George Washington University Graduate School of Education and Human Development, and director, Master Teacher Leadership Development Program, George Washington University School of Medicine and Health Sciences, Washington, DC.

Dr. Schroth is associate professor of medicine and associate dean for administration, George Washington University School of Medicine and Health Sciences, Washington, DC.

Correspondence should be addressed to Dr. Schroth, George Washington University School of Medicine and Health Sciences, Ross Hall, Suite 713-West, 2300 I Street NW, Washington, DC 20037; telephone: (202) 994-2987; fax: (202) 994-0926; e-mail: wschroth@gwu.edu.

integration as a central characteristic of their curriculum and of their plans for ongoing curricular reform.[4]

The rationale for curricular integration is well documented in the learning literature: Experience applying knowledge motivates its comprehension, helps codify it, and serves as the basis for the development of new knowledge.[5–8] Further, the types of reasoning in which physicians must be able to engage— analytical, heuristic, and creative[9]— require a progression of activity that includes comprehension (of knowledge), application (experience), and synthesis (further knowledge development).[10,11]

The examples of teaching strategies that promote integration offered in the Carnegie Foundation report include early clinical immersion, problem-based learning, team-based learning, blended learning, simulations, and standardized patients.[2] Other discussions in the recent medical education literature regarding integration include reorganizing the curriculum into cross-cutting themes,[12] integrating clinical experiences into basic science teaching,[13–15] extending the teaching of the basic sciences throughout the curriculum,[16] and maximizing the use of small-group teaching.[17]

Integration in education is most broadly defined as "any intentional uniting or meshing of discrete elements or features."[18]

The literature, then, discusses integration as an operational concept, where separate areas of knowledge are deliberately unified, but leaves education administrators and faculty without an organizing framework for approaching integration. This definition and the examples above make it clear that there are aspects of integration that apply at the program level (e.g., curricular themes), the course level (e.g., course design that combines knowledge acquisition and experience), and the individual course-session level (e.g., using various teaching methods such as problem-based learning and formats such as small-group teaching).

Although the concept of curricular integration has been lauded, the literature also contains criticism of the practices associated with its implementation.[9,18,19] We contend that these criticisms most often arise from a failure to understand that integration is a *strategy* of curriculum development and not a goal in itself. The basis for using this strategy—that is, the goal that it is designed to achieve—should be clear, and the application of the strategy at all three levels—program, course, and session—should be carefully executed. The literature does not, however, provide a framework or practical guidance for implementing integration in a medical education curriculum. In this perspective, we articulate the conceptual and practical issues that we believe are critical to

consider in order to achieve successful curricular integration. We begin with a brief overview of the challenges of integration and then propose a three-level framework for applying integration as a guiding curricular strategy.

General Challenges of Curricular Integration

There is a long history of curricular integration activity throughout all types of education.[18] However, as described above, criticism has been leveled at the use of curricular integration in a variety of domains. Proposals for curricular integration (outside medical education) have been described as "treating undernourished persons by promoting gluttony"[18]—in other words, there is an assumption that more integration, in any form, is an improvement. Absent a proper diagnosis of the underlying curricular problems, it would be easy to deliver curriculum reform "overkill."

Medical educators, in criticizing past curricular reform efforts such as shifts to learner-centered approaches, have noted that "often no clear distinction is made between the aims and objectives of educational provision and the strategies adopted for their achievement;

educational concepts may become ends in themselves, and the overall aim becomes lost."[19] Moreover, new methods of education (e.g., problem-based learning) have been described as being applied without a full understanding of the concepts they are based on or what is achieved in practice.[19] With respect to integration, it has been noted that there is no one way to integrate: Each medical school needs to select methods appropriate for its own goals, structure, and constraints.[9]

Thus, there is a risk that medical education integration activities may be advocated blindly and implemented at the level of delivery (classroom or clinic) without a clear understanding of what overall purpose is desired. In addition, in the absence of a systematic framework for the conceptualization of integration, incorporating integration in reform efforts may not further the medical school's unique goals. As a result, integration activity may fall short of its potential.

An Organizing Framework for Curricular Integration

To maximize the benefits of integration, integration activities should be aligned at

the program, course, and session levels. To develop a framework for achieving this alignment, we gleaned guidelines from the learning literature, specifically in the domains of adult education, curriculum design, and organizational learning and change, and analyzed descriptions of integration experiences in the medical education literature.

Figure 1 illustrates our proposed framework for aligning and enhancing the value of medical education integration activities. It provides an overview of the decisions required first at the program level, then at the course level, and finally at the session level. At each level, curriculum design decisions precede decisions related to integration. This is presented as a linear process; in practice, there may be iterations of decision making *within* each level. However, proceeding to the next level without resolving the decisions to be made at the prior level would not reflect solid curriculum design and management.

Program-level decisions

Program-level curriculum development decisions begin with considering the medical school's mission[20]: the purpose of medical education at the
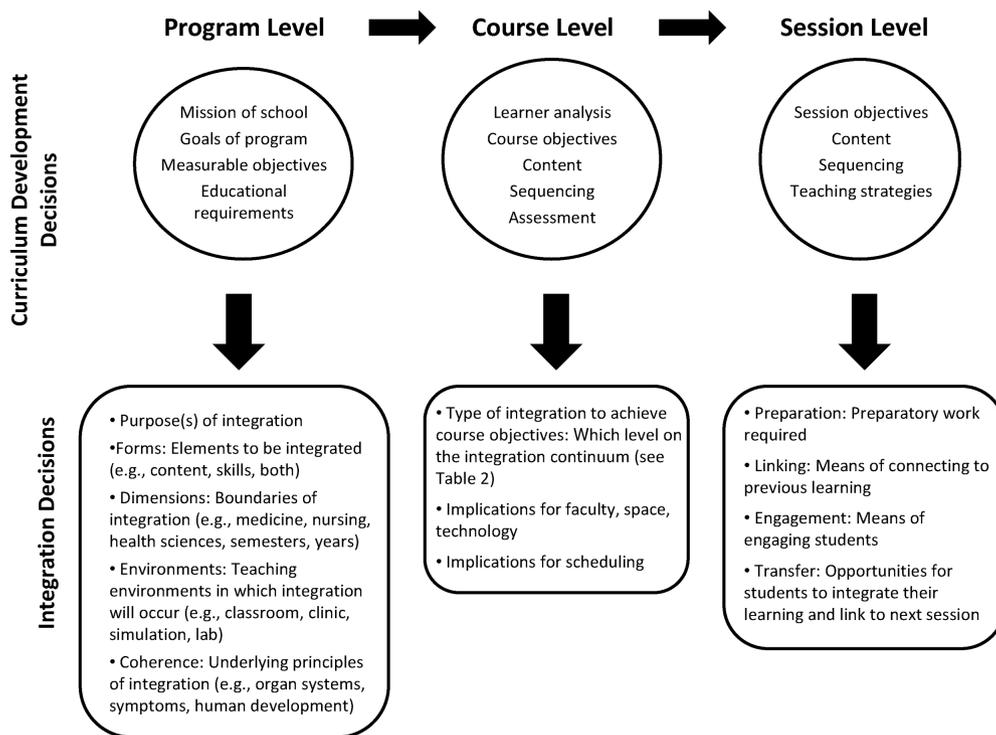

Figure 1 Organizing framework for curriculum development and required integration decisions at the program, course, and session levels of curricular design.

particular institution. This informs the program goals, which in turn lead to the establishment of measurable objectives for determining how well the goals are being met. The program goals will inform specific educational requirements, such as mandatory service, interdisciplinary education, or particular clinical skills or experiences deemed important by the institution. Additionally, program goals provide the rationale for program-level integration, making integration a strategy to achieve the goals. For example, if one program goal is to foster excellence in clinical teamwork, the purpose of curricular integration would relate to uniting medical, nursing, and health science professionals in learning and practice environments. Alternatively, if a major focus of the program is to develop capabilities in community-based practice, the purpose of curricular integration would relate to developing longitudinal competencies in population health, community assessment, and the causes of and remedies for health care disparities. In each example, the specifics of integration will be different; in both examples, integration is a strategy for achieving program goals.

Once the program-level curriculum decisions are clear, and curricular integration is selected as a strategy for achieving some of the program goals, a number of program-level integration decisions need to be made. Table 1 provides a synopsis of five crucial considerations and decisions, with associated examples.[1,9,18]

As noted above, integration activities should be driven by a clear statement of purpose. The answer to the question "What is the integration trying to achieve?" (What is the purpose of integration?) should relate to the medical school's program objectives and unique characteristics. This answer will, in turn, inform the selection of elements of integration (what should be integrated) and their boundaries and locations (when in the curriculum integration should occur and in what environments).

Once there is a picture of the depth and breadth of the integration required to achieve the stated purpose(s), the underlying organizing principle(s) can be addressed: For example, would it be best to organize the curriculum by

organ systems or some other principle? How much grounding in the basic sciences would the students whom the school attracts need before they could obtain significant value from clinical immersion? Taken together, the decisions made regarding the five program-level integration considerations should form a rational foundation on which to build the curriculum structure at the course (or clerkship) level.

Course-level decisions

Curriculum development decisions to be made at the course level relate to course objectives, content, and sequencing, as well as form of assessment (Figure 1).[20] Course objectives can be determined by considering the role of the course in the program and the needs of the students, the field (e.g., specialty competencies, examination requirements), and other stakeholders. This activity is referred to in instructional design theory as "analysis." Much of the information needed to complete the analysis will result from the program-level integration decisions; information about the student body (e.g., undergraduate majors, past experiences) is also needed. Further analysis may be necessary to assess students' starting knowledge and skills for the specific course.

Once the course objectives have been identified, the content can be specified and its order of presentation determined. The course objectives should also be aligned with assignments or other means of assessing the extent to which students have achieved them (e.g., tests, observations). Together, these course-level curriculum decisions are referred to in instructional design theory as "design."

The design decisions frame the course and determine the nature of integration required at the course level. As noted in Figure 1, course-level integration decisions include the types of integration needed and the associated implications for faculty, resources, and scheduling. A useful way of determining the nature of integration required is to locate the course along the continuum depicted in Harden's[1] "integration ladder" (summarized in Table 2). Harden's continuum identifies integration options for course delivery, beginning with no integration whatsoever ("isolation") and ending with completely fused design ("transdisciplinary"). The question facing course directors is, "What type of integration is needed to achieve the course objectives?"

Table 1

A Systematic Approach to Using Integration as a Curricular Strategy at the Level of an Institution's Educational Program

Considerations (framing question)	Decisions required	Examples
Purpose(s) (Why?)	What is the integration trying to achieve?	• Help students deal with complex problems • Enhance functional competency • Foster higher-order thinking
Forms (What?)	Which elements are to be integrated?	• Content knowledge • Skill development
Dimensions (When?)	What are the boundaries of the integration activity?	• Horizontal integration (semester or year) • Vertical integration (multiple years) • Both horizontal and vertical • Interprofessional
Environments (Where?)	In what teaching environments should integration take place?	• Classroom • Simulation center • Clinic/bedside
Coherence (How?)	What underlying principle or principles unify the integration activity and provide it with integrity?	• Organ systems • Stages of human development • Disease or symptom • Competencies

Consider the general recommendation in the Carnegie Foundation report to "incorporat[e] more clinical experiences earlier in medical school."[3] This objective can be achieved in many ways at different points along the continuum (Table 2). For example, a basic science course like Gross Anatomy could "nest" clinical demonstrations or live patient encounters in the course. Alternatively, the course could cease to exist in stand-alone form; instead, the material could be taught in a "multidisciplinary," case-based manner across courses on different body systems or in conjunction with early clinical experiences in a "doctoring" course. These two examples illustrate how course-level analysis will affect course-level integration decisions. If the analysis determines that a large number of the medical school's students do not have adequate preparation in the principles of anatomy, then "nesting" or "complementary" integration would make sense. Previous program-level integration decisions are also influential: If it has been decided that the curriculum should be organized by organ systems (as the underlying principle of curricular integration), and analysis indicates that students have adequate preparation in the principles of anatomy, then a multidisciplinary integration approach may be appropriate.

Meeting the general objective of the Carnegie Foundation report to "provid[e] more opportunities for knowledge building later in medical school"[3] may also be achieved in many ways. For example, sessions with Gross Anatomy faculty could be "nested" into clerkships to help students apply knowledge. If the aim is to develop students' higher-level thinking, such as synthesizing information to identify surgical interventions, a multidisciplinary approach may be appropriate.

The level of course integration targeted, particularly if it is one of the higher levels on the continuum, may have important collateral implications for course delivery.[18] First, as courses move to increasing levels of integration, more faculty time is required both for centralized course design and overall curriculum planning. Second, not all faculty may be comfortable with team teaching or teaching in fused courses outside their traditional areas of expertise. These issues may increase the costs of education related to the recruitment and development of faculty who must take on new roles. In addition, failing to determine program-level strategies first may lead to the adoption of an inappropriate course-level strategy with substantial implications for faculty effort and curricular coherence. Further, uncoordinated integration strategies at the course level may lead to more integration than is necessary to achieve program goals. As the examples above demonstrate, first making the curriculum development decisions and then the integration decisions at each level may help avoid the "more is better" phenomenon.

We noted earlier that these steps may not always be linear. Particularly at the course level, there may be interplay of the decision making; that is, discussing the appropriate placement of the course on the integration continuum may result in changes to the content and sequencing decisions. Such discussions should not, however, change decisions that have been made at the program level: That would allow courses to drive the program and indicate a lack of effective curricular oversight. This emphasizes the importance of devoting ample deliberation and discussion time with faculty to ensure that they clearly understand the program-level curriculum

Table 2

A Systematic Approach to Using Integration as a Curricular Strategy at the Level of a Specific Course or Clerkship: The Continuum of Integration Within a Course*

Continuum (level)	Definition	Examples[†]
Isolation (no integration)	Independent teaching by subject matter experts	Gross anatomy, physiology, immunology, surgery
Awareness (cooperating)	Same as Isolation, but faculty have knowledge of the content taught by others	Faculty share lecture notes/handouts, commonly through a central curriculum database
Harmonization (consulting)	Same as Isolation, but faculty consult with each other to avoid overlap	Faculty have informal discussions; curriculum planning meetings
Nesting (importing)	Content/skills are infused into existing subject-based course, such as including "clinical correlations"	Pathology course including aspects of clinical medicine to demonstrate pathology principles; pharmacology review in a clerkship
Temporal coordination (aligning)	Timing of related subjects aligned across independent courses	Physiology teaches the function of the heart at the same time that anatomy teaches the structure of the heart
Sharing (coteaching)	Complementary disciplines jointly plan and deliver content	Neurobiology and psychopathology deliver a behavioral medicine course
Correlation (linking)	An area of common interest to multiple subject-based courses is introduced	The gastrointestinal system is looked at from the perspectives of multiple content areas
Complementary (coordinated mixing)	Integrated courses that are offered side by side with subject-based courses with temporal coordination	"Doctoring" course sections are scheduled to coincide with basic science teaching
Multidisciplinary (mixing perspectives)	A number of subject areas in a single theme, problem, or issues-based course	Patient management is taught from the standpoints of pain relief, family relationships, economics, and multiculturalism
Interdisciplinary (multiple combined perspectives)	Two or more disciplines are combined such that no individual subject area is identifiable	A new course in evidence-based medicine
Transdisciplinary (fused learning; complete integration)	The focus is on the field as a whole using real problems to structure opportunities for student-initiated integration	Integrated clerkships with individual pacing; individualized self-learning

*Levels in the continuum are adapted, with permission of the author, from Harden RM. The integration ladder: A tool for curriculum planning and evaluation. Med Educ. 2000;34:551–557.
[†] Examples are drawn from a variety of medical schools.

development and integration decisions driving course-level decisions.

Session-level decisions

Session-level course development decisions relate to objectives, content, sequencing, and strategies (teaching methods, formats, and materials) (Figure 1).[20] These aspects are referred to in instructional design theory as "development." Faculty have almost endless options in this stage of course development. For example, potential teaching methods include lecture, case discussion, role-play, and simulation, or some combination thereof. Teaching formats may be large-group, small-group, individual, or dyadic. Possible materials include text, film, video, or other media. Selecting the "right" teaching strategies should be based on the session's objectives. The question that faculty must answer is, "What do we want the students to know or be able to do at the conclusion of the session?"[21,22]

The Carnegie Foundation report recommends "strengthening connections between formal and experiential knowledge across the continuum of medical education."[3] From a learning standpoint, although faculty can "set the table" for integration, the learner ultimately needs to integrate his or her own knowledge and experience. Benor[9] described the difference:

> There is a fundamental difference between a curriculum in which many disciplines are represented simultaneously, reflecting many interconnections among them but not requiring the student to achieve any transfer, and a curriculum in which the student is required to generalize, to identify commonalities and to draw conclusions applicable to other disciplines…. The former type of curriculum demonstrates integration on the part of the planner, at the macro-level; the latter, on the learner's at the micro-level.

The individual's learner's cognitive processing dimensions related to integration occur at the final two levels of Bloom's taxonomy of objectives: "synthesis" and "evaluation."[10,11] Teaching methods that target these two levels include the use of problems, cases, simulations, projects, exercises, and critiques. (In contrast, lower-level objectives can be achieved through lectures, videos, examples, role-play, and demonstrations.) As faculty design individual sessions and adopt

instructional methods, they should systematically link session objectives to activities that promote integration of learning.

In Table 3, we provide an outline of session activities that are designed from an adult learning standpoint to help the learner integrate material.[5–8,17,20–22] Examples of teaching strategies consistent with learners' achieving the cognitive level of synthesis are provided as part of the "engagement" component. (Given the plethora of teaching strategy options, we primarily listed methods in Table 3 and provided a few examples of formats and materials.) Consistency of strategies across the other aspects of engagement, and with the "preparation," "linking," and "transfer" components, promotes learner integration of the material.

Students' ability to integrate knowledge and experience requires that they be familiar with relevant vocabulary and terminology and have some level of knowledge of the content.[9] This is consistent with where "synthesis" occurs on the taxonomy of objectives.[10,11] Session synthesis is also fueled by shared engagement and reflection.[6,7,21,22] Students may require additional training and practice to develop these

skills, however, and faculty can employ numerous techniques to help them do so.[21,22] In our own experience, we have found that shared engagement activities (i.e., small-group work) are effective when we explain to students why groups are being used, provide a structured approach with clear questions to be answered, assign roles for all group members (including someone to keep time and someone to report out), and make strategic use of the work completed (e.g., limited repetition when reporting out, faculty summarization of critical points). We have found that students' reflective abilities increase when we pose specific questions either before or after class sessions, to which students must respond with a written reflection posted on the course Web site. Faculty provide graded feedback on these posts along with comments to foster additional reflection.

Recommendations and Conclusions

Calls for integration across the medical curriculum present many challenges to faculty and students alike. To apply integration as a guiding strategy for curricular design, clear integration decisions are required at the program, course, and session levels and should

Table 3

A Systematic Approach to Using Integration as a Strategy for an Individual Learning Session Within a Course or Clerkship

Session component	Purpose	Examples
Preparation	• Give the learner needed background information • Set expectations for what is to come	• Assign readings, questions, or problems in advance • Describe clearly how session will run
Linking	• Stimulate the brain: Connect to what the learner already knows and/or has experienced	• Reference/recall specifics from prior session and/or other coursework • Query about recent experiences
Engagement	• Excite: Hook the learner by showing the relevance • Present material and learning guidance • Engage: Have the learner use the material to integrate it with prior knowledge and experience • Foster awareness: Help the learner realize what he or she has gained	• Use alarming statistics, a story of a patient, etc., as a hook • Present a case, problem, project, etc., and the thought/action desired • Assign individuals, pairs, or small groups to solve a problem, develop a plan, formulate a response, etc. • Provide opportunity for reflection and discussion; feedback
Transfer	• Enhance retention of new learning	• Provide cues and strategies for future retrieval • Describe next session

follow the curriculum development decisions previously made at each of these levels. Making decisions in this order will help ensure that a coherent rationale for integration is carried forward into course design and sequencing and into the selection of optimal pedagogical strategies for each session.

Clearly, implementing integration as a curriculum development strategy requires considerable effort on the part of both faculty and students and, frequently, additional resources. Faculty and students may experience initial discomfort when new approaches to teaching and learning are introduced. Faculty may not be prepared to teach using collaborative formats or more active learning methods. Redesigning courses requires considerable time and energy; it is far easier to deliver a lecture than it is to conceptualize and codevelop experiential learning activities. Students for whom active learning is a new experience may resent learning on their own and in groups with others, perceiving that they have "paid" for learned faculty to impart knowledge to them. This may require additional material to be developed regarding the methods and value of self-directed and group learning. Further, facilities, such as classrooms and laboratories, may need to be redesigned to better accommodate group work. Additional administrative personnel may be needed to help change scheduling, locate appropriate facilities, and modify evaluation mechanisms.

At the same time, adopting a systematic approach to integration offers many potential benefits. Faculty may enter into new collaborations that lead to research and publishing opportunities. These collaborations may enhance their professional development as team teachers and offer new opportunities for course leadership. They may also discover they enjoy teaching more. Students, particularly those of the multitasking millennial generation, are likely to enjoy class sessions more and, by becoming

more self-directed in their learning, gain a skill that will serve them well for the rest of their careers. Ultimately, patients and communities will benefit from physicians who graduate from medical school with more highly developed analytic, heuristic, and creative thinking skills—skills that faculty helped them develop through the use of instructional design adopted and implemented as part of a comprehensive approach to curricular reform that used integration as a strategy.

References

1 Harden RM. The integration ladder: A tool for curriculum planning and evaluation. Med Educ. 2000;34:551–557.

2 Cooke M, Irby DM, O'Brien BC. Educating Physicians: A Call for Reform of Medical School and Residency. San Francisco, Calif: Jossey-Bass; 2010.

3 Carnegie Foundation for the Advancement of Teaching. Educating Physicians: A Call for Reform of Medical School and Residency [press release]. June 2010. http://www.carnegiefoundation.org/newsroom/press-releases/educating-physicians-call-reform-medical-school-and-residency. Accessed February 15, 2012.

4 Anderson MB, ed. A Snapshot of Medical Student Education in the United States and Canada: Reports From 128 Schools. Acad Med. 2010;85(9 suppl):S1–S706.

5 Cozolino L, Sprokay S. Neuroscience and adult learning. New Dir Adult Contin Educ. 2006;2006:11–19.

6 Illeris K. How We Learn: Learning and Non-learning in School and Beyond. New York, NY: Routledge; 2007.

7 Merriam S, Caffarella R, Baumgartner L. Learning in Adulthood: A Comprehensive Guide. 3rd ed. San Francisco, Calif: Jossey-Bass; 2007.

8 Sheckley BG, Bell S. Experience, consciousness, and learning: Implications for instruction. New Dir Adult Contin Educ. 2006;2006:43–52.

9 Benor DE. Interdisciplinary integration in medical education: Theory and method. Med Educ. 1982;16:355–361.

10 Bloom BS, Engelhart MD, Furst EJ, Hill WH, Krathwohl DR. Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook 1: Cognitive Domain. New York, NY: David McKay; 1956.

11 Krathwohl DR. A revision of Bloom's taxonomy: An overview. Theory Into Practice. 2002;41:212–218.

12 Kitzes JA, Savich RD, Kalishman S, et al. Fitting it all in: Integration of 12 cross-cutting themes into a school of medicine curriculum. Med Teach. 2007;29:437–442.

13 Norris TE, Schaad DC, DeWitt D, Ogur B, Hunt DD. Longitudinal integrated clerkships for medical students: An innovation adopted by medical schools in Australia, Canada, South Africa, and the United States. Acad Med. 2009;84:902–907.

14 Ogur B, Hirsh D, Krupat E, Bor D. The Harvard Medical School–Cambridge integrated clerkship: An innovative model of clinical education. Acad Med. 2007;82:397–404.

15 Van der Veken J, Valcke M, De Maeseneer J, Derese A. Impact of the transition from a conventional to an integrated contextual medical curriculum on students' learning patterns: A longitudinal study. Med Teach. 2009;31:433–441.

16 Spencer AL, Brosenitsch T, Levine AS, Kanter SL. Back to the basic sciences: An innovative approach to teaching senior medical students how to best integrate basic science and clinical medicine. Acad Med. 2008;83:662–669.

17 McNeil HP, Hughes CS, Toohey SM, Dowton SB. An innovative outcomes-based medical education program built on adult learning principles. Med Teach. 2006;28:527–534.

18 Case R. The anatomy of curricular integration. Can J Educ. 1991;16:215–224.

19 Spenser JA, Jordan RK. Learner centred approaches in medical education. BMJ. 1999;318:1280–1283.

20 Diamond RM. Designing and Assessing Courses and Curricula: A Practical Guide. Rev ed. San Francisco, Calif: Jossey-Bass; 1998.

21 Caffarella RS. Planning Programs for Adult Learners: A Practical Guide for Educators, Trainers, and Staff Developers. 2nd ed. San Francisco, Calif: Jossey-Bass; 2002.

22 Silberman ML. Active Learning: 101 Strategies to Teach Any Subject. Needham Heights, Mass: Allyn and Bacon; 1996.