Chapter

A Hybrid Model of Problem-based Learning

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If we observe the process which we call instruction, we see two parties conjointly engaged - the learner and the teacher. The object of both is the same, but their relations to the work to be done are different ... [The] essential part, the appropriation and assimilation of knowledge by the mind, can be performed by no one but the learner... [from which]... it follows that he is in fact his own teacher, and ... that learning is self teaching ... The Teacher's part then in the process of instruction is that of a guide, director, or superintendent of the operations by which the pupil teaches himself. (Joseph Payne, 1883)

General principles

As the opening citation - from Joseph Payne, first Professor of the Science and Art of Education at the College of Preceptors in London - demonstrates, the idea that adult learners teach themselves is scarcely revolutionary. By incorporating this idea as its first principle, and augmenting it with an acknowledgement of the range of adult learning styles born of modern cognitive psychology, the New Pathway curriculum at the Harvard Medical School displays what might be considered its most characteristic quality: hybridization. The New Pathway aims to innovate without sacrificing the best of the old, to stimulate individual initiative without inefficiency, and to balance the latest developments in medical science with the age-old values of
healing. In every sense, our goals and implementation of those goals are hybrids - with, we hope, the strength and adaptability that hybrids usually display.

More specifically, our new curriculum challenges the assumptions of the predominant lecture-based model of medical training that crystallized and became standard during the first eight decades of the 20th century: two years of ‘pure science’ and laboratory work followed by two clinical years. The New Pathway incorporates our assumptions that passive attendance at basic science lectures will not guarantee learning for every student; memorization of increasingly large numbers of facts will not necessarily provide the accessible knowledge base required for clinical practice or research; and, finally, that presenting discrete bodies of information in totally separated courses during the first two years of medical school will not prepare every student to apply and integrate that information in solving clinical problems in the second two years of training. The New Pathway at the Harvard Medical School is a broad-based attempt to create a four-year pedagogical structure within an organization that supports students to equip themselves with the skills, knowledge, and sensitivities they will need in a swiftly evolving professional environment (Tosteson, 1990).

These three pedagogical objectives for the new curriculum - knowledge, skills and sensitivity - have dominated faculty planning discussions from the beginning of the design process. By knowledge, we mean a broad, deep and flexible familiarity with the intellectual materials of the profession. By skills, we mean competencies that will require renewal over a lifetime of learning; and by sensitivity, we mean ethical awareness and openness to the world of the patient. It was to promote these broad goals that we implemented the framework for the first pilot track in September 1985. And it is these goals that support the continuing evaluation and evolution of our curriculum.

**Application of principles**

Throughout the planning and implementation process, faculty members met in committees to clarify goals, design programmes, and provide ‘feedback’ and suggestions for improvement. From an institutional context that includes a range of diverse opinions, the planning group reached consensus on the pilot programmes. As its intellectual base they endorsed and implemented the concept of problem-based learning along with the teaching strategies that support this
A Hybrid Model of 'Problem-based-Learning

philosophy. Tutorials in which small groups of students, each led by a tutor, approach general medical education by reading, studying and discussing 'real life' medical cases were to become the primary launching pad for problem-based learning. The rationale for teaching by the discussion of paper cases is that students who discover for themselves the basic science concepts of a given set of symptoms or a diagnosis not only enjoy the process but retain the information. At Harvard, where our goal is to preserve excellence in general medical education and accommodate a wide range of adult learning styles, the cases assume a key integrative role in the new interdisciplinary courses.

To accommodate a variety of learning styles, there was strong sentiment for the retention of lectures, labs and conferences along with the implementation of small discussion tutorials. Replacing all lectures with discussion groups or tutorials would merely substitute one lopsided system for another. Extensive debate resulted in the realization that the scope, frequency and format of lectures and laboratory sessions could be effectively altered to dovetail with active problem-based discussions. Our hybrid curriculum, therefore, incorporates a range of carefully planned teaching strategies. The planning committee's objective became the integration of all these pedagogical elements around a core of student-directed learning.

Overall planning: an integrated approach

A Core Faculty Planning Group designed the framework and goals for the first two years of basic science study with a set of interdisciplinary blocks (Figure 14.1). Each block includes small group case discussions (tutorials) led by instructors called tutors. Tutorial time varies from block to block. In the human body block tutorials meet for one hour a day five times per week; in the human nervous system and behaviour block, and most of the other blocks, they meet for three one-and-a-half- or two-hour sessions each week. For each block, there is a smaller faculty planning unit called a Curriculum Design Group comprised of scientists and clinicians from each represented discipline and a curriculum coordinator providing expertise in education. The members of these groups continually re-evaluate, redesign and re-implement each block guided by the Masters of the five Academic Societies who share responsibility for the oversight of the curriculum and integration of content across the four years. The curriculum
The Challenge of Problem-based Learning
A Hybrid Model of Problem-based Learning

design groups are charged with establishing the goals of the course, integrating its disciplines, identifying the level of content appropriate to a general medical curriculum, and matching that content to the most effective pedagogy (see the model schedule of a prototypical week, Figure 14.2).

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D Lecture 8.30-9.30am

Figure 14.2 Prototypical weeks - years one and two

Most Curriculum Design Groups for individual blocks begin by pairing the course goals with a series of increasingly complex written cases, usually one per week. The cases are the primary vehicles for the students' tutorial discussions and self-directed study (Glick and Armstrong, 1996). As a supplement to the cases that organize each unit, regular lectures, labs, conferences and computer-aided instruction sessions offer a variety of perspectives on the major instructional theme of each week.

The curriculum coordinator plays an active role in facilitating the preparation and review of cases and all support materials for the block. The coordinator acts as an educational consultant to the planning group and is sometimes referred to as the producer of the block. The primary responsibility for facilitating communication among numerous faculty and guiding the planning and implementation of the course rests with the coordinator.

A two and a half year patient/doctor course promotes conceptual and practical integration. It is offered one afternoon per week in the first and third year concurrently with the human biology blocks and

141
The Challenge of Problem-based Learning

the third year clerkships. In the second year, it increases in time from one afternoon, to one day, and finally to two days per week during the last two months, allowing students to expand progressively their physical examination skills. Committed to the importance of the development of sensitivity as a new curriculum goal, planners soon realized that emphasis on the knowledge and skill components of the basic sciences might overwhelm this area in the human biology component. While not precluding any discussion of psychosocial issues in the small discussion groups of the basic science blocks, the planners designed a longitudinal course in which social science issues would be explored in the context of learning to care for patients. In the patient-doctor course, behavioural, ethical, fiscal and attitudinal aspects of the patient-doctor relationship are explored as students master the basic skills of history taking and physical examination.

During the first two years, the patient/doctor course is designed to dovetail with the content of the human biology courses and encourage students to assimilate what they are learning into a coherent whole. For example, while the students are engaged in learning the physiology of male and female reproduction in the genetics, embryology and reproduction block they are also learning to take sexual histories from their patient in the patient/doctor course. During the third year, the patient/doctor tutorials revisit many themes of the first two years at a level more appropriate for students immersed in the clinical care of patients, such as ethical and medical financing issues. They also offer the opportunity to share clinical experiences in the tutorial setting.

Lectures

One of the goals of the new curriculum was to increase active learning and decrease students' experience of the sort of passive learning that occurs in lectures. Accordingly, the number of lectures was reduced below that of the traditional curriculum, and the remaining lectures were focused to emphasize key concepts, build a framework of ideas and relate to the case of the week. Lectures are used to present material that is new or more conceptually difficult and, therefore, less likely to be readily assimilated from the readings or tutorial study. In addition, lecturers are asked to make their presentations interactive - to permit interruptions and take more questions.

Our hybrid model differs from the traditional first- and second-year medical curriculum in having fewer contact hours and lectures per
A Hybrid Model of Problem-based Learning

week (see Figure 14.2) and in balancing case discussions with lectures and other pedagogical modes (Feletti and Armstrong, 1989). Within the existing weekly schedule, lectures are presented as a multidisciplinary series whose theme relates to the teaching objectives of the particular week. Lecture material is also integrated with labs and discipline-based conferences. All the approaches combine to prepare students to grasp and apply what they are learning.

To maximize continuity and focus - and avoid the 'cameo appearance' syndrome that plagues many institutions with large and diverse faculties - lecturers are requested to provide a minimum of three related presentations. Ideally, in this structure, lecturers have the time and opportunity to construct conceptual frameworks within which students may assimilate their new understandings as these emerge from tutorial discussions and independent studies.

The pervasive goal of interdigitating content and teaching modes requires a high level of communication and preparation, for faculty and students alike. Each course director generally offers guidance to faculty members who are asked to lecture, and each lecturer has an opportunity to see how his or her presentation fits into the overview and relates to the case and labs of the week. To promote coherence, lecturers receive copies of the case(s) to which their lectures must correspond and they are requested to submit one- or two-page lecture outlines which, when reviewed and accepted, are published in student guides and distributed before the lectures. These outlines specify learning objectives and list one or two key references. Students report that these outlines enable them to prepare for lectures, organize their independent studies and learn actively during lectures. As a result of preparation and careful curricular integration, it is also common for students to bring up unresolved questions from tutorial discussion or independent study in the lecture hall. This approach has permitted lectures in the new curriculum to promote far more active learning than in the past.

Tutorial discussions and cases: the key to student learning and faculty development

The range of cases developed for the curriculum makes Harvard's course materials somewhat unusual in the community of problem-based medical learning. Our cases tell a story about a patient that is revealed through a set of progressively distributed pages. Generally
The Challenge of Problem-based Learning

the student begins the first tutorial with only a brief introduction to the patient that includes a description of the presenting symptoms. After the learning agenda is established in the tutorial, the tutor distributes the subsequent case parts. The agenda is used by the students to direct their self-study. Frequently, they will decide to establish tasks related to agenda items that can be divided among the tutorial members, and report on their progress at the next meeting.

In one block - Genetics, Embryology and Reproduction - the diagnosis is presented in Part I of some cases, while in other blocks it is always withheld until much later in each case sequence. Presenting the name of the genetic disease on the first page of the case effectively prevents students from hypothesizing about a diagnosis, but it also drives them to focus their learning agenda quickly on the molecular biology that underlies the disease whose name they have been given. To date, faculty and students seem quite satisfied with the learning that takes place in this block, but further research will be necessary to determine the effects of this pedagogical variation in case development.

All our paper cases include learning objectives, which we present either in behavioural terms or in the format of study questions that encourage students to evaluate their own progress. Tutors distribute the objectives or questions only after students have had the opportunity to create and follow their own learning agendas. Students may use these objectives to guide their studies and self-assessment - or not.

Each case includes a list of available audio-visual resources and suggested readings from course textbooks and/or collections of journal articles. Faculty resources (experts) who may be consulted are also listed in each case. In some teaching blocks, cases are supplemented with prepared packets of articles for which copyright clearance is obtained. In addition to these materials, a wide range of multimedia resources including DXplain (Barnett et al, 1987) are available. These supplement the paper cases in two ways: they offer students the chance to explore the significance of different clinical manifestations described in a paper case by presenting parallel examples, and they portray other patient cases with related symptoms.

Tutors receive a written tutor guide or teaching note for each case. These guides detail the key features of the case and may include suggestions for pacing the case through the allotted tutorial time. Some provide a brief update on related research or clinical practice. Often, tutor guides are organized around information related to key concepts that underlie each objective or study question in the case. The guides
A Hybrid Model of Problem-based Learning

provide an invaluable standard body of basic knowledge, which tutors - who range from generalists to specialists - find extremely useful as a point of reference. In addition, weekly tutor meetings provide tutors with a forum in which to review the tutorial process, discuss content issues related to the case under study, and prepare for the case of the following week. The preparation for the forthcoming case may include a presentation from the case author or an expert on the content and objectives of the case. These meetings throughout each course support our faculty development efforts and enhance a collegial network among tutors.

Continued challenges of the 'paper case'

As our curriculum and experience with written cases evolve, we find ourselves challenged to increase the variety and range of our cases and make them come alive for students. While our cases are rooted in actual patient scenarios, frequently drawn from medical records, we continue to examine ways to make the patients seem real in an effort to blend cognitive and affective learning modes for students. Working at all times within the constraints of preserving patients' confidentiality (or obtaining their written permission), we have created addenda to cases including: epilogues, photographs, videotaped interviews, letters from medical records, X-rays, ultrasounds, and relevant lab data. Courses have World Wide Web home pages that include reference to additional computerized resources and easier access to some expert faculty. Occasionally the actual patient in the case is able to visit the class and be interviewed or take part in a clinic presentation.

A further challenge in our use of paper cases is adaptation of the method and materials for use in different time-frames and with groups of different sizes. Conference and lab leaders are also examining opportunities to use problem-based learning techniques and employ cases. Some of the blocks employ mini-cases of one to three paragraphs to link lab groups' work with real patient encounters. Other blocks use a series of short cases, presented to groups of 40 students at the end of a week, to highlight and review key concepts.
Clinical curriculum keeping pace with health care delivery

Substantial recent changes to the last two clinical years provide additional time in ambulatory settings and a longitudinal primary care experience promoting a generalist perspective. One month has been added to each of the surgery and the medicine clerkships, specifically designed for outpatient teaching. A twelve month, one afternoon per week, primary care clerkship gives each student the opportunity to have a continuous experience with a primary care preceptor and patients in one practice. To complement these more decentralized teaching activities in disparate sites, a Clinical Commons course offered one afternoon per week, in conjunction with the Patient Doctor 3 course, addresses clinical problem-solving in central sessions at the medical school.

A one month course offering a return to the basic sciences is also required during the third and fourth years. Students may choose from among 20 Biomedical Sciences (ABS) courses ranging in topic from the Biology of Solid Tumor Progression to Epidemiologic Approaches to Major Clinical Problems. Each ABS course examines basic science concepts in the context of clinical medicine, taking advantage of the students' increased clinical sophistication (see Figure 14.3).

Some benefits of the new curriculum

Christensen (1987) described several benefits of case method teaching for both students and faculty at the Harvard Business School. He highlighted students' opportunities to discover in their own ways and build unique personal frameworks for the knowledge base they acquire. For faculty, case teaching and development provide opportunities for intellectual stimulation and pedagogical risk-taking. Faculty who shift from lecturing to case method teaching often report new learning and a refreshing sense of adventure. Christensen went on to note that, for some faculty members, case development rekindles research interests and faculty and students all benefit from the general culture of change that results.

The case method is supportive of a culture that places high value on review and innovation. Too often, faculties teach change - but practice the status quo. Individual course and overall curriculum reviews often depend on the personal initiative of an instructor or the work of faculty committees. But
The Challenge of Problem-based Learning

when faculty must prepare teaching cases, their continuing contact with the world of practice provides the institution with an external force for change. Suggestions that a familiar framework be reviewed or new concepts developed are often received more sympathetically when they derive from the impersonal demand of practice rather than from colleagues or departments, with their personal agendas. The case method encourages an adaptive culture.

What Christensen described about problem-based learning in a business school setting appears to be transferable to a medical school. Many of our faculty members appear to enjoy all aspects of their tutoring from training with colleagues to working with students. Tutor training sessions, in which case authors review their own cases, also provide faculty with opportunities for professional development. Some tutors report that insights gained in these settings have provided the stimulus for changes in their practice or research. In addition, the marketing of our cases to other institutions may increase collaborative ventures and contribute significantly to advances in medical education.

In a formal study of the first two student cohorts in the curriculum, Moore et al (1994) showed that there were no measurable differences in biomedical knowledge acquisition between these students and those in the traditional curriculum. The New Pathways students were consistently and often significantly better able to relate to patients and they perceived their curriculum as more challenging, stimulating, difficult and relevant.

Our hybrid problem-based learning curriculum may benefit our own institution by virtue of the interdisciplinary nature of the blocks. New research is stimulated by involving a network of faculty from varied fields in a full range of teaching modalities integrated into a single curriculum. As faculty are learning to work together in teams so too are our students.

Conclusions, further challenges

Kaufman (1985) suggested that the conceptual idea of problem-based learning can only take root in an institution if a broad representation of the faculty samples it. The Harvard Medical School curriculum shift has accomplished just that. By creating a hybrid curriculum that promotes active learning and self-direction in concert with a variety of other teaching modes, we have tapped large numbers of faculty as
A Hybrid Model of Problem-based Learning

tutors, lecturers, lab leaders, conference leaders and clinical clerkship instructors. While this chapter has focused more on the first two years of our programme, we are committed to enhancing our support for innovations in the clinical years through expanded faculty development programmes and a regular curriculum meeting to review the educational experience of years three and four. Teaching has become the responsibility of many faculty members in disparate areas as they work towards common goals - not only in interdisciplinary content areas, but also in a shared commitment to helping students succeed as self-directed adult learners.

Having now developed our own network of faculty to write paper cases and design and implement a new curriculum that supports self-directed learning in a variety of teaching modes, we acknowledge the ongoing need to adapt to changing times. As curriculum designers and implementers, we must conduct the same sort of continuing self-assessment that we expect of our students. Our perpetual question must be, 'How well does our curriculum support learning?' A good curriculum is never finished.

As students, faculty and society change, new technologies in teaching will emerge. Discovering new content and new processes in the next decade and beyond will require us to apply all the problem-solving skills that we expect our students to acquire. For those of us who design, implement and evaluate curricula, each new iteration is a case in problem-based learning for us to study. This continuous improvement process - begun through the efforts of the team that launched the New Pathway - is already under way.

References


149
The Challenge of Problem-based Learning

