An Instructional System as Change Agent

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Since its inception in the mid-1970s, the Project on Curriculum Development in Preventive Medicine has sought to change teaching of preventive medicine in professional and continuing education. Project development staff have learned lessons that go beyond the domain of educational technology. They have had to solve questions of authorship, academic responsibility, and limitations in the state of preventive health care delivery systems. But most of all, they have had to cope with problems inherent in institutional change.

In this article, background information about preventive health services is discussed first to provide a context for understanding the project and its development, but its main focus is on three aspects of the project's development process that are distinctive: 1) the identification of skills to be taught that are presently seldom employed in professional practice, and for which knowledge is limited or consensus on acceptable procedure is lacking; 2) the use and management of large numbers of experts from many disciplines to author instruction; and 3) dissemination strategies involving material design, "entrepreneurship" and retrieval systems for material access.

Background

Preventive health services focus on risk reduction and health promotion. For example, the risk of cardiovascular disease is reduced by smoking cessation, weight/cholesterol reduction, exercise, and hypertension control. Other preventable conditions include cancer of the lung, cirrhosis of the liver, many infectious diseases, and occupational disorders. Health promotion includes proper nutrition, exercise, lifestyle enhancement, and stress reduction. Some examples of preventive health services are immunization, blood pressure measurement, and pap smear analysis.

At the turn of the century, clinical preventive medicine was widely practiced in this country for infectious diseases like typhoid, tuberculosis, diptheria, cholera, and tetanus. The fight against infectious diseases was aided by the availability of effective countermeasures, including immunization. With the decline of infectious disease, longevity increased and chronic diseases such as heart disease, cancer, and stroke became leading causes of death. Since infectious disease was no longer a problem and chronic disease was considered part of the natural aging process, the teaching of clinical prevention declined.

However, several decades of epidemiologic studies have demonstrated that primary and secondary chronic disease prevention measures are effective (United States Department of Health, Education, and Welfare, 1979). Primary prevention is any intervention with the purpose of reducing risk of disease occurrence, while secondary prevention is any intervention with the purpose of detecting asymptomatic remediable disease or reducing risk of disease recurrence (Stokes et al., 1982). Even though a scientific basis for clinical prevention now exists, the associated knowledge and skills are not emphasized in medical schools, nursing programs or primary care residencies. Only three percent of the medical school curriculum is currently devoted to preventive medicine (Bishop, 1983; AAMC, 1983; AMA, 1983; NLN, 1981).

To strengthen preventive medicine teaching, the Project on Curriculum Development in Preventive Medicine was undertaken by the Association of Teachers of Preventive Medicine and the Center for Educational Development in Health with the Kellogg Foundation support. The curriculum resulting from the project, entitled *Health Maintenance in Clinical Practice*, consists of three modules. Its contents and components are summarized in Figure 1. A systematic, competency-based approach was used to design the curriculum (Segall et al., 1975.)

Defining Outcomes

The first development task was to delineate the scope of professional performance in an area where skills are new, evolving, and seldom practiced. This was accomplished by first listing both generic responsibilities (those cutting across specific conditions or risks) and categorical responsibilities (those limited to a specific condition or risk). Outlining these responsibilities made it possible to identify a process for planning, implementing, and evaluating preventive services. An algorithm depicting the process, shown in Figure 2, has been found applicable to a range of services, including those associated with the cardiovascular risk factors of smoking, hypertension, and nutrition, as well as occupational health, breast cancer, alcohol abuse, immunization, and other responsibility categories. Developing a general procedure for performing professional responsibilities and several specific categorical examples was useful for conceptualizing complex, interrelated skills, and providing a framework for identifying these skills and organizing materials.

To verify responsibilities of physicians and nurses, two modified Delphi surveys (Linstone & Turoff, 1975) were conducted: the first with 50 practicing physicians; the second with 35 nurses. They were either engaged in clinical practice or were teaching clinical prevention. Panels of experts, composed

of physicians and nurses serving on the project's advisory and steering committees, also were consulted. Both the Delphi results and the expert panel suggestions were used to determine the scope of the curriculum and the three major areas of module development.

Practitioners could respond to the Delphi articulately only in areas where they had *some experience*. Further, some performance discrepancies were identified that were not due to lack of skill or knowledge. For example, provision of mammograms to women over 40 is now recommended by the American Cancer Society (1980) but infrequently practiced because of organizational policy or lack of compensation by third party payers such as health insurance and maintenance organizations. Because of the inability of any one group of respondents to see the "total picture," verifying assumptions about professional performance was accomplished using complementary groups. Moreover, instructional materials were developed that addressed skill/knowledge deficits, not policy issues beyond the control of the developers and their sponsors.

In deriving educational objectives from responsibilities there was a major behavioral/attitudinal component. Since some people smoke, eat high cholesterol foods, drink too much alcohol, and refrain from exercise because this helps them cope with everyday problems and frustrations, behavior modification skills had to be taught. Experiences of colleagues in behavioral medicine, especially those involved in major intervention trials such as the Multiple Risk Factor Intervention Trial, MRFIT, (Davidson et al., 1980; Benfari, 1981) were used to develop the training objectives. Because of the difficulties inherent in effecting behavior modification, some skills were defined for which there were few well established techniques compared to other aspects of medicine. Altering patient attitudes, however, is a critical part of preventive care, and it was essential to teach these skills and the behavior modification approaches that are available even though knowledge in the area is relatively limited. The credibility of the curriculum would be compromised if difficult-to-teach but important subjects were avoided.

Figure 1

THE INSTRUCTIONAL SYSTEM: AN OVERVIEW

The Instructional System Consists of 3 *Modules:*

1. The Epidemiologic Basis of Clinical Prevention
2. Management for Preventive Services
3. Clinical Health Maintenance

EACH MODULE

Incorporates 4 Components		Has 2 Facets
1. Guidebook:	methods and procedures for use in case studies, patient simulations and clinical encounters	1. Generic: encompassing those aspects of basic vocabulary, concepts, principles and competencies which are common to and can be applied in a wide range of categorical areas.
2. Learning Resources Package:	exercises, case studies and supplementary references	
3. Anthology of Readings:	key papers and supplementary references	2. Categorical: applications to specific diseases, conditions and health hazards (e.g., risk factors in coronary heart disease, occupational health hazards, alcoholism).
4. Instructor's Manual:	recommended learning and education activities	

Figure 2

Development of an Instructional System in Clinical Prevention

1. Define Professional Performance/Verify
2. Specify Instructional Objectives
3. Develop Instructional Materials
4. Field Test and Revise
5. Disseminate the Materials

Authoring

When curriculum projects are large scale and multidisciplinary, it is often necessary to enlist the aid of many authors — professional and scientific writers, educational technologists, and subject experts — with varied teaching backgrounds. In this project, authors who knew the subject matter, who could apply educational technology principles, and who were experienced teachers performed best. They did not have to read themselves into familiarity with the subject, and they had a clear sense about how to communicate content and how to create resources that instructors could use. Finally, most successful work was done by authors who worked throughout the development project, insuring continuity through different iterations of materials tryout and revision.

In addition to authors, other subject experts were needed to set objectives, identify readings and review draft materials. An overall editor checked format consistence, standardized bibliographies, developed cross references, and caught omissions and redundancy. Outside reviewers insured content accuracy, while student readers identified what was confusing, wordy, or difficult. Where disagreement arose, project directors refereed.

Testing and Packaging

Initial tests in nine medical schools and a school of osteopathic medicine revealed that the user group required more than an instructor's manuals, the only resource originally developed. They asked for cases/exercises, up-to-date readings, and a job aid (Lineberry & Bullock, 1980) for performing preventive procedures. As a result, a *Learning Resources* book, an *Anthology* of readings, and a *Guidebook* were added. Instructors required precise instructions as well as model answers to study questions so they could use lesser trained teaching staff not conversant with the details of a given preventive strategy. Because of the rapidly changing nature of preventive practices, senior faculty also welcomed the additional materials.

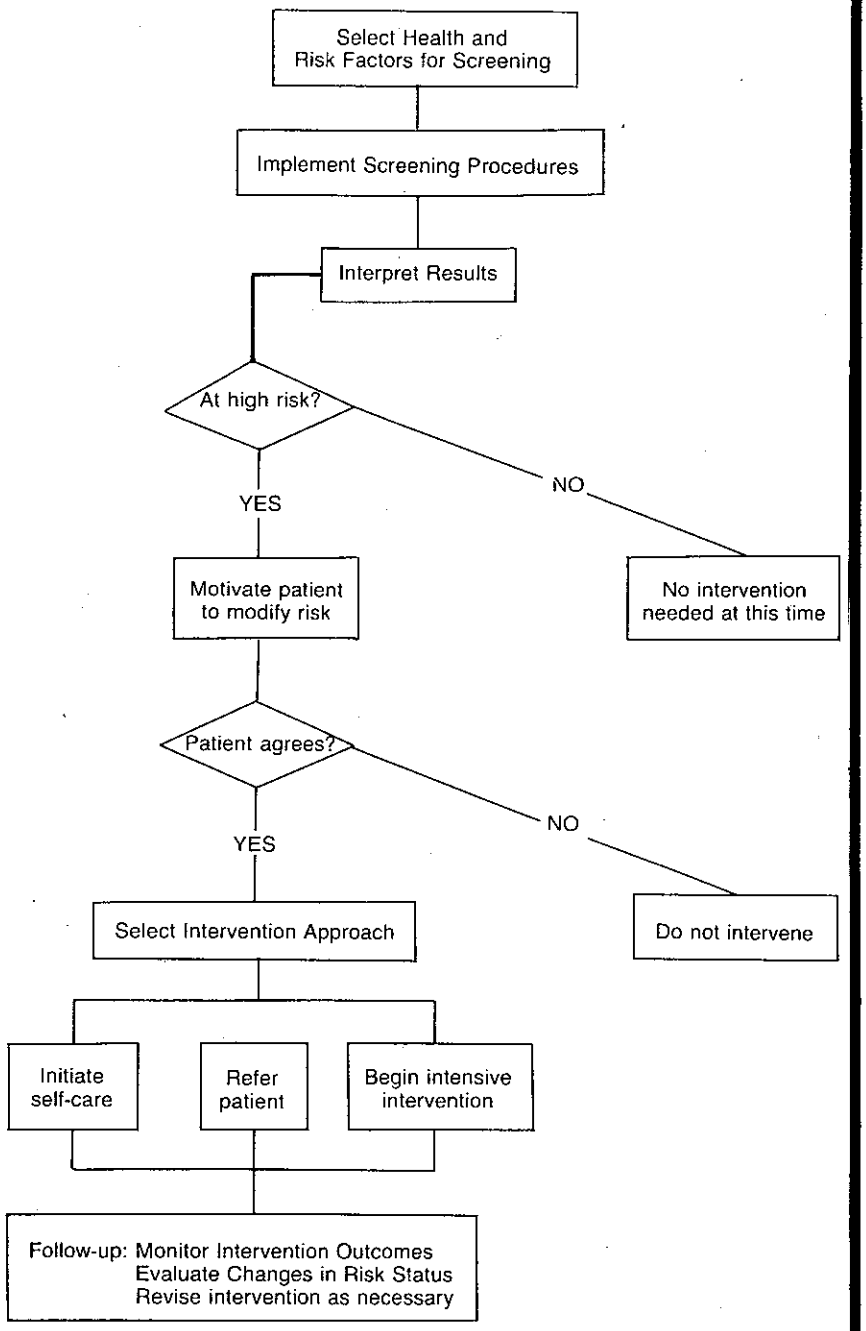
In its early revisions, the entire curriculum system was presented in a loose-leaf notebook with tabs for separate components. The volume was found "heavy and forbidding." Users took out what they wanted from the notebook and left the rest. Some used articles only, in order to bring their standard course in preventive medicine up to date. Some used the exercises and case studies only, thus introducing interactive teaching into what would otherwise have been a lecture course. Some users adopted all offerings but changed the sequence.

Materials were repackaged accordingly, placed in twelve thinner books and bound and formatted for maximum flexibility. Further subdivision is likely. In some other settings, instructors may follow procedures slavishly and demand tight structure—indeed, it may be mandated by an organization. Such an approach would be rejected by this target instructor group working in varied institutional settings.

When making revisions, designers work down from the most general design specification (the job description and instructional objectives) to the specific aspects of instructional design. This top down approach, moving from the general to the specific, is a logical way of designing instruction and revising it. It is also cost effective, because testing the course when it is at a fairly high level of generality can indicate what additional components are needed. Initially creating many specific materials may result in a curriculum with many components that are redundant or unnecessary, and deletions are often more difficult to identify than additions.

Figure 3

General Clinical Health Maintenance Algorithm



Dissemination

In disseminating instructional materials to groups such as physicians, nurses, nutritionists, and physician assistants, the instructional designer must be aware of the political and social contexts of education. Some users will be sensitive to the role of women or to that of non-physicians as health care providers. Examples cited should reflect a range of user groups. Titles and terms included should be acceptable for all users, based on feedback from the intended users. Plans for dissemination should be considered early in designing and packaging materials.

A problem any instructional innovation faces is how to win converts. There are many reasons given for not adopting a new instructional program:

- I'm doing it already.
- I have little time for teaching. I have a

private practice and I do research on the side.

- In order to be promoted I need research publications. Good teaching does not help.
- I'll get around to it in a year or two.
- It was invented by you guys in the East. This is Miracle Falls, Idaho. We'll invent our own, thank you.
- Our curriculum is already crammed full. We can"t add another thing.

To overcome resistance to our program, efforts were made to gain confidence by repeated visits, phone calls, and letters. Instructors had to be urged on. Many used the resources only after they got to know project staff. Individuals who do use the materials are contacted frequently. Once they have "bought into the system," they often call back to ask for further consultation, request additional material, and begin to structure new courses. Once a preventive health program is implemented, instructors often want to see for themselves how materials can be effectively used. In this project, over sixty such inquiries have been made by instructors in health science institutions throughout the world, and a network of demonstration centers is being established. The demonstration centers will:

- Offer courses for continuing education of physicians and nurses in clinical prevention.
- Introduce preventive initiatives into residency training and graduate nursing programs where clinical facilities are available for delivering preventive services. Here residents (graduate physicians) and nurses can obtain "hands-on" learning experience.
- Include the materials in clinical clerkships and rotations of third and fourth year medical and nursing students, where students spend one to several weeks at a time developing different specialized skills.
- Include the materials in first and second year courses where the more didactic portions of the three modules can be taught.

This integrated, comprehensive approach to the teaching of preventive health care should serve as a stimulus to the would-be user.

By the time the project is complete in 1986, there will be upward of 1,000 curriculum components. Because of its complexity, a plan has been developed for computer retrieval of materials. The data base and automated access system depicted in Figure 3 will enable faculty to pick and choose among holdings and enhance flexibility in adoption and use of materials. The system allows retrieval not only by content, but by selected instructional design attributes.

Figure 4

Diagram of Data Base and its Operations

ACCESSING INSTRUCTIONAL ATTRIBUTES	CATEGORIES OF EDUCATIONAL MATERIALS	DISPLAY CHARACTERISTICS
• Category of materials	• Readings	• More detailed information concerning instructional attributes
• Educational objectives	• Exercises	
• Key words	• Clinical case studies	• Availability information
• Time required	• Medical practice studies	• Guidance on utilization
• Location in system	• Film/videotapes	
• Prerequisites	• Slide series	
	• Computer aided instruction	
STEP 1	STEP 2	STEP 3
Instructor specifies instructional attributes of educational material required.	The data base is searched and educational items with the attributes specified by the instructor are identified and retrieved.	Each item retrieved is displayed or printed in hard copy. For each item certain characteristics to guide the instructor in curriculum planning are displayed.

Conclusion

What seems most attractive to the instructors who use the program materials is adapting them to their own instructional setting, rather than wholesale *adoption*. Allowing adaptation engenders change in successive approximations. This approach is particularly appropriate in a time of scarce resources, as it leads to gradual, concerted progress toward measurable goals.

The project started out by applying a systematic approach to instructional design to the development of instructional materials in preventive medicine. Both the approach and the products have become more flexible. There should be rigor in curriculum design but other factors must be addressed to effect institutional change. These include developing a meaningful and credible method of identifying new skills, developing and packaging materials for adaptation to local needs, establishing retrieval tools that facilitate adaptation, establishing demonstration centers to show how material can be applied, and building interpersonal relationships between producers and users of materials. Large scale projects also require the identification of appropriate participants and coordinating their efforts to effectively achieve desired outcomes.

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