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*Original Article*

## Implications of the Model of Change and Learning for Undergraduate Medical Education

ROBERT D. FOX, EdD

Professor, Research Center for Continuing Professional and Higher Education

University of Oklahoma

Norman, OK

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**Abstract:** *This essay responds to the need for closer intellectual ties between continuing medical education (CME) and the undergraduate experience. Medical educators in each of these two phases of lifelong learning are often unfamiliar with the implications of research in each phase for the other. In order to redress this, this essay describes one of the major explanations for change and learning in clinical practice and draws implications of this model for the education of undergraduate medical students. The model includes the role of forces for change, image of change, assessment of needs for learning, and the use of learning resources in a self-directed curriculum. Specific implications for each of the phases of the change process are offered. General implications of the model and a set of new assumptions for the development of formal curriculum in undergraduate medicine are also described.*

**Key Words:** Change, continuing medical education (CME), undergraduate medical education

Although the theoretical bases of continuing medical education (CME) and undergraduate medical education have many common ancestors, their family trees have also developed in unique ways. One reason for the divergence is the difference in the assumptions that have driven research and practice in CME versus undergraduate medical education. Over the past 2 decades, CME has been evaluated on the basis of two questions: can CME programs identify problems in medical practice and can education be used to bring about a change in physicians' performance and patient outcomes? These questions have dominated undergraduate medical education: can one write an increasingly complex general text on medicine on the minds of novice physicians and can problems be used to organize that text? Although both of these summaries of the different mandates of these two branches of medical education are overly

simplistic, they emphasize the differences in the development of each branch. One branch attempts to equip the empty handed with a first set of intellectual tools, while the other must discover the need for changes in practices in order to facilitate learning and bring about changes.

This essay will take one of several formal explanations of change and learning that have developed in the literature of CME and connect it to the practice of undergraduate medical education. It will accomplish this by first describing, in general terms, the theory of change and learning as it is portrayed in the literature of CME. Second, it will describe some of the major implications of this model for facilitating learning in the undergraduate setting.

This is offered with appreciation of the variety of curricular arrangements that characterize undergraduate medical education. The range is from strategies that emphasize the basic sciences of medicine for 2 years, followed by clinical clerkships for 2 years to those that have designed teaching-learning transactions around clinical problems throughout the curriculum. Clearly, problem-based

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Reprint requests: Robert D. Fox, EdD, Professor, Research Center for Continuing Professional and Higher Education, 200 McCarter Hall, University of Oklahoma, Norman, OK 73072.

approaches to the general preparation of physicians emphasize practice as a point of departure for learning. The value of this approach is supported by the evidence of the number and variety of learning activities driven by the need to make changes in practices. However, observations from research on how and why physicians change and learn may serve to provoke thought in both problem-based and traditional curricula. It should foster in each the notion that change and the issues of learning associated with change are worth consideration as curricula are developed and implemented. Helping students learn to learn is an important objective of the curriculum. The issues of learning associated with changing practices or adopting innovations are important skills that should be addressed early and often since the rate of change will probably increase with the passage of time.

### Overview of the Model of Change and Learning

The pressure that drove the development of a study to explain the relationship between change and learning was the increasing need to prove the effectiveness of CME programs in bringing about change in clinical practices. The event that, more than any other, spurred development of the model was the publication of a study in the *New England Journal of Medicine* that pronounced that CME was not an effective means for changing the ways that doctors practice medicine.<sup>1</sup> This study contradicted some obvious evidence that, in fact, most physicians do change the ways they practice and most of these changes would be impossible without learning. It was also evident that, although the literature of medical education was full of information about designing instruction, very little addressed the native process of learning and change as it was occurring in the lives of physicians. This prompted the development of a naturalistic study using the methods of grounded theory to generate a model of the process by which physicians learned in order to make changes in their practices. The results of this 5-year project examining interview data on a total of 775 cases of change was published

in a book-length manuscript in 1989.<sup>2</sup> Subsequent studies have supported the usefulness of this model as an explanation of how change occurs in the practices of physicians. Basing their findings on randomized trials of effectiveness, Davis et al.,<sup>3</sup> for example, describe CME programs as less likely to succeed when they do not account for certain elements of the model (e.g., needs assessment). Crandall,<sup>4</sup> Rankin and Fox,<sup>5</sup> and Blanchard and Fox<sup>6</sup> also provide evidence of the elements of the model's usefulness in understanding the natural process of learning as it is associated with changes in clinical practices. Each found evidence that the model accurately represents data obtained in other studies of physicians<sup>4,5</sup> and was useful in associating different patterns of learning with specific types of changes.<sup>6</sup> The model was fundamental to the design of the continuing education accreditation systems of the Royal College of Physicians and Surgeons of Canada<sup>7</sup> and the American Institute of Architects.

The model describes steps that physicians take in changing practices as follows:

- Physicians experience a set of forces that drive them to examine the need for change in their clinical practices. These forces were described as personal (curiosity, sense of personal or financial well-being), professional (stage of career development, desire to be more competent, and pressures from the clinical environment), and/or social (peers, medical institutions, regulations, and community needs). The experience of these forces initiates the process of change and learning.
- Physicians imagine what it would be like to practice differently. They develop an image of their practices if they changed the way they accomplish the tasks of medicine or their approach to patient care. This image varied according to its clarity, complexity, compatibility, and relative advantage. Changes may also be imagined to be relatively easy to try out before used routinely as part of practice. This image of the change

was an estimate often based on incomplete information as to the nature of the change; however, the image helped organize the subsequent steps of the process.

- Using this image, physicians described a process of self-examination of their need for change and for learning based on their estimates of what they should be doing versus what they were actually doing. This estimate of need as a discrepancy between what is and what ought to be generated a sense of anxiety that formed the foundation for motivation to change and learn. In this model, motivation was described as a drive to reduce anxiety by reducing discrepancies.
- At this point, physicians began to address the discrepancies in practices by a three-stage process of learning, referred to as the self-directed curriculum for change. The three stages characteristic of the self-directed curriculum were learning in order to develop a clearer estimate of what competencies were necessary, learning these new competencies at the desired level or in the desired way, and learning how to implement these competencies in their practice. In most cases, each of these stages was characterized by the use of two or more of three different types of resources: material resources, human resources, and educational programs.
- At the end of the process of learning and change, physicians described the successful implementation of incremental and structural changes in their practices. Incremental changes were described as step-wise progress within an area of practice. Structural changes were characterized as the adoption of a new area of practice, the dropping of an old set of practices or procedures, or the reorganization of practices based on a new perspective of their role.

The model of changing and learning provided an explanation based on the natural course of events within the context of practice. It is a useful

explanation because it provides insight into the process of learning within the context of medical practice. But what are its implications for undergraduate medical education?

### **Change, Learning, and Undergraduate Medical Education**

Certain assumptions are necessary in order to identify the meaning of this model for medical students and undergraduate medical education. First, one may assume that part of the general preparation of physicians should include preparing students to continue to learn and change after medical school. Therefore, using information about how physicians learn and change could allow medical educators to structure experiences that simulate the dilemmas of practice. This would give learners experience and guidance as to how to approach change without the benefit of a formal curriculum to support them.

Second, although the general preparation of medical students in the basic sciences is an appropriate task of medical schools, the scientific model is not sufficient as an organizing framework for the problem solving and learning that will face students in practice. Evidence of this may be found in the testimonials of students in their clinical years who describe "re-learning" science within the context of clinical practice. Organizing scientific information within the context of care is a fundamental dilemma facing clinicians throughout their medical careers. Perhaps organizing some education for medical students around this model will approximate this lifelong challenge for practicing physicians.

### **Some Specific Implications**

Each part of the model has specific implications for the teaching and learning of medical students. These implications are offered as a way of thinking about how to use this exposition of the process of learning and change in order to provide students with learning experiences in medical school that

more closely resemble the kinds of learning and changing that are concomitant to medical practice.

### Forces for Change

The context of medical practice is rich with energy that shapes practices. Although it would appear from undergraduate medical curriculum that there are general competencies that apply to all practice settings, physicians describe ways in which they have sculpted their practices to fit these forces.

Recent discussions related to "evidence-based health care" address the issues of forces for change. However, scientific evidence as to the efficacy of practices does not address the complexity of the clinical environment or the social and political forces for change. It is naive to assert that only scientific evidence should be evaluated in considering a change in practice, just as it is a mistake to make changes regardless of the evidence. Students should have structured and guided experiences inside the curriculum for evaluating the forces for change and deciding on a course for a clinical practice within the flow of forces for and against change. Such simulations of real life should help students develop skills and understanding related to such things as patient demands, new or changing policies and regulations, income, and professional peer groups. Physicians for the future will need to manage this cataract of conflicting forces to accommodate the change imperative in everyday practice.

Curriculum should be rich with content related to the forces acting on contemporary medicine. As the health care system changes, so does the role of physician. Curriculum should be directed towards these challenges even though there may be different challenges by the time most 1st-year students begin residency. Learning experiences in medical school should lead to an understanding of the context of practice, the actors in health care, and the ways in which they relate to the lifelong process of tailoring practice to circumstances. Classroom or seminar sessions may allow students to understand these forces and decide on when and how to adjust practices.

### Image of Change

When physicians in the study of change and learning were able to clearly conceive of the outcomes of efforts to change, they reported a shorter process, greater satisfaction with the outcomes, and what appeared to be more efficient use of time and energy.<sup>1</sup> Research subsequent to the change study that used concepts from innovation adoption literature<sup>5</sup> also substantiates the notion that how changes are imagined affects the process of self-assessment and the use of learning resources in the change process. Image of change seems to represent a keystone of the change process. Skills in developing and clarifying images of change, particularly in terms of estimating complexity, relative clinical advantage, and compatibility with the context of practice (e.g., patient needs, third-party payer regulations, health resources, and practice style), are described as factors in the self-assessment of the need for change and in decisions as to how to learn from what resources.

One of the major differences between learning in undergraduate medical education and learning in medical practice is the ability of learners to imagine how practices may change. Practicing physicians may draw from a large pool of knowledge, skill, and experience in order to generate an image of change. Although undergraduate learners do not have this background, they often complain of the lack of relevance of new information and skills within the curriculum, especially if they are experienced in another area of health care or have begun their clinical learning experiences. These complaints may be ways of expressing frustration because they do not have a clear image of the changes in their behavior that are sought in the curriculum. Undergraduate education has addressed this by emphasizing behavioral objectives, holding to a belief that this will help learners to imagine where they are going in a particular element of the curriculum. In many instances, these behavioral objectives have become so definitive and "measurable" that they have lost their ability to describe a comprehensive image of the kind of clinical

performance sought in the curriculum. Consequently, students only "get it" at the end, if at all. Curriculum planners and teachers could improve their ability to facilitate learning if they considered exercises early in "courses" that allow students to imagine the changes that are sought by the curriculum, especially in terms of complexity, compatibility with what they already know or can do, and the relative advantages of adopting these behaviors.

Two other factors associated with imagining change have been evident in studies of change and learning: the extent to which practitioners are able to observe the new practices and the extent to which they can try out a new practice safely before adopting it for widespread application. Undergraduate curricula should also emphasize opportunities to observe and try out new behavior in all stages of the curriculum. Presently, students are presented with the opportunity to try out or observe new behavior following the presentation of information rather than before it. It may seem logical to provide the knowledge and skills first, but in the natural order of change and learning among physicians, the ability to imagine the behavior is used as a foundation of self-assessment of the need to change and a precursor to motivation to learn. Certainly, approximation of the behavior required in order to learn and change occurs throughout the learning process. However, it may be advisable to provide additional opportunities to practice early in order to help learners develop a stronger motivation to learn and to organize knowledge and skills within the context of clinical practices.

### **Needs and Motivation**

Physicians described using the image of change to project what their practices and competencies ought to be. They talked about comparing current practices and competencies with this notion of what ought to be. When there was a discrepancy between what is and what ought to be, they described a level of discomfort or anxiety. The drive to relieve this discomfort has been described as motivation.<sup>8</sup>

In both areas of the continuum of medical education, motivation drives learning and predicts success. The intense attention to motivation makes sense in CME where voluntary attendance at meetings supported by registration fees is a practical as well as educational issue. Motivation to learn is an enduring problem in both CME and undergraduate medical education. However, CME has become accustomed to the notion of voluntary learning while undergraduate medical education has developed within a framework of compulsory education. Understanding and adjusting for motivation as an essential part of curriculum planning is inherent to CME but often falls to the side in undergraduate medicine in favor of the power of the grade and the consequences of failure.

Undergraduate education should benefit from the emphasis on understanding of motivational theories and adjusting education to accommodate to the natural motivation of learners. In order to achieve these benefits to the educational process, teachers must begin to enable learners to discover each of the three elements of self-assessment of need early in the teaching-learning transaction. Learners must have clear and correct information about what their level of performance and competencies ought to be if they are to function effectively as physicians. They must have the means to accurately estimate and verify their present level of performance and competence in each area of performance within the curriculum. Finally, they must be given the opportunity to feel a level of discomfort about the discrepancies between what is and what ought to be. For example, an exercise early in the teaching-learning transaction that enables learners to come to grips with where they are, where they ought to be, and how far they must go should enhance their motivation to learn.

There are, however, differences in the level of discomfort that have vastly different consequences. Very large discrepancies seem to generate sufficient anxiety to cause learners to avoid learning. In most areas, medical students will experience a high level of anxiety if the standards for what ought to be are not achievable within the context of the

course or clerkship. This can be accommodated by describing what ought to be as a series of steps and the course or clerkships as an attempt to help them climb to a certain level rather than climb to the top. For example, although the interviewing skills of a practicing physician should be high in all areas of care, "this experience will focus on interviewing as part of a routine physical examination." This reduces anxiety to the point where learners are not so frightened of failure that they avoid the topic as much as possible.<sup>8</sup>

However, if one lowers anxiety and discomfort too much, learners may feel that they are close enough to competent and devote their energies to areas where anxiety is somewhat higher. When the gap is too small, learners may believe they can live with such a small problem or discomfort rather than seek to relieve it, and motivation may be too low to generate effort. This is especially a problem when the teacher provides too much in the area of reassurance, reducing discomfort to the point that the learner puts his/her energies to other areas.

Learners in the undergraduate curriculum are in their first real encounter with estimating where they are in terms of their knowledge and skill versus where they ought to be and deciding how to act on this estimate. It is very valuable, in the development of a successful physician, to provide multiple and continuing opportunities to make accurate and motivating assessments of the need to learn. Although it is necessary to be objective in medical education, it is foolish to assume that what the students think they need to know or be able to do is inconsequential. Ignoring this may lead to learners without motivation or with anxiety so high that it causes aversion of attention away from the subject, the patients, and the clinical problems.

### **Self-Directed Curriculum and Stages of Learning**

Most of the physicians interviewed or surveyed about how they learn in studies of change and learning have described using three different types

of learning resources in up to three stages of the learning process. The first type of resource is material resources, including such materials as texts, journals, and manuals. Human resources, such as colleagues, other specialists, or other health professionals, are a second type of learning resource. CME programs, such as rounds, national meetings, and case conferences, make up a third type of learning resource. Physicians appear to "triangulate" resources to increase the likelihood that they will get a balance of information based on the kind of trust they put in resources in each category. Material resources such as journals appear to provide an "objective" version of the knowledge and skill associated with change. Human resources seem to be valued because they have subjective interpretations based on knowledge of the environment and the learner's experience with similar changes. Physicians can interact with human resources such as colleagues to clarify what needs to be learned in order to make a change. Finally, CME programs appear to combine an element of both, that is, they provide objective information and the opportunity to clarify this information through interaction with colleagues.

Medical students may benefit from the opportunity to practice triangulating information in the curriculum. Learning experiences that provide knowledge and skills from multiple sources may foster the ability to use these skills in learning after formal training is completed. The need to build and use a collegial network in the undergraduate experience is often manifest in the tight social structure of students' extracurricular lives. Organized activities that foster and legitimize information from interaction may improve the ability of learners to use this way of learning as part of the development of lifelong learning skills.

Like physicians in practice, students depend on their abilities to judge the information that threatens to swamp them in medical school. Recent discussions related to evidence-based medicine have promised to help students to evaluate information, but efforts to enhance learners' abilities to use colleagues and formal learning experiences may be

necessary for students to learn how to manage learning and change in their careers.

### **General Implications**

Although it is valuable to look at theoretical models to find different ways of doing things, models can also suggest new or different fundamental assumptions and new paradigms for practices in medical education across the continuum. For CME, identifying and describing the paths to changes in practice has placed the learner at the center of CME rather than the teacher and the curriculum. Some of the assumptions of CME under this new emphasis on facilitating learning and change may also be useful assumptions for facilitating learning in the undergraduate curriculum. The following are some of these fundamental assumptions and their implications:

- *Learning and the learner are at the center of a successful curriculum and effective teaching-learning transactions.*

Of all of the lessons learned from studying learning and change, the most valuable may be that facilitating learning depends on the ability of education to engage the mind of the learner and pass on new abilities in a manner that is compatible with the natural process of learning. Learning appears to be as natural as eating. Yet many of our contemporary prescriptions as to how to learn do not start with an understanding of how learning occurs naturally. By analogy, it is difficult to alter diet without baseline understandings of how an individual normally eats, what special meanings are associated with eating, and how digestion and metabolism work. All of medical education will benefit from the assumption that facilitating learning will be more effective if we understand learning in general and the individual learner specifically. Research in medical education should continue to emphasize the value of more and better knowledge of learning within the culture of medicine. Teachers should come to know as much about learners as possible and should view their perceptions as important ingredients in decisions about curricula.

- *Medical practice acts as a point of departure for learning and a basis for evaluating the worth of education. It is the organizing principle for deciding what to learn, when, and how.*

This assumption has many ramifications. First, it suggests that useful medical knowledge and skill must be relevant to the practice of medicine. It suggests that new competencies should be connected clearly and directly to new practices and to patient problems. It suggests that curricula strive to approximate practice to the extent possible and that simulations of real life are more likely to succeed than any other strategy for facilitating learning.

This assumption also suggests that existing templates used to organize knowledge and skills may need to be examined for their effectiveness and efficiency. For example, I have listened to students complain about making the transition from the basic sciences, where knowledge is organized around the disciplines to clinical clerkships, where knowledge is organized around the practice of medicine. Some are articulate in describing how difficult it is to “re-learn” science so that it fits practice problems. Physicians in practice describe learning that starts and ends, in most cases, with a set of clinical dilemmas. Problem-based learning may be proving its value as an educational movement in undergraduate medicine because it simulates learning in practice and is bound up in the culture of medicine. However, more widespread use of thorough and complete simulations to help learners self-assess and learn independently are in order.

- *Self-evaluation and reflection are critical skills for making appropriate changes in practice. Medical schools should integrate strategies for self-evaluation and reflection into curricula.*

Self-evaluation is critical for practitioners because they are in control, for the most part, of the process of change and learning. One potential problem for practitioners is based in their ability to accurately perceive their own needs for learning and change. Quality assurance committees,



peer review groups, and self-assessment programs are ways that the health care system helps clinicians to accurately estimate their needs. Undergraduate education should place more emphasis on the process of self-evaluation, emphasizing valuable sources and methods of accurate self-evaluation. Developing skills in self-evaluation will permit physicians to more accurately assess their practices and the knowledge and skill that lie at the foundation of their practices. Lifelong learning within the context of skilful self-evaluation may ensure a more competent and up-to-date practicing physician. To the extent possible, simulations of opportunities for self-assessment should reflect the opportunities of practice, including reports from peer review committees, patient feedback, discussions with other physicians, and case reviews.

- *Evidence should be the basis of educational decisions.*

Because CME is expensive in time and money, is voluntary for the most part, and attempts to alter the actions and decisions of physicians in practice, it has always been under pressure to explain itself. This has created a genuine commitment to studying the effects of learning within the context of change. Recent studies have suggested that, when carefully constructed, CME can contribute to the changing of physician behavior.<sup>3</sup> However, CME has also been compelled to study the process of learning in order to generate more effective CME programs. Increasingly, CME professionals are able to explain how factors such as learner needs, motivation, organizational context, peer networks, and barriers to participation affect the teaching-learning process. These and other formal explanations of the process of learning may be useful to undergraduate medical education if research can verify their relative contributions to learning in medical students.

Increasingly, educational decisions must depend on a body of evidence that, in turn, verifies an explanation of learning. Presently, undergraduate and continuing medical education are discussed as if they connect in a continuum of learning over the career of physicians. However,

this rhetoric contrasts with a reality characterized by little contact between those professionals who work in undergraduate medical education and those who work in CME. If the notion of a continuum is to become more than rhetoric, collaborative efforts to understand learning within the context of a developing career must replace systemic barriers to viewing the development of doctors as a lifelong stream rather than a series of unconnected ponds. Doctors experience medicine as a continuous process of evolution from novice to expert, perhaps in spite of the different approaches of education as they learn and change.

## References

1. Sibley JC, Sackett DL, Neufeld V, Gerrard B, Rudnick KV, Fraser W. A randomized trial of continuing medical education. *N Engl J Med* 1982; 306:511-515.
2. Fox RD, Mazmanian PE, Putnam RW, eds. *Change and learning in the lives of physicians*. New York: Praeger, 1989.
3. Davis DA, Thomson MA, Oxman AD, Haynes RB. Changing physician performance: a review of the educational literature. *JAMA* 1995; 268:1111-1117.
4. Crandall SJS. The role of continuing medical education in changing and learning. *J Cont Educ Health Prof* 1990; 10:339-348.
5. Rankin R, Fox RD. Innovation adoption: interviews with Canadian radiologists. *Ann Roy Coll Phys Surg Can* 1995; 28:100-103.
6. Blanchard D, Fox RD. A profile of non urban physicians from the study of changing and learning in the lives of physicians. *J Cont Educ Health Prof* 1990; 10:329-338.
7. Fox RD. The foundations of the maintenance of competence program. *Ann Roy Coll Phys Surg Can Special supplement on CME*, 1993; 26:22-29.
8. Knox AB. Influences on participation in continuing education. *J Cont Educ Health Prof* 1990; 10:261-274.