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APPLYING ADULT LEARNING THEORY TO IMPROVE MEDICAL EDUCATION

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B.A., University of Virginia, 2001

A Thesis

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APPLYING ADULT LEARNING THEORY TO IMPROVE

MEDICAL EDUCATION

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Table of Contents

Challenges in medical education 1

Pressure on the educational system 1

Funding dilemmas 2

Principles and strategies to consider in improving medical education 5

Assumptions about adult learners 5

Historical perspective 5

Assumptions in adult learning 6

Andragogy versus pedagogy 10

Implications of assumptions for medical education 13

Cognitive styles 15

Differences in learning styles are important 15

Field dependence versus field independence 16

Conditions for adult learning 18

Teaching strategies 20

Presenting strategy 20

Enabling strategy 23

Exemplifying strategy 27

Facilitation strategies 34

Voluntary participation 34

Mutual respect 34

Collaborative spirit 35

Action and reflection 35

Critical reflection 35

Self-direction 36

Theory-based strategies for improving medical education 37

Educational materials 40

Conferences 40

Educational outreach 41

Local opinion leaders 41

Patient reminders 42

Audit and feedback 42

Clinician reminders 43

Multifaceted interventions 43

Improving education – Public health implications 45

One student's story 47

Conclusion 51

References 54

List of Tables

Table 1	Challenges to health professions education	4
Table 2	Summary of Lindeman's key assumptions about adult learners	8
Table 3	Key distinctions between pedagogy and andragogy	14
Table 4	Conditions for adult learning	18
Table 5	Key elements of the presenting strategy	21
Table 6	Key elements of the enabling strategy	25
Table 7	Key elements of the exemplifying strategy	28
Table 8	Comparison of Hyman's teaching strategies	32
Table 9	Continuing medical education interventions	39
Table 10	Applications of adult learning theory	50

List of Figures

Figure 1. Natural maturation toward self-directed learning as compared with the culturally permitted rate for growth of self-direction 12

Abstract

This thesis describes theories of adult learning and suggests ways these principles can inform medical education. Carefully designed and effective educational programs and activities are essential to prepare physicians for changes in medical technology and patient demographics. Challenges in the undergraduate, graduate, and continuing education of physicians are discussed, followed by key concepts in adult learning theory. Strategies for improving educational programs are considered. A review of the medical and educational literatures was conducted to determine trends in adult education and medical education. Areas where learning theory could be applied to improve or revise existing programs are identified. Public health implications of educational interventions are considered, and a medical student's perspective is offered to provide context for the current state of education. There is evidence that physician satisfaction and quality of health care may be improved by considering the characteristics of adult learners when designing and implementing educational programs.

Challenges in Medical Education

Pressure on the Educational System

The system responsible for educating health care providers faces tremendous pressure in a changing health care environment. According to Jordan J. Cohen, M.D., President of the Association of American Medical Colleges, "the work of improving medical education knows no end" (Buckley, 2003). Unfortunately, medicine has been slow to respond to these changes, and decreased funding for education has placed a heavy burden on those responsible for teaching the next generation of doctors.

Carefully designed educational programs and activities are essential in order to prepare physicians for shifts in patient demographics, advances in technology, and movement away from inpatient treatment. Twenty percent of the U.S. population will be over age 65 by 2030 and will demand an unprecedented volume of health care services (United States Bureau of the Census, 2004). Although chronic conditions may account for three out of every four deaths, the health care system is still organized around acute care hospitals (The Robert Wood Johnson Foundation, 1996). Training in important areas such as primary care and ambulatory settings is currently under-funded by an outdated system of reimbursement for graduate medical education (GME) that does not reflect current practice settings and clinical trends (Rich et al., 2002). Finally, as the United States is eager to develop and quick to adopt technological innovations, "technology diffusion has been regarded as the

single most important factor in medical cost inflation" (Shi & Singh, 2004, p. 170).

Funding Dilemmas

Teaching hospitals struggle for financial solvency for many reasons. In order to preserve clinical services, the educational missions of many hospitals are increasingly at risk. Teaching faculty feel pressure to generate revenue and may sacrifice teaching to see more patients (Institute of Medicine, 2001; Institute of Medicine, 2003). Since GME funding is coupled to reimbursement for patient care, it is impossible to 'follow the dollars' from investment to educational outcome. GME budgets are controlled by hospital administrators who are disconnected from teaching responsibilities (Rich et al., 2002). Due in part to lack of accountability, GME funds are used for everything from capital improvements to indigent care. Moreover, the amount of funding for GME can be arbitrary, ranging from $10,000 to $240,000 per resident in 1995 (Medicare Payment Advisory Commission, 1998). Because funding is often scarce, it is essential to derive maximum value from educational encounters.

Continuing medical education faces funding dilemmas of its own (Wilson, 1998; Schaffer, 2000; Relman, 2003). As institutional support has decreased, commercial funding of CME has more than bridged the gap. Fully 50-60% of CME is now paid for by drug and device manufacturers (Van Harrison, 2003). This support creates both perceived and actual conflicts of interest that threaten to undermine the professional ethos of lifelong learning (Relman, 2003).

The National Academy of Science's Institute of Medicine paints a particularly stark picture of the state and future of education in medicine:

> Education for the health professions is in need of a major overhaul. Clinical education simply has not kept pace with or been responsive enough to shifting patient demographics and desires, changing health system expectations, evolving practice requirements and staffing arrangements, new information, a focus on improving quality, or new technologies (Institute of Medicine, 2001; Institute of Medicine, 2003, p. 1).

Key questions remain unanswered about the future funding and structure of medical education- questions of public policy, commercial influence, and maintaining professional competence during an information revolution (see Table 1). One fact remains certain: medical educators cannot count on old methods to guide them through the storm. Academic physicians and policy makers must meet these challenges and adjust their curricula to achieve the most value for a shrinking educational dollar. This thesis reviews some principles and strategies for enhancing the value and outcomes of educational programs.

Table 1

Challenges to health professions education

Demographic
Aging population
Need for emphasis on wellness and preventive care
Impact of chronic diseases
Increase in outpatient care
Technological
Crowded curricula
Competing demands for depth and breadth of new and old knowledge
Financial
Lack of funding to review curriculum and teaching methods
Few resources to make needed changes
Emphasis on research and patient care
Conflict of interest concerns about corporate sponsorship of CME
Administrative
Little reward for teaching
Lack of faculty development
Lack of oversight across the continuum of education
Fragmented responsibilities for undergraduate, graduate, and continuing medical education
No integration across oversight processes: accreditation, licensing, certification
Lack of evidence base to assess impact of changes in teaching methods

Principles and Strategies to Consider in Improving Medical Education

Assumptions about Adult Learners

Historical perspective.

Formal adult learning has gone for millennia with precious little investigation into its nature. The lack of research interest in this area is quite interesting when one considers that the great teachers of old - from Scorates to Cicero – were teachers of adults. The ancient philosophers viewed the concept of teaching through a different lens than that of today's formal classroom instructors. They viewed learning as a lifelong process, rather than a series of discrete events. The ancient Greeks were responsible for the Socratic method, in which the leader poses a dilemma and engages the group to pool their experiences and backgrounds in search of a solution. The Chinese and Hebrews introduced the world to what is now called the case method. This technique involves a leader describing a situation, followed by a group exploration of causes for and solutions to the problem (Knowles, 1998).

Seventh century Europe saw the development of schools for teaching children based on a set of assumptions that became known as pedagogy – literally, "the art and science of teaching children." (Knowles, 1998, p. 36). These assumptions formed the framework of modern educational systems worldwide. Scholars did not take interest in adult education until the end of World War I. Over the decades, an organized conception of adult learning known as andragogy has evolved. The principles of

andragogy have significant and exciting implications for improving the education of physicians.

Assumptions in adult learning.

In order to respond to the increasing demands placed on the medical education dollar, those who teach physicians and physicians-in-training must realize that adults learn differently than children do. Long, passive lectures are not effective ways to facilitate adult learning (or child learning for that matter). The first step toward improving educational programs in medicine involves gaining appreciation for the ways adults learn. To reach a physician audience more effectively, educators must understand a set of assumptions regarding adult learners.

In his Meaning of Adult Education, Lindeman identified five key assumptions about adult learners (Lindeman, 1926). His work has been supported by later research and serves as the bedrock of adult learning theory (Knowles, 1998). These assumptions are described below and summarized in Table 2.

1. Adults are motivated to learn as they experience needs and interests that learning will satisfy; learning activities, therefore, should be centered around these points. For example, a group of family physicians reporting confusion about the management of heart failure should seek out continuing medical education (CME) experience in that area.

2. Adults' orientation to learning is life-centered; the appropriate bases for organizing learning, therefore, are life situations, not subjects. For example, a coaching session by an attending physician on motivational interviewing should begin and end with reflection on the importance of this skill on the trainee's life as a clinician.
3. Experience is the richest source for adults' learning; therefore, reflection on experience is the core methodology of adult education. "None but the humble become good teachers of adults. In an adult class the student's experience counts for as much as the teacher's knowledge." (Lindeman, 1926, p. 166). For example, a discussion in grand rounds regarding antibiotic therapy for sepsis may begin with an inventory of residents' experience with sepsis patients.
4. Adults have a deep need to be self-directing; the teacher, therefore, engages in inquiry with the student, rather than serving as an oracle of knowledge. For example, medical students could be encouraged to report on journal articles of interest to them or their families (within a range of choices to ensure comprehensive coverage of learning objectives).
5. Individual differences among people increase with age; therefore, adult educators should optimize learning by taking account of differences in style, place, and time of learning. For example, educators should be mindful that a CME activity may attract a range of attendees from the newly trained to the nearly retired. They should plan activities that appeal to these learners' differing needs.

Table 2

Summary of Lindeman's key assumptions about adult learners

1. Adults are motivated to learn as they experience needs and interests that learning will satisfy.
2. Adults' orientation to learning is life-centered.
3. Experience is the richest source for adults' learning.
4. Adults have a deep need to be self-directing.
5. Individual differences among people increase with age.

These assumptions were evaluated and expanded upon by social scientists. Carl R. Rogers, father of client-centered therapy, conceptualized "student-centered teaching" as a parallel concept. His approach was based on five hypotheses, the first two of which are most applicable to adult education. His first hypothesis is a powerful summary of teaching in general: "We cannot teach another person directly; we can only facilitate his learning." (Rogers, 1951, p. 388). He continues to say that "Every individual exists in a continually changing world of experience in which he is the center." (p. 389). Put another way, motivation to learn must be internal and facilitation must focus on the needs and experiences of the learner. Rogers also believes that significant learning occurs only when the subject is involved "in the maintenance of, or enhancement of, the structure of self." (p. 391). This may sound far too abstract for application to medical education. However, most physicians would agree that their clinical skills are indeed a part of themselves. Rogers would

likely agree that the proper educational program to enhance skills would enhance the self-structure as well.

In his study of continuing adult learners, Cyril Houle (1961) identified three learning types. He notes that learners are not locked into one category, as the three circles overlap at their edges. Houle's three styles of learning include goal-oriented, activity-oriented, and learning-oriented. Goal-oriented learners use education as a means to an end. They are concerned with accomplishing defined objectives, and they learn in episodes that begin with identifying a specific learning need. There is no continuity between their learning experiences, but these learning episodes are recurrent. Activity-oriented learners gain knowledge by relating to others, and benefit from frequent interaction with fellow learners. Learning-oriented individuals are more concerned with the "journey" of learning, rather than the "destination" of knowledge acquisition. They learn for the sake of learning (Houle, 1961).

It is reasonable to assume that physicians may begin their schooling firmly entrenched as goal-oriented learners as they attend required pre-medical courses. Their goal is progression to medical school, and they may not have a great deal of interest in the subject matter. Some may remain goal-oriented throughout their careers. However, a more likely result is movement between the goal-, activity-, and learning-oriented categories as learning and life become less distinct from one another. A physician need only observe his colleagues to identify each of these styles at work in the medical classrooms known as hospital wards, conference rooms, and lecture halls.

Andragogy versus pedagogy.

What evidence is there that adults require such a different approach to learning as compared to children? This important question requires an exploration of maturity's role in learning, particularly with respect to motivation. The pedagogical model is rooted in dependency – the students expect that the teacher will make all decisions about the material to be learned and the manner in which it will be taught. This is entirely appropriate for children while their capacity to direct their own learning remains immature. There is strong evidence,[1] however, that "as individuals mature, their need and capacity to be self-directing, to identify their own readiness to learn, and to organize their learning around life problems increases steadily from infancy to preadolescence, and then increases rapidly during adolescence." (Knowles, 1998).

Despite the body of knowledge regarding the need for self-direction in adult learning, culture does not support gaining the skills required to make the transition from submissive learning to self-directed learning. Thus, a chasm forms between the need and the ability to direct one's learning. This may result in poor performance, resentment or even rebellion against learning. Figure 1 shows the natural maturation toward self-direction as compared with the culturally permitted rate of growth of self-direction (Knowles, 1998, p. 63). In this figure, Knowles depicts a transition from other-directed learning (where pedagogy is appropriate) toward increased self-reliance, which is better served by the principles of andragogy. Educators may do

[1] Further support for this progression may be found in: Bruner, 1961; Erikson, 1950, 1959, 1964; Getzels and Jackson, 1962, Cross, 1981; Smith, 1982.

physicians a disservice by using pedagogical methods such as didactic lecture when their learners are ready for andragogy.

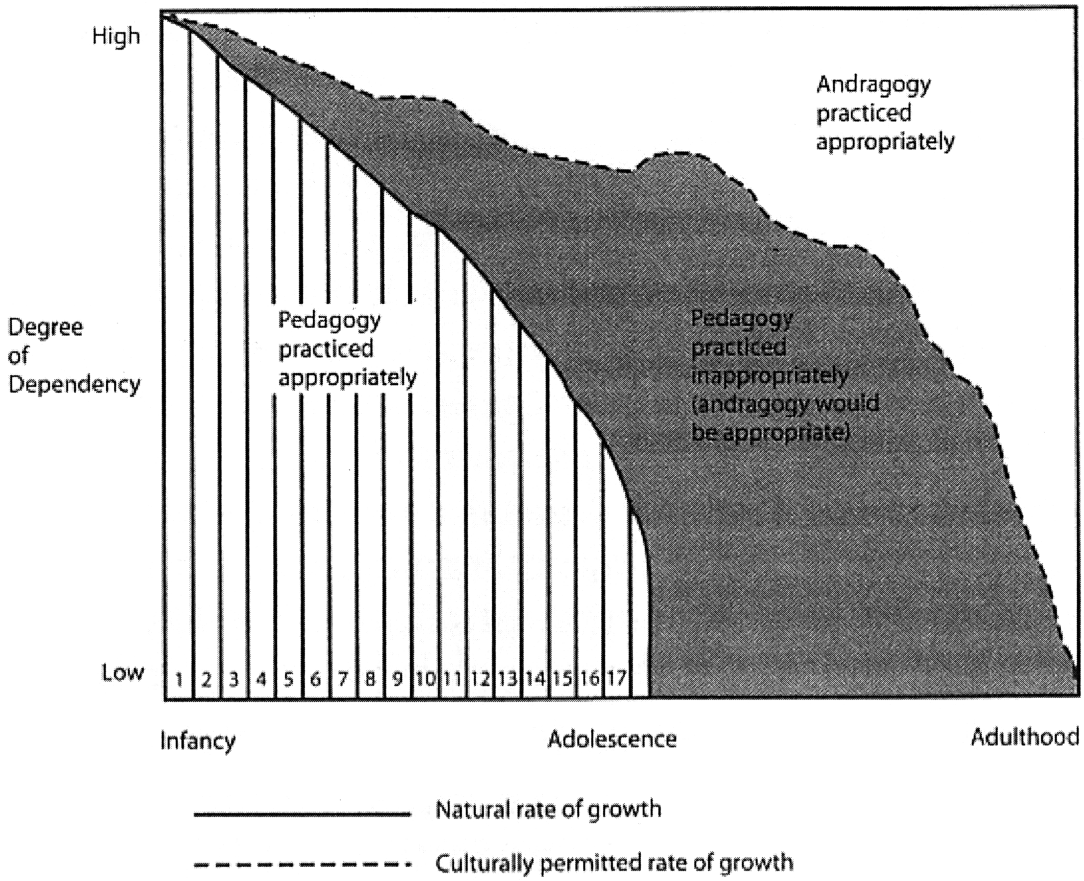

Figure 1. Natural maturation toward self-directed learning as compared with the culturally permitted rate for growth of self-direction. From The Adult Learner (p. 63), by M. S. Knowles, 1998, Houston, TX: Gulf Publishing. Copyright 1998 by Gulf Publishing Company.

Implications of assumptions for medical education.

Educators in medicine need to ask themselves whether their program is consistent with the assumptions underlying adult learning. Upon careful study, one may be surprised to find that many programs and activities more closely follow the pedagogical model. Although the tenets of pedagogy may be appropriate for some adult learners, there is much evidence that adults learn better from teachers who embrace andragogy. Table 3 summarizes the key assumptions of pedagogy and andragogy (Knowles, 1998).

Physicians learn early in their training that learning is inextricable from life itself. The very nature of medicine begs that "new knowledge takes root firmly, strikes deep, and feeds on what the day's life brings it." (Knowles, 1998, p. 42). Despite continuous teaching and learning, there have been few discussions about applying adult learning theory to the education of medical professionals. However, those who teach doctors can take cues from both modern andragogy and the example of the Ancients as they help physicians become seekers of knowledge. Medical education stands to learn from adult education theory and writings.

Table 3

Key distinctions between pedagogy and andragogy

Pedagogy	Assumption	Andragogy
Learners are less concerned with the reason they need to learn information	The need to know	Learners need to know why they are learning
"I am dependent on the teacher"	The learner's self-concept	"I am responsible for my own learning"
Learners have fewer experiences from which to draw	The role of experience	Wide differences among learners enriches experience, also introduces long-held biases
Learners may be less ready to learn	Readiness to learn	Learners understand the need for new knowledge and skills to address real-life situations
Subject- or content-centered	Orientation to learning	Life-, task-, or problem-centered
External: grades, instructor, peer or parent approval	Motivation	Internal: self-esteem, job satisfaction, quality of life

Cognitive Styles

Differences in Learning Styles are Important

Intuition and experience suggest that learning occurs in different ways both within an individual and between learners. While one person may prefer to learn by reading a document, another may prefer to listen to a presentation. Yet a third person may learn best by participating in an activity. The manner in which an individual most effectively acquires and uses information may be described as his or her cognitive style. Is there any theoretical basis for the strong anecdotal evidence of differences in cognitive style?

Long (1983) noted that the study of cognitive styles began when researchers recognized the differences in people's learning behavior. He made the observation that some people learn things such as language better than math, while others have the opposite predilection. He commented that "not only do individuals differ in their learning efficiency according to content, but they also differ according to their approach to the learning task." (Long, 1983, p. 47). Witkin et al. found that cognitive style is a powerful contributor to academic and vocational choices, the way learners learn, and the manner in which teachers teach in the classroom (Witkin, Dyk, et al., 1962). Despite the importance of cognitive style, Cross acknowledges that few teachers are informed about the concept (Cross, 1976).

Field Dependence versus Field Independence

The most robust body of research on cognitive styles relates to Witkin's concept of field dependent versus field independent learning. Field-dependent learners tend to be influenced by the learning environment and may be described as "other directed." They learn best when they are engaged in traditional learning environments and rule sets. Field-independent learners, however, are self-directed and learn best when they are given tools for discovery on their own. Learning is not either field dependent or field independent; rather, one's learning style exists somewhere on a continuum. Few fall at either extreme.

In their review of cross-cultural studies of cognitive style, Witkin and Berry (1975) came to the following conclusions regarding cognitive style:

1. Direction is toward field independence up to early adolescence, followed by a plateau, with a movement toward field dependence at around fifty years of age. Individuals show stability throughout life with respect to their *relative* position on the continuum.
2. Field-dependent styles seem to be favored in cultures that emphasize sharp, clear role definition and social control; cultures that place greater emphasis on self-control and independence encourage field independence.
3. Field dependence is also associated with cultures that follow strict child rearing practices that emphasize obedience and parental

> authority; practices that encourage individual autonomy and are tolerant of violation of parental authority are associated with field independence (Long, 1983, p. 48).

Based on these conclusions, it becomes clear that the environment in which medical learning occurs may well favor those with a field dependent orientation. The hospital and clinic have a culture of spoken and unspoken rules and hierarchies that clearly define roles and acceptable behaviors. For example, it would be considered improper for a physician in training to question the decision of his or her superior in most clinical environments. This and countless other rule structures may promote the learning of the field-dependent student, but it may hinder the progress of the field-independent.

Keogh and Donlon (1972) noted that neither field dependence nor field independence seem to be a reflection of intelligence. They did find an association between field independence and analytical ability. This may explain why field-independent learners favor math and sciences in school. Field-independent learners also have fewer learning difficulties than those with a field-dependent cognitive style (Keogh and Donlon, 1972). This introduces the possibility that learning difficulties may have more to do with presentation rather than intelligence (Long, 1983). This concept has important implications for medical education, as it underscores the importance of considering the cognitive style of physician audiences when designing educational programs.

Conditions for Learning

Smith (1982) discusses some conditions for optimal learning in adults. These are summarized in Table 4. He explains that these are "conditions that educators find useful to activate and that learners have a right to expect." (p. 47).

Table 4

Conditions for adult learning

Adults learn best when…

1. … they feel the need to learn and have input into what, why, and how they will learn
2. … the content and process of learning bear a perceived and meaningful relationship to past experience and experience is effectively utilized as a resource for learning
3. … what is to be learned relates well to the individual's developmental changes and life tasks/goals
4. … the amount of autonomy exercised by the learner is congruent with that required by the learning method utilized [2]
5. … they learn in a climate that minimizes anxiety and encourages freedom to experiment
6. … their learning styles are taken into account

[2] For example, learners cannot be expected to be independent for self-directed learning without training, nor can they collaborate effectively without knowing how to be interdependent with others. Both of these modalities are relevant to the study and practice of medicine.

Clearly, Smith's concepts are present in the work of Knowles (1998), Brookfield (1986), and Long (1983). This reinforces the importance of considering the special needs of adult learners. It is important for medical educators to consider these principles when designing and implementing educational programs for physicians.

Teaching Strategies

The effectiveness of learning has much to do with the teaching strategy chosen. Ronald Hyman describes the purpose of teaching strategies as tools "to help teachers in achieving their goals by formulating appropriate guidelines for and sequences of actions to take during the complex interaction of teaching." (Hyman, 1978, p. 141). He describes three main types of teaching strategies: presenting, enabling, and exemplifying. These types are named according to the primary action of the teacher, and each type has distinctive rationale, advantages, and disadvantages. The name of each teaching strategy was chosen to reflect the teacher's intent and role when using that particular strategy (Hyman, 1978). This section will describe these teaching strategies, discuss their strengths and weakness, and explain their relevance to medical education. Table 8 serves as a summary of the strategies discussed.

The Presenting Strategy

Perhaps the best-known strategy in its various forms is presenting. Didactic methods such as lecture and recitation belong in this category of teaching. As presenters, teachers put forth information while students receive and process it. The message may be a set of specific information units (such as historical facts) or a general idea (such as the concept of democracy). In order to understand the message conveyed, students either generalize from the specific information provided or make the general message particular in order to relate to the new learning and act upon it

later (Hyman, 1978). The presenting strategy is based upon the elements expressed in Table 5

Table 5

Key elements of the presenting strategy

1. The teacher knows what information the student needs to know.
2. The teacher is personally familiar with the needed information.
3. The teacher can effectively transmit a message containing the information to the student.
4. The student can understand the highly symbolic nature of this strategy (symbolic in that the teacher's message comes mostly through oral channels).
5. The student can particularize or generalize from transmitted messages, relate the teacher's messages to life outside the classroom, and act on symbolically derived learning.

Note. Adapted from Strategic Questioning (p. 145), by R. T. Hyman, 1979, Englewood Cliffs, NJ: Prentice-Hall.

The roles of both teacher and student remain important in selecting a teaching strategy. The presenting strategy demands that teachers are active participants in the learning process. "The teachers are diagnosticians, selectors, organizers, synthesizers, presenters, questioners, and examiners" while students remain "receivers and relaters" (Hyman, 1978, p.145). The physical, cognitive, and

emotional expectations of the students are not as great as those placed on the teacher. Rather than use the information conveyed in the classroom, students are expected to act on their learning outside of class.

Hyman describes generational efficiency as the greatest advantage of the presenting strategy. Generation efficiency refers to the "symbolic crystallization and transformation of information," or the ability to pass along large quantities of information using words rather than actions (Hyman, 1978, p.145). Without symbolic representation, each generation would be forced to learn such things as how to build buildings, make fire, and treat infections all over again. Presenting is efficient for two other reasons. First, the teacher can cover many topics quickly. Second, students can learn from the messages of many presenters in one learning session because of the low cognitive demands placed upon them as passive learners.

The advantages of presenting are offset by significant weaknesses. Students may not be able to relate to the abstract nature of the symbolic messages conveyed and consequently learn little from them. Since the teacher is doing most of the mental work, the learner may not even be interested in performing the required cognitive manipulations necessary for relating to the message. If the teacher attempts to force meaningfulness upon the learner by way of extrinsic rewards or exams, students may resent the learning process and shut down. However, some teachers feel that such coercive techniques are necessary to demonstrate retention of material.

Although the presenting strategy is focused on the teacher's energies, students may become engaged through questioning. Questions serve as a check on the level of students understanding and can alert the teacher when a concept is unclear. The

teacher needs questions for guidance as much as students need questions for clarification. Methods such as recitation and programmed instruction rely heavily on questioning. In a recitation, the teacher guides discussion between students using questions and presents information to elaborate upon students' answers. Programmed instruction relies on questions as a feedback mechanism to help students determine their readiness to continue on to more complex material (Hyman, 1978).

The Enabling Strategy

Enabling is used much less widely than presenting in medical education despite a wealth of evidence supporting its usefulness (Norman & Schmidt, 1992, 2002; Vernon & Blake, 1993; Colliver, 2000). Enabling is a difficult strategy because it requires a sophisticated, experienced teacher who has the desire to be involved with students. Methods such as problem solving projects and discussions belong to the enabling strategy. Students are engaged in some activity under the teacher's supervision. The activity is generally centered around a problem to be solved, as in a laboratory experiment. Teachers may be highly involved or at the periphery, but must remember that their task is to *enable* students to perform the task. Regardless of how tempting it may be to solve the problem for students, teachers must restrain themselves and encourage students to take a leading role (Hyman, 1978).

Residency training is an example of the enabling strategy. The teaching hospital and attending physicians serve as the "enablers" by providing the patients

requiring medical attention. This is true for medical students during their clinical clerkships as well. After taking a history and performing a physical exam, the student presents the analysis of his findings to a resident physician. Students are encouraged to seek further information to confirm or reject the hypothesis they have created regarding the nature of the problem. They continue to ask questions and put forth ideas until a hypothesis is accepted. The teacher's role is to facilitate discussion among the residents and students, allowing them to draw upon their experience and hypothesis-testing skills. According to Hyman, the teacher's role is "to enable the students to generalize from the particulars of the activity, to formulate and test hypotheses…the teacher steps in, makes suggestions, and asks questions only when it is necessary to enable the students to proceed on their own." (Hyman, 1978, p.148-9). The enabling strategy is based on the ideas described in Table 6.

Table 6

Key elements of the enabling strategy

1. Students gain skills, knowledge, and beliefs meaningfully through activities they are involved in themselves.
2. Students will probably act on generalizations and test hypotheses with which they have been actively concerned themselves.
3. There is intrinsic motivation to learn and remember what is learned when activity arises out of interest, curiosity, or a problem.
4. Teachers can enable students to learn to think analytically and creatively by suggesting, prodding, challenging, and leading, since teachers cannot meaningfully abstract an idea for the student or apply an idea to the students' lives.
5. Students perform cognitive tasks well and with significance when they are physically, emotionally, and cognitively involved in the activity.

Note. Adapted from Strategic Questioning (p. 149), by R. T. Hyman, 1979, Englewood Cliffs, NJ: Prentice-Hall.

As enablers rather than presenters, teachers are not necessarily as physically active as students. Teachers need to participate, however, in order to establish an alliance with students and to be aware that students will generalize from the particulars of an activity. Thus, the teacher must monitor the steps taken as students form hypotheses.

Hyman summarized the advantages of the enabling strategy as follows: "Students learn willingly, enthusiastically, and meaningfully when they have an

active, relevant stake in the teaching situation" (Hyman, 1978, p.149). When properly empowered to solve a problem, students learn that solving the problem is a reward in itself. Extrinsic rewards become meaningless, as students realize that the ability to work through a problem is its own reward. Importantly, students learn how to benefit from a problem because they have practiced proceeding from specifics to generalizations. When they face a problem in the future, they will possess the tools required to approach it in a stepwise fashion rather than becoming frustrated or overwhelmed.

As beneficial as enabling can be to learners, it is underutilized as a teaching strategy for several reasons. First, it requires a sophisticated teacher who understands the process of generalizing. Enablers must be sensitive to the developmental status of learners' problem solving capacities. They must be prepared to restrain themselves from solving the problem for their students and must allow them to fail and learn from the failure.

Beyond the limitations of teachers, time is the biggest obstacle to wider use of the enabling strategy. Development of problems and activities that are meaningful requires creativity and time. Enablers must allow students to follow their own leads (within reason), and must therefore schedule loosely in order to avoid stopping students at the point of a breakthrough. Objective measurement of student learning is also a problem, as the goal of enabling is to empower students to think analytically, critically, and creatively. These skills are not easily measured by a multiple-choice exam or other traditional evaluation tools (Hyman, 1978).

The Exemplifying Strategy

Hyman's third strategy is least used by teachers. Teachers may unconsciously engage in exemplifying skills such as proper spelling or respect for authority. In general, teachers do not strategically model behavior with the specific goal that students will learn from their example. According to Hyman (1979), this is a lost opportunity to capitalize on the unstudied curriculum, the ever-present hidden agenda that teachers constantly demonstrate, whether or not they are aware of it. Because of the nature of knowledge that can be learned by modeling, the exemplifying strategy is most effective when conveying skills, processes, and values such as medical ethics (Hafferty & Franks, 1994). The exemplifying strategy may also be used to teach facts, although not in the same way as when demonstrating a skill or manifesting a value. Elements of the exemplifying strategy are shown in Table 7.

Table 7

Key elements of the exemplifying strategy

1. Students learn from watching a model and imitating it.
2. Students learn from concrete and meaningful examples in the classroom, just as they have done from the first minutes of their lives.
3. The teacher does not necessarily verbalize or needs only minimal verbalization as an accompaniment to strategic exemplification.
4. It is only natural and sensible for teachers to exemplify a harmony among objectives, verbal action, and nonverbal action since the students learn from them all.
5. Many students respond better to the primarily nonverbal model exemplified by what teachers do than to the verbal language spoken by teachers.

Note. Adapted from Strategic Questioning (p. 153), by R. T. Hyman, 1979, Englewood Cliffs, NJ: Prentice-Hall.

To use the exemplifying strategy, teachers must build the appropriate foundations upon which they can elaborate the skill or value they wish to model. The teacher gathers appropriate materials for demonstration of the process or belief to be conveyed, and ensures that his own understanding of the exercise is complete. Then, the teacher exemplifies what he wants the students to learn by his actions as the students observe. The students then relate what they see to their own lives and act upon this knowledge in similar situations they may face in the future.

While exemplifying may occur in the context of presenting or enabling, it is primarily a nonverbal teaching mode. Teachers may make comments in order to reinforce the behavior being modeled, but the nonverbal action itself is the critical one. The advantage of exemplifying is this nonverbal component. Many students who have difficulty with a verbal or written message can learn much from the subtle information conveyed by modeling. This communication form is ubiquitous in life outside the classroom as most learning is done by imitating nonverbal examples in the environment (Hyman, 1978). An old limerick captures the appeal and importance of nonverbal communication:

> There once was a person named Beecher
>
> Successful, effective, great teacher.
>
> "I'll tell you the key:
>
> What I teach them is ME,
>
> I serve as a model, not preacher (National Society, 1976)."

The exemplifying strategy may be the only way to effectively make concrete the abstract values and principles that are important for students. Speaking about ethics and beliefs in symbolic terms may cloud already complex concepts. The exemplifying strategy empowers students to perform at a higher level by showing them how to use skills they possess but cannot act upon without modeling. Hyman (1979) calls exemplifying "a bridge between school and society", as it shows the teacher as a real person working through real issues (p. 154). The exemplifying

strategy also motivates teachers more than the presenting or enabling strategies. Teachers become intimately involved with the situation when exemplifying as the border between teaching and life fades to grey.

For all its advantages, exemplifying has significant drawbacks. In order for teachers to set an example, they need to craft an appropriate environment where students are comfortable and receptive. If the situation appears contrived or false, exemplifying will be much less effective. Fortunately, the emotional content of teaching in the clinical setting lends itself well to exemplifying, so this barrier is less of an issue in medical education than in other settings. Also, it is difficult for teachers to determine whether the intended message is indeed being communicated. If the teacher disrupts the activity to ask students, the flow of nonverbal activity may be compromised. Because students are not used to learning from this strategy, they must observe the teacher intimately over sustained periods. This may not be possible in all educational settings.

Students may ask questions as part of the exemplifying. In fact, these questions are essential, though they may be less frequent due to the nonverbal aspect of the lesson. Perceptive teachers welcome feedback whether exemplifying, enabling, or presenting.

The exemplifying strategy is extremely well suited to the development of interpersonal skills in young physicians, particularly in the realm of behavioral sciences and motivational patient interviewing. Hafferty and Franks (1994) argue that the most critical determinants of physician identity are developed within the "hidden curriculum" rather than through formal learning. Medical educators would

be well-advised to be aware of the unstudied curriculum that they teach every day in their interactions with patients and colleagues. For better or worse, students are learning from their example.

Table 8

Comparison of Hyman's teaching strategies

	Presenting Strategy	Enabling Strategy	Exemplifying Strategy
Teacher attributes	Teacher is physically, cognitively, emotionally active	Sophisticated, insightful, creative preparation. Relatively passive role while teaching	Teacher is aware that he is always exemplifying something to students
Student attributes	Students receive information, later relate it to their lives	Students are engaged in problem solving	Students receive unspoken lessons and act on example
Advantages	Generational efficiency[a] Students can devote energy to several topics simultaneously Good for students not ready to learn, lacking resources, or inclined to learn by listening	Builds skill in critical thinking and problem solving Empowers students	Students often act upon "unstudied curriculum", whether or not they are aware of it

[a] Hyman describes generational efficiency as the ability of one generation of learners to benefit from those before. Essentially, this efficiency prevents constant "reinventing of the wheel" because the presenting strategy allows "symbolic crystallization and transmission of information" (Hyman, 1978, p. 145).

Table 8 - continued

Comparison of Hyman's teaching strategies

	Presenting Strategy	Enabling Strategy	Exemplifying Strategy
Disadvantages	Passive strategy emphasizing quantity of messages over quality Retention of information is questionable	Time consuming preparation and completion of activity Unable to test learners using traditional methods	Unable to confirm receipt of message by students. Time commitment required to exemplify
Application of strategy	Lecturing medical students about DNA replication CME presentation on heart failure treatment	Clinical case presentations and problem-based learning	Critical care attending physician demonstrates compassion when revealing difficult news to family members in presence of an intern

Facilitation Strategies

Effective facilitation during a learning activity helps secure the exchange of knowledge, skills, or attitudes between facilitator and learner. Brookfield (1986) has described six principles as part of an effective facilitation strategy:

Voluntary Participation

Although their specific motivation may come from an external circumstance or an internal decision, "adults engage in learning as a result of their own volition" (Brookfield, 1986). For instance, one may desire training in order to prepare for a new career after being laid off. Or, one may pursue education to satisfy a personal interest such as a sport or hobby.

Mutual Respect

This principle simply states that the facilitation of learning should "make participants feel that they are valued as separate, unique individuals deserving of respect" (Brookfield, 1986). Facilitators should take care to provide feedback in a sensitive, nonjudgmental manner, avoiding humiliation or intimidation in order to maximize learning. The facilitator should show respect for learners' differences (e.g. cultural background, learning style) through the use of different learning modalities.

Collaborative Spirit

Brookfield defines collaborative spirit as the existence of some kind of participatory and collaborative element "which should result in evolving roles and continual renegotiation of activities and priorities" (1986). Collaboration can be introduced when instructor and student work together to identify and negotiate learning objectives.

Action and Reflection (Praxis)

Brookfield describes praxis as the "alternating and continuous engagements by teachers and learners in exploration, action, and reflection" (1986). Some learners are better than others at looking back on their experiences and extracting lasting meaning that transcends the learning activity. Skilled facilitators can draw forth this important process. The use of a learning journal, in which students reflect in writing about the learning experiences they have undergone, is one form of praxis. Silberman (1996) noted that through journaling, students "are encouraged to become conscious, through language, of what is happening to them" (p. 129).

Critical Reflection

In discussing this principle, Brookfield describes that "learning is being effectively facilitated when the educator is prompting in learners a sense of the culturally constructed nature of knowledge, beliefs, values, and behaviors" (1986). The medical community frequently finds itself at the crossroads of such cultural constructs, naturally leading facilitators and learners to such reflection. For example,

a teaching session on palliative care for internal medicine residents may lead to a discussion of cultural roles when a resident meets a patient whose beliefs differ from those of the care team.

Self-direction

According to Brookfield, "self-directed learning…is not merely learning how to apply techniques of resource allocation or instructional design. It is, rather, a matter of learning how to change our perspectives, shift our paradigms, and replace one way of interpreting the world by another." (1986). Physicians are motivated to lifelong learning that is self-directed. However, effective facilitators will help learners improve upon their skills for knowledge self-discovery. An example would be comprehensive, effective training that points resident physicians toward CME activities that fit their needs and cognitive style.

Translating the principles of adult education into programming and methods that meet the needs of learners in a changing medical care environment could be described as a paradigm shift in medical education. The educational landscape is changing due to forces from within the profession and outside that have been described earlier. Although medicine is traditionally slow to respond to change, there has been progress in improving education for physicians. Mazmanian and Davis (2002) define eight categories of interventions in CME that are rooted in the assumptions, principles and practices of adult learning (see Table 9).

There is evidence (Davis et al., 1999; Davis & Taylor-Valsey, 1997; Davis et al., 1995) that "continuing medical education strategies that enable and reinforce change are more likely than other more traditional, passive activities to influence behavior" (Mazmanian & Davis, 2002, p. 1057). Traditional CME is a time-based system of credits with a focus on didactic lectures (Mazmanian & Davis, 2002). Evidence suggests that the presenting strategy alone is much less effective in changing behavior and patient outcomes than activities such as case discussion or hands-on practice sessions (O'Brien, et al., 2002; Davis et al., 1999; Davis et al., 1992). In addition, recent studies suggest that physicians who develop their own learning objectives through reflection on clinical strengths and weaknesses benefit the most from their choices of CME activities (Campbell, et al., 1999; Epstein & Hundert, 2002). The key to effective continuing education in medicine is emphasis on continuing; that is, activities that are essential to practice and self-directed rather

than isolated learning experiences. Knowles (1998), Long (1983), and Brookfield (1986) would agree on the importance of acknowledging the assumptions, strategies, and practices appropriate for adult learners when maximizing the value of CME. The following are examples of educational activities that apply adult learning theory to achieve changes in physician behavior and patient outcomes.

Table 9

Continuing medical education interventions

Intervention	Example
1. Educational materials – published or printed recommendations	Clinical practice guidelines
2. Conferences – outside the practice setting	Workshops
3. Educational outreach – trained person meets providers within practice setting to suggest opportunities for improvement	Pharmaceutical representative
4. Local opinion leaders – peer-nominated colleagues	Local cardiology expert
5. Patient reminders – information sought from or given directly to patients	Direct mailings to patients
6. Audit and feedback – summary of clinical performance from documented record	Chart review and clinical recommendation
7. Clinician reminders – prompt a physician to take action	Preventive reminders
8. Multifaceted interventions – combination of the above seven	Educational outreach visit to discuss performance followed by implementation of a reminder system

Note. Adapted from "Continuing Medical Education and the Physician as a Learner," by P. E. Mazmanian and D. A. Davis, Journal of the American Medical Association, 288(9), p. 1058.

Educational Materials

Educational materials are provided to physicians to inform them of changes in clinical practice or suggest new approaches to diagnosis and treatment. They include clinical practice guidelines, audiovisual materials, and electronic publications such as journals (Mazmanian & Davis, 2002). Physicians must be motivated to make use of these materials – a guideline for treating lower back pain will not "read itself," for example. In this way, educational materials may be consistent with andragogy because the learner is intrinsically motivated (Knowles, 1998). However, Cabana et al. (1999) have identified several significant barriers to adherence to materials such as practice guidelines. These barriers include: lack of agreement among expert recommendations; lack of self-efficacy (physicians did not believe they possess the skills to perform the recommended intervention); lack of response expectation (failure to expect a good outcome from implementing the change); and the simple yet powerful "inertia of previous practice" (p. 1461).

Conferences

Lectures and workshops outside the practice setting also fall under the umbrella of conferences. Thomson-O'Brien et al. (2002c) reviewed the literature on the effect of continuing education meetings on health care outcomes and the clinical practice of attendees. Their findings were consistent with principle that didactic sessions alone are unlikely to change behavior. They also found that interactive workshops, an example of Hyman's (1978) enabling strategy, result in moderately large changes in professional practice (Thomson-O'Brien et al., 2002c).

Educational Outreach

Educational outreach visits, or academic detailing, involves a trained individual who comes to a physician's workplace to provide information on improving performance or outcomes (Thomson-O'Brien et al. 2002a). This type of intervention is often conducted by representatives of pharmaceutical companies and device manufacturers. These "detail people" often have an effect on prescribing practices. Thomson-O'Brien et al. (2002a) found that educational outreach visits have an effect on physician behavior, particularly when combined with social marketing. This may represent an application of the exemplifying strategy (Hyman, 1978), whereby a teacher demonstrates not only a skill but an attitude that persists in the learner.

Local Opinion Leaders

When a group of professionals agree that one of their colleagues is exceptionally knowledgeable, that individual may be considered a local opinion leader. As such, he may be sought after to enrich other practitioners. Local opinion leaders have mixed effects on professional practice. It has been difficult to characterize exactly what these leaders do to influence their colleagues (Thomson-O'Brien, 2002b). Although more research is needed, it is reasonable to conclude that a certain amount of exemplifying is taking place when leaders share their skills.

Patient Reminders

Patient-mediated or patient-focused interventions involve the patient in his or her own care by prompting or reminding patients to pursue a chronic-care or preventive service. Patient reminders in the form of telephone calls or mailings have shown to be highly effective across different practice settings, particularly with respect to improving immunization rates. Because they are actively engaged with their patients when using these interventions, physicians may be highly motivated to implement behaviors that improve care (Szilagyi et al., 2000).

Audit and Feedback

Reviewing a physician's performance using medical record or claims data and providing feedback is an example of this intervention. Any summary of performance based on information obtained from the clinical record, from patients, or by observation may be considered audit and feedback as well (Mazmanian & Davis, 2002). Thomson et al. (1998) found a small to moderate effect of audit and feedback. The main effects on physician behavior were found in prescribing practices and ordering of diagnostic tests. However, they were not able to define what elements of audit and feedback were most useful and did not recommend this strategy for widespread use (Thomson et al., 1998). Given the importance of feedback on education (Knowles, 1998), it is puzzling that this strategy has not been shown to have greater influence on physician behavior. Further study is necessary to determine the strengths and weaknesses of audit and feedback.

Clinician Reminders

Reminders prompt a physician to perform a clinical action such as ordering a laboratory test or scheduling a follow-up visit. Reminders may be manual or computerized (Mazmanian & Davis, 2002). Dexter and colleagues found that a system of computerized reminders significantly increased the delivery of preventive measures in hospitalized patients (2001). When physicians are reminded to provide good care, it is reasonable to assume that their satisfaction would increase, perhaps encouraging further improvement. This is consistent with Brookfield's (1986) notion of action and reflection, whereby the physician considers the benefits of the reminder to provider and patient and applies this knowledge in future practice.

Multifaceted Interventions

The previous seven interventions may be combined into a multifaceted intervention strategy. For example, a smoking cessation counselor may conduct an outreach visit to review performance feedback on the frequency of cessation guidance provided by the physician. Then, a computerized reminder system may be developed to remind physicians to counsel patients on tobacco use. Multifaceted interventions may be more effective than single interventions because more barriers to change can be addressed and overcome (Hulscher et al., 2002). The potential benefits of combining different interventions to change behavior are supported by evidence that people learn differently depending on their cognitive style (Long, 1983).

While these educational programs serve as examples of applied adult learning theory, there is much room for improvement in designing interventions in continuing medical education. Continued research is needed to merge theory with practice when designing effective interventions to change physician behavior and health outcomes. The health care community's continued interest in quality improvement (Bodenheimer, 1999) may lead to further study in this important area.

The public health community is certainly interested in having the best-trained physician workforce possible. Enhancing the learning opportunities for physicians in training lays the foundation for quality care as they transition to independent practice. Moreover, skills for information analysis and effective learning will benefit new physicians throughout their careers. Applying adult learning principles to continuing medical education will allow programmers to reach more experienced clinicians to help them confront the challenges they face in a changing health care environment.

Appropriate education is intimately related to quality health care. Providers who have the skills to seek out information effectively will be able to provide care that is consistent with the best professional knowledge. This will correct the underuse of interventions such as preventive care, ultimately reducing health care costs over the long term. However, clinicians may find that they are under-using effective therapies, and implementing these into practice will raise the cost of health care. These increases in health care costs may be tempered by two factors. First is the misuse of care, a subset of which is medical errors. By reducing errors, costs for remedying such errors are eliminated, thereby saving money. Costs associated with the defense of litigation resulting from errors may also decrease. The emotional cost borne by a physician who made an error because he was unaware of a potentially better practice would also be reduced. This cost is significant, though not easily measured. The overuse of care will decline with better-educated physicians, causing a decrease in cost to the system along with a reduction in iatrogenic injury. The

reduction of underuse, misuse, and overuse of health care through improvements in education is important to the health of the individual and the community.

Although the population has much to gain from better-educated clinicians, these benefits are not free of costs. First, research on adult learning theory and its importance in medical education is in its infancy. The body of knowledge must be strengthened for these important principles to diffuse into practice. This thesis illustrates the importance of meeting the learner at his or her place of need. Creating individualized learning experiences requires large investments of time and capital. The money spent training physicians will not be available for direct patient care, possibly reducing access to care for some patients. However, once physicians are guided toward the best sources of information, their learning will become more efficient and pleasurable, leading to better patient outcomes. In this way, the health care system could recover the costs of improved medical education and apply them to restoring the access lost during the training process.

I began medical school in the autumn of 2004 with all the vigor of an athlete at his first game of the season. I had worked my way through the paternalistic, submissive, pedagogical pre-medical curriculum at a major university. I learned very little, and resented the way in which I was forced to absorb facts without regard to their relevance or my needs and style. I had high hopes that medical school would finally afford me the opportunity to use my gifts of curiosity and self-awareness to study more effectively. I longed to finally take pleasure in the learning process, to direct my learning in a meaningful way as I gained the knowledge and confidence necessary to practice medicine.

I could not have been more disappointed with the reality of the basic science portion of medical school. Although I had felt like an adult learner for years, I was still being treated the same as a fifth-grader – lecture, no interaction or discourse with my instructors, completely teacher-directed. After years of anticipation, I seriously considered leaving medicine after my first semester. However, I felt the call to physicianhood so strongly that I chose to create my own pathway instead.

The patient-based learning opportunities I needed did not exist in the classroom, so I sought them elsewhere. I discovered case books and vignette-style questions that really spoke to my style of learning by discovery, whereby the clinical data tell a story and the basic science comes alive in the context of an ill patient whom I can help. Loathing the microscope, I turned to the internet and computer-based histology and pathology resources to hone these skills. These electronic

resources combined tissue images with a clinical vignette. Having the science information in the context of patient care cemented the basic chemistry and biology in my mind in a way that even the most talented lecturer never could. For all the money I was paying in tuition, I entered the classroom building approximately twice monthly to take exams during my first two years of medical school. I became known as one of the "daytime ghost" students, seeing my classmates only for social purposes after school hours.

The vast majority of the educational experience provided for me as a medical student was based on the presenting strategy. However, I found that my best learning occurred when I was taught by someone well-versed in the enabling strategy. Most of the time, this person was the author of a textbook or a talented clinician in a small group setting. One of my most memorable experiences was a pediatric pathophysiology case conference held biweekly by the pediatric chief resident. These sessions were conducted in a small-group setting. They began with a patient who presented to the doctor with a set of complaints. The students worked together under the guidance of the chief resident to elicit the proper historical data and begin to form a diagnosis. Even though my knowledge was rudimentary, I found that I was nearly unable to restrain myself from asking question after question and positing theory upon theory as the case evolved. I couldn't wait to go home and seek more information on the patient's problem. I don't think it was a coincidence that I received one of the highest scores ever given to a pediatric clinical clerk as I built upon this foundation of discovery into my third year of medical school.

As I refer to Table 10, I can easily see why the enabling strategy fits me best. When I am enabled, I draw on my own experience in a collaborative environment with my teacher and fellow students. I am given autonomy and allowed to make mistakes. I am encouraged to direct my own learning and seek resources that fit my learning style. My decision to interrupt medical school to earn my Master of Public Health through study of such disciplines as health economics, law, and policy is another example of how I directed my own learning process once I realized that I needed to study population health.

Despite my personal preferences, there are plenty of students who learn best by listening to a lecturer or reading material in a text. Adult learning theory emphasizes diversity among adult learners. This requires that creators of educational programs develop a menu of options, from lecture to workshop to procedure simulation and beyond, in order to reach students best.

Table 10

Applications of adult learning theory

Purpose of Learning	Relevant Assumptions About Adult Learners[a]	Facilitation Strategies[b]	Conditions for Learning[c]	Cognitive Styles[d]	Sample Educational Activities[e]
Presenting	Motivated by interests that learning will satisfy Life-centered orientation to learning	Voluntary participation Critical reflection	Subject relates to individual's development, goals	Field independent	Educational materials Conferences
Enabling	Experience is a rich source for learning Deep need to be self-directing	Voluntary participation Collaborative spirit	Climate encourages freedom Appropriate autonomy given	Field dependent	Educational outreach Audit and feedback Clinician reminders
Exemplifying	Life-centered orientation to learning	Action and reflection	Climate minimizes anxiety & is natural	Field dependent	Local opinion leaders

[a] A detailed discussion of these assumptions may be found on pages 5-16.
[b] Further information on facilitation strategies may be found on pages 34-36.
[c] Further information on conditions for learning may be found on pages 18-19.
[d] Cognitive styles are considered on pages 15 & 16.
[e] Descriptions of sample educational activities are located on pages 37-43.

Conclusion

In a time of results and randomized clinical trials, one may ask if there is a place for the study of educational theory in the realm of medical education. Couldn't medical educators simply implement new curricula based on trial and error, or what makes intuitive sense? Some would argue that the best way to design effective educational interventions is to construct simulations and assign participants to experimental and control groups. Unfortunately, the process of learning is not so amenable to a randomized, controlled trial. The importance of research on learning in medicine is supported by Norman and Schmidt (2000), in their response to attacks on the relevance of this sort of research. They elaborated the following claims, which are echoed by this author:

1. Research on cognitive theory leads to highly relevant outcomes with strong effect sizes that can be used to design precise interventions.
2. Curriculum-level interventions (ie. simple, experimental designs limiting the manipulation to one variable) are doomed to failure and invalidity.
3. Education needs more theory-based research, conducted in relatively controlled settings rather than rigid experimentation to advance educational practice (Norman & Schmidt, 2000).

There are a variety of challenges facing medical education in the twenty-first century. From markedly decreased funding to dramatic advances in technology to the

sheer vastness of clinical information, the demands on physicians as learners will only increase. Given the immense challenges facing medical education today, it is unwise to assume that learning interventions of the past will prepare physicians for medical practice in the future.

Medical educators must be aware of several assumptions about adult learners. They must understand that adults learn differently than children, and that individual differences in learning style should be seen not as an obstacle but an opportunity when designing programs. Teaching strategies should be appropriate for the message delivered. Curriculum designers should realize that good facilitators are made, not born, and their skills can be improved to the learners' benefit. Finally, there are many strategies currently in use for CME, and these should be explored and expanded so that physicians may chose the learning environment and subject most suitable to them from a menu of activities.

From a public health perspective, there are many benefits to improving education through application of adult learning theory. Quality of care and access to appropriate treatment will undoubtedly increase when physicians become better learners. System-wide costs may well increase, as the creation of effective learning environments requires investment in talented teachers. Also, if better-educated physicians correct the underuse of preventive and therapeutic care, costs will almost certainly rise. These expenses, however, may be balanced by a concomitant

reduction in overused or misused health care. Finally, research into theories of adult learning, although essential for improving health care, is not free of cost.

This thesis should serve as a tool that gives designers of educational programs a foundation on which to build. Table 10 provides an overview of the opportunities to use adult learning theory to inform medical education. The chasm between educational research and learning in medicine must be bridged in order to best prepare the doctors of tomorrow. The quality and sustainability of health care depend on the ability of its leaders to adapt to a brave new world of information. With a firm grasp of adult learning theory, leaders and developers will be able to help physicians meet this challenge.

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