

**Achieving Large-Scale Change  
In  
Medical Education**

Chapter 33 (pages 1039-1084) in International Handbook for  
Research in Medical Education. Part Two. (Eds) Norman,  
G., van der Vleuten, C. and Newble, D. 2002. Amsterdam:  
Kluwer Academic Publishers  
ISBN 1-4020-0466-4

**Lynn Curry, PhD  
CurryCorp**

**17 Oakland Ave.  
Ottawa, Ontario K1S 2T1  
CANADA  
Tel: (613) 232-6708  
Fax: (613) 232-0038  
E-mail: [Lynn@CurryCorp.net](mailto:Lynn@CurryCorp.net)  
[WWW.CurryCorp.net](http://WWW.CurryCorp.net)**

**Running Head: Achieving Large-Scale Change**

## **Chapter Organization**

<b>1. INTRODUCTION.....</b>	<b>4</b>
<b>2. IMMINENT LARGE-SCALE CHANGE IN MEDICAL EDUCATION .....</b>	<b>6</b>
2.1. INTERNAL AND EXTERNAL DISSATISFACTION WITH MEDICAL SCHOOLS .....	6
2.2. CHALLENGES TO TRADITIONAL SCOPE OF PRACTICE.....	9
2.3. SHIFTS IN THE PRIMARY STAKEHOLDERS: PHYSICIANS.....	9
2.4. SHIFTS IN SECONDARY STAKEHOLDERS: THE PUBLIC .....	11
2.5. SUCCESS OF NEW MODELS FOR HIGHER AND PROFESSIONAL EDUCATION .....	13
2.6. DEVELOPMENT OF ALTERNATIVE MODELS FOR MEDICAL EDUCATION .....	14
2.7. THE PRESENT AND THE PROMISE IN INFORMATICS.....	16
<b>3. WHY EDUCATORS SHOULD LEARN TO MANAGE LARGE-SCALE CHANGE.....</b>	<b>18</b>
<b>4. WHAT CAN WE LEARN FROM PAST REFORM FAILURES? .....</b>	<b>20</b>
<b>5. MANAGEMENT OF CHANGE MODELS.....</b>	<b>21</b>
5.1. THE SWOT ANALYSIS	22
5.2. THE PLANNING APPROACH	22
5.3. THE ANALYSIS OF POSITION	23
5.4. ENTREPRENEURIAL MANAGEMENT	23
5.5. APPLICATIONS OF COGNITIVE SCIENCE	24
5.6. APPLYING LEARNING THEORY	24
5.7. POLITICAL POWER TECHNIQUES	25
5.8. THE CULTURAL ANALYSIS	26
5.9. THE ENVIRONMENTAL IMPERATIVE	26
5.10. COMBINED APPROACHES	26
<b>6. CONCLUSIONS .....</b>	<b>28</b>
<b>8. AREAS NEEDING FURTHER RESEARCH.....</b>	<b>29</b>
<b>9. APPENDIX 1: CHECK-LIST FOR CHANGE AGENTS .....</b>	<b>30</b>
<b>10. SUGGESTED READINGS .....</b>	<b>34</b>
<b>11. REFERENCES.....</b>	<b>36</b>

**“The problem is the reconciliation of unbridled radicalism and inert conservatism into reasonable reform”. (Dewey, 1898)**

## 1. Introduction

Human beings are a questing lot. The idea of finding ‘a better way’ has motivated mankind across cultures, time, space and adversity. All areas of human knowledge have benefited from this drive to know more, to predict more accurately, to act more effectively and to produce more efficiently. This increase in human capacity has not been achieved in a smooth ascending curve. There are irregular intercept jumps corresponding to new understandings, more useful paradigms or wider generalization from previous knowledge. We are living during one such ‘intercept jump’ characterized by significant new capacities in biology (i.e. genomics) and in informatics (i.e. the Internet). This chapter makes the case that these accomplishments and others portend radical change in the form, function and content of medical education.

We are also a social species. We organize into collectivities and we create institutions to carry out functions on behalf of society at large. Institutions are regularly formed and reformed to follow changes in social needs and human capability. The pressures for institutional adjustment may wax and wane, and may require implementation of small or large-scale modifications, but the requirements for adjustments are ubiquitous and inexorable. The question is not whether social institutions will change, but how frequently and by how much.

Medical schools are one such socially sensitive institution. The societal function fulfilled by medical schools has existed from the beginning of medicine: to provide a reliable supply of suitably trained physicians to replace those individuals currently in practice serving the health needs of society. To date, the responsibility to satisfy the social demand for new physicians has been entrusted solely to the profession of medicine. This is one of the responsibilities in the social contract that medicine, like other professions, have with the society they serve. In exchange for the right to decide who will be allowed to enter the profession, as well as the means and conditions of that entry, the profession undertakes to train those chosen individuals to standards defined by the profession and to guarantee that anyone legitimately awarded professional status is competent to serve society in that capacity. Society at large enforces this contract with significant sanctions against anyone purporting to practice a profession without status attested to by that profession. For example, “practicing medicine without a license” is a prosecutable offence in most of the developed world.

Medical schools slowly come to reflect significant gains in human knowledge and capacity by making constant small adjustments in pertinent areas. The initial scientific breakthroughs in bacteriology were eventually reflected in professional medicine and medical schools. That quantum gain in human knowledge had many effects, one of which was to provide the practice of medicine with a scientific base, increasing both the

predictability and efficacy of medical interventions. Writing in 1915 Cabot described this shift,

“The ‘big men’ of twenty years ago, had without exception, gone through the school of general practice and had risen from the ranks to eminence by sheer force of character, being largely without assistance of the laboratory, and having fewer instruments of precision than we possess. They had trained their faculties of observation in the hard school of experience and had come to rely far more than we do today upon their individual judgment, unsupported by clearly demonstrable fact. They were more astute judges of men, with a larger comprehension of the strength and weakness of human nature and a wider sympathy. They were characterized by a certain boldness less seen today, bred of the necessity of staking their reputations upon much less certain evidence. They seem to me to have been broader-minded, and rather more in touch with affairs other than those of medicine. Their devotion to the ideals of medicine I believe to have been more profound.” (p65).

Thus the emphasis on the quality of the human interaction in the provision of care became increasingly overshadowed by the importance of correctly understanding, interpreting and employing the relevant science. As a consequence, the medical school changed significantly from an apprenticeship model to one that could more easily guarantee sufficient exposure to the requisite sciences. The Flexnerian (1910) revolution in medical education codified this trend by requiring that all medical education take place in research universities and be composed of two years of ‘basic medical sciences’, taught by scientists currently engaged in research in these ‘basic’ sciences, before any clinical application or exposure to clinicians would be allowed.

The structure for medical education promulgated by Flexner satisfied social needs for increasing standardization of medical graduates and brought together a sufficiently strong constellation of interests to be both initially cohesive and self-sustaining within the medical profession. The Flexnerian structure for medical education has been replicated across the world and has remained essentially unchanged from that time. Such is the resiliency of that entrenched organizational model that new educational technologies (i.e. “problem-based” medical curricula) can be accommodated within the standard medical school structures without change to the operative divisions by academic discipline or between basic and clinical sciences.

This comfortable equilibrium in medical schools is, however, likely to destabilize over the next decade. The limits of the organizational resiliency within medical schools to maintain the current structure will be challenged by a massive reformation that is occurring in our capabilities and in our expectations. These social changes, outlined in Section 2 below, are sufficiently fundamental to impinge directly on medical schools as individual and collective organizations. In response to these pressures, new organizational structures with corresponding new functions will transform medical education. Again, the question is not whether, but how soon and by how much. Perhaps

more important is a second level question: what can we do to participate in shaping this transformation?

## **2. Imminent Large-Scale Change in Medical Education**

Many of the following signs and symptoms of impending large-scale change have been noted for some time in the literature (for example, Inglehart, 1997; MacLeod, 1997). These and other authors have repeatedly documented the following forces for significant change in the nature, structure and content of medical education:

1. internal and external dissatisfaction with the system
2. increased challenge in practice scope
3. shifts in primary stakeholders: physicians
4. shifts in secondary stakeholders: patient/ clients
5. success of new models for higher and professional education
6. development of alternate models for medical education
7. informatics technology supporting increased access to information

### **2.1. *Internal and External Dissatisfaction with Medical Schools***

Both the mission and the mandate of medical education are being actively questioned from inside the profession and by society. There are increasingly vocal complaints from practitioners about the result, the process and the content of initial professional education and training. Medical students are becoming more organized and are lobbying locally and nationally for guarantees that their education will be 'relevant' on graduation, that they will be employable in their preferred locations and specialties. Medical schools are being challenged by students to justify all aspects of the training: the content, the process, the structure, the timing and the cost.

There is much debate within the medical disciplines, sometimes in contradictory directions, about the most appropriate structure for the knowledge and skill base and the format for delivery of that knowledge and skill to the public. One form of this pressure for structural change is the perennial debate about generalization versus specialization in discipline-based knowledge and skills. For example, in North America the discipline of pathology divided in the 1980's into anatomical, forensic and laboratory pathology. Each required a specialized course of studies, separate examinations and separate certifications. Now the separate fields are re-generalizing, perhaps in part due to the fact that the employment market is very narrow for sub-specialized pathologists, but adequate for general pathologists. Similar pressures are seen in surgery and internal medicine. Worldwide, the biggest defined need for physicians is for general practitioners (WHO, 1966).

The public, acting through their agents in elected and public office, is showing significant signs of dissatisfaction with current medical school structures. In the United States most states have restricted university education budgets for the last decade and recently many states have enacted balanced budget legislation. The effect of these measures has been to effectively remove almost all direct government subsidies for

higher education including medicine. All higher education, including medicine, reacted by passing more costs along to students. As that strategy began to produce negative results (such as a dwindling applicant pool), the search began for opportunities to create new revenue streams such as catering to industrial research partners, training foreign students on contract and aggressively entering the health care provision market. Medical schools sought to control referral chains by buying the practices of independent physicians, particularly general practitioners. Corporate mergers were undertaken to control geographic segments of the managed care market. These revenue enhancing strategies have been less than successful, at least partially because state and federal governments have attempted to control costs in health care.

The costs of health care are of grave concern throughout the world. Economic analyses (e.g. Evans & Stoddard, 1990) indicate an inverse relationship in the developed world between social spending on provision of health care and indicators of health status at a population level (i.e. premature mortality, infant mortality, low birth weight babies). This effect has been documented by the Organization for Economic Cooperation and Development (OECD, 1999) across 23 countries. Only in countries that currently spend very little on health care (such as Mexico where less than \$500US is spent on health care per person per year) would an increase health care spending result in increased population health. Countries with currently higher rates of spending on health care provision, such as Canada at \$2,200US and the USA with \$4,000US per person each year, would receive almost no increase in population health status from increases in spending on health care.

Given those results, government office holders acting for the public across many countries have tried various means to control the costs of health care provision. In Canada the monopsony power of governments, derived from their role as the only source and payer of hospital and medical care, allows relatively direct control over both the costs (i.e. drug costs, physician costs) and the utilization of costly interventions (i.e. MRIs). As costs grow within restricted budgets, Canadian governments restrict the rate of growth in both costs and access to interventions. These dual restrictions have immediate negative effects on Canadian medical schools from uncompetitive salaries for faculty to vastly increased acuity in teaching hospitals. In the U.S. this cost containment is seen in the significant reductions in direct government support for health care programs (i.e. Medicare and Medicaid) and a sharp increase in government tolerance for the aggressive cost-cutting measures taken by privately funded programs. These measures have severely restricted revenues to medical schools from health care provision.

Attempts to increase medical school revenues through other sources have been similarly problematic. The successful training of foreign students requires more faculty and administrative support than usual and thus nets fewer dollars than expected. Revenues from industrial research partners or government grants and contracts tend to be increasingly directed towards very specific research issues, personnel and processes. In addition to this curtailing and forced shaping of interest-based research, the increased importance of private enterprise research funding has had further negative effects. Blumenthal et al (1997) reported that 20% of surveyed faculty members delayed

publication of at least one study for at least six months to serve proprietary needs. Results that are negative or unfavorable are less likely to be published when research is sponsored by private industry (Stelfox et al, 1998; Friedberg et al, 1999; Bodenheimer, 2000). Both effects are the result of researcher conflict of interest, violate the basic tenets of science and imperil the public trust. Added to the already myriad methods of industry influence in academic medical centres, the general effect is a threat to the integrity of these institutions, the professionals within them, and the medical profession as a whole (Angell, 2000).

The public, and their agents in government, have poorly understood medical schools and academic medical centres, at least partly due to the confused rhetoric put out by these medical centres and the mismatch between the objectives stated by academic medical centres and the observable actions taken. Richard Lamm, former Governor of Colorado writes, “Academic health centres have their place in the health care system, but they are also fiscal black holes into which society can pour endless resources and often get little in return. -----For 12 years as governor of Colorado, I listened to self-serving statements from our medical centre, which did little or nothing about our major health challenges: increasing primary care; expanding coverage to the uninsured; dealing with smoking, alcohol abuse, dietary excesses, and deficits; non-medical drugs; and violence. Their biomedical model had little room for the chronic degenerative diseases that are the predominant health issues of the elderly” (*Science*, 1993:p1497).

In summary, medical schools provide high cost education in circumstances where those high costs are no longer being met. Either costs will have to be reduced or revenue increased to sustain the current structure. All obvious mechanisms to do the latter have been implemented without solving the shortfall. The biggest portion of any education budget is faculty costs. Therefore, reducing faculty costs would be the most effective way to reduce overall costs in medical education. However, any significant change in faculty numbers will require a major change in the structure and function of the medical school. For example, in many North American medical schools the clinical earnings of faculty significantly subsidize the costs of medical education (practice earnings are often pooled and redeployed to satisfy departmental needs including education). This is rationalized in part because the apprenticeship nature of medical training allows faculty significant delegation latitude to students at varying levels of training. Clinical faculty members, for example, are not often seen in the on-call rota. Reducing faculty numbers would, at least, force recalibration of work and reappraisal of the true displacement cost of medical education on a departmental basis. It remains to be seen whether clinicians will continue to be willing to participate in cross-subsidizing departmental practice plans when their personal incomes are squeezed by the paying agencies. Pardes (1997, 2000) argues convincingly that American clinical faculty may not be eager to use clinical revenue to cross subsidize medical education given the likely context of bankruptcies, massive deficits, layoffs and merger dissolutions that will follow the negative balance sheets seen in 60% to 70% of US hospitals (Lewin Group, 2000).

## **2.2. Challenges to Traditional Scope of Practice**

The scope of practice in medicine has expanded exponentially to match the growth in medical capability. New medical sub-disciplines are being invented annually and compete for medical personnel through the creation and funding of residencies and related research programs. Even during the period (1980 to 1995) of substantial increase in the number of medical graduates produced (49% in Canada [*Globe & Mail*, 1999] and 62% in the US [Finocchio et al, 1995]), there was active competition among specialties for new personnel. Medical schools in North America were downsized during the in the latter half of the decade, so the competition has only increased.

One of the side effects of this competition among medical disciplines for personnel has been that some areas of medicine do not attract replacement physicians in sufficient numbers to meet social obligations for service provision. Areas such as pregnancy, delivery and well baby care, foot care for diabetics, geriatric monitoring, primary care in specialized populations (for example, the homeless, the indigent, the home-bound) are perennially short of medical manpower. Health care agencies have recognized the cost of not providing early and preventative care to each of these populations and in the absence of physicians have legitimized alternate providers: midwives, advanced practice nurses, podiatrists and community care workers. This trend is perceived with alarm from within medicine, particularly as evidence accumulates indicating that results obtained by these alternative providers are equal or better than those obtained by physicians (for example, Koch, Pazaki & Campbell, 1992; Mitchell et al, 1993; and Hylka & Beschle, 1995).

What is the appropriate response from medical schools to this erosion in control of practice scope? A number of possible responses would be legitimate measures to meet the social contract: the schools could insure that replacement medical personnel are available in these underserved areas; they could incorporate the training of the alternative providers within the medical school; or they could restructure the training of physicians to cede this practice scope to the other providers and teach appropriate interactions with them. Any of these responses represents a significant change in the medical school structure, values, curricula and operations.

## **2.3. Shifts in the Primary Stakeholders: Physicians**

For the past two decades increasing numbers of women have entered medical training. At present fully half of the physicians under the age of 35 in Canada are female. This gender rebalancing is perceived to have positive effects: the majority (79%) of physicians believe that patients will benefit from the increase in counseling associated with female physicians' practice. Ninety-two percent of female and 72% of male physicians shared that opinion (*Medical Post*, 1998). This expectation appears to be supported in differential patient outcomes. Younger women general practitioners were more effective in lowering the rate of teenage pregnancies in their practices than were male physicians of any age (Hippisley-Cox et al, 2000). This effect was attributed to provision of more effective counseling.

In addition to changing the content of their practices, women are changing the structure of practice as well. Historically women physicians have worked fewer hours per week than their male colleagues (Powers, Parmella & Wisenfelder, 1976; Kehrer, 1976; Heins et al, 1977; Gray, 1980; Bobula, 1980, Day, 1982). This pattern continues: in 1999 women physicians in Canada worked an average of nine hours less each week than did their male counterparts (*Globe & Mail*, 1999). Male physicians in Canada now work an average of 2,426 hours annually (*Globe & Mail*, 1999), one third more than average male earners. Female physicians work 1,970 hours, 43% more than the average for female workers in Canada. Women physicians were also three times more likely than male physicians to work part time (*Globe & Mail*, 1999), a pattern documented by other observers over the past thirty years. This configuration of part-time work and fewer hours has long been attributed to the conflicts women physicians must manage among their competing primary roles of physician, wife and mother (Johnson & Johnson, 1976; Levinson, Tolle & Lewis, 1989 and Cooper, Rout & Faragher, 1989). The effects of these role conflicts continue as well: Woodward, Cohen & Ferrier, (1990) report that becoming a parent had no effect on the practice patterns of male physicians but was associated by a significant reduction of working hours for women physicians. Studying gender roles and family pressure among British physicians Dumelow et al (2000) found that 15% of female physicians as opposed to only 3% of male physicians chose to live single or divorced and childless as a consequence of their careers. Thirty percent of female physicians and 12% of male physicians significantly restricted their work involvement to allow more time for family roles. The majority of physicians (55% of female physicians and 85% of male physicians) try manage both full time careers and family roles.

So, in general the higher percentage of women in medical practice indicates steadily fewer hours of available medical expertise. These effects are not predictably linear however. Partly due to a more generalized desire for better-balanced lifestyles, average total work hours have been dropping or both male and female physicians over the past decades. In fact male physicians have reduced their work hours by a significantly higher percentage than have female physicians (14% versus 2% fewer hours in 1999 [*Globe & Mail*] than in 1969 [Powers, Parmella & Wisenfelder, 1976]). Regardless of the cause, less physician availability has implications for medical manpower planning and will contribute to the substitution rate of other health care professionals in any and all releasable aspects of the medical scope of practice. Demand for more physician services may lead to an increase in medical school entering class size, but the degree of matching financial support will be questionable. Equally likely are other solutions such as increased use of foreign medical graduates and tightly focused training programs to produce physician-like skills in narrow targeted areas.

Also associated with managing their role conflicts, women physicians have tended to practice in hospital settings or in institutional situations with fixed salaries and fixed hours (Wilson, 1979). The higher percentage of women in medical practice, all seeking stability, predictability and controllability in their work life in order to better manage their other roles, has provided willing staff for a range of formerly novel financial

arrangements. Salaried physicians, for example, are essential to the community clinic models in North America.

Female physicians have been less inclined to join medical professional organizations (Relman, 1980). This lack of involvement is at least part of the reason that organized medicine now represents less than 50% of practicing physicians in Canada or in the USA. This reality narrows the points of view available within organized medicine and thus hampers policy formation. Being less representative makes medical organizations less relevant. It also makes organized medicine less powerful in renegotiating the social contract. Individual paying agencies are therefore much more successful in negotiating variances with local physicians irrespective of positions taken by national or regional medical professional associations. Some of the variances currently in place as pilot programs will be adopted more widely as cost saving measures: capitated funding for identified practices; consolidation of sole practitioners into larger groups supported by alternative health care providers.

Lastly, there appears to be a gender difference in how physicians learn (Curry, 1991) when they are given the freedom to choose methods as occurs in continuing medical education. Male and female physicians also have different patterns of cognitive style (Curry, 1991) indicating that rigidly structured learning situations, such as most medical schools, systematically disadvantages one gender or the other most of the time.

In sum, the fact that female physicians will shortly form half of the available medical personnel is a profound pressure for change in medical education, medical professional organization, the structure for delivery of medical care and remuneration for that care.

#### **2.4. Shifts in Secondary Stakeholders: the Public**

A broader base of society is educated, even well educated. A much wider segment of the population has direct and sustained access to what was 'guild' information a generation ago (MacLellan, 1998). Increased information availability has provided interested patient/ clients the access to study symptoms, conditions, treatments and the exotica of risk-benefit studies in significant detail. Patient/ clients are routinely able to seek alternative opinions, medical and otherwise, from across the globe. The Cochrane Collaboration (<http://hiru.mcmaster.ca/cochrane>) has been explicitly established as an international organization to encourage "clinicians and consumers to work together, mainly through the internet, to design, conduct, report, disseminate and criticize systematic reviews in all areas of health care" (Jadad, 1999: p761).

One result of this equalization of access to medical knowledge has been the democratization of medical action & intervention. Citizens now have the access to educate themselves as narrowly or as broadly as they might wish to, and are acting on that knowledge. Insisting on equal status for their own knowledge in their interactions with physicians and with the health care system, citizens are making their own diagnoses and initiating their own treatments. This phenomenon has been noted for some time in over the counter (OTC) remedies, the use of herbs and the use of alternative therapies, all

of which has been enhanced by the race among pharmacies to have a sales presence on the Internet (Zoeller, 1999). Now, however, even prescription drugs are obtainable over the Internet with questionable, if any, medical input (Bloom, 1999; Larkin, 1999; PJ 1999 and 2000). Pharmaceutical firms have responded to this self-diagnosis and self-intervention trend with direct to consumer advertising (Pirisi, 1999; Levy, 1999). *Business & Health* (1998) reports on the success of this direct advertising tactic: eight of ten physicians write a prescription for the requested drug. Furthermore, they state that consumers with drug plans are less likely to accept generic substitutes.

The ‘baby-boomers’ and all subsequent generations have developed relationships to authority differently than did the generations that went before them. People now have less automatic respect for authority figures of all kinds; they are more likely to question and even openly challenge authority. This widely observed change has representation in patient/ client attitude and approach to interaction with their physicians. Patient/ clients now expect, unless they specifically request otherwise, to be primary decision makers in all matters of health care for themselves and their families. This attitude places all health care professionals in consulting roles and requires them to be patient-centered in a much broader way. Patient autonomy now requires responsibility to be taken by providers of care for what the whole health care system has, or has not, delivered and the specific outcomes obtained by each patient/ client, including their degree of satisfaction with the health care system and the outcomes they obtained. Most medical curricula do not currently prepare physicians for that role.

This shift away from deference to health care authority might be expected to produce more patient/ client self-responsibility for health status. But, because patient/ clients are not generally health economists, this self-responsibility is often ill informed and counter-productive. For example, when faced with a low-level health situation (any perceived health crises will go directly to hospital emergency rooms) and a bureaucratized delivery system in a social context that emphasizes choice and convenience, a growing proportion of patient/ clients utilize the ‘quick medicine’ options such as walk-in clinics. This pattern results less continuity of care and forgoes the opportunity to build truly supportive relationships with a health care team of providers. It also costs more, both directly to the patient/ client at the time of use and indirectly to the patient/ client through increased premiums or increased taxes to maintain rest of the health care system. Because there is no central medical record system that follows the client, all tests are repeated, further escalating costs and increasing risk.

We live in an era of assessment and accountability that affects all segments of society. This is a positive development if it leads to increased information flow to inform decision making at all levels, including that of patient/ clients’. If, however, the emphasis on assessment and accountability produces only simplistic data compilation and unreasonable comparisons, then neither the patient/ clients, the health care providers, education systems or society at large has gained anything worth the massive increase in costs involved to collect and analyze ineffective data.

These and other social changes are forcing renegotiation of the social contract held by the profession of medicine with society and with its members. The renegotiation is occurring at the level of individual patient/ client interactions with professionals, student interactions with educators and staff and student or user interaction with administrators. The renegotiation is also occurring at collective levels in the legislative, policy and regulatory processes by which society periodically codifies its values. All of this presents a direct and significant challenge to the structure and function of medical schools and medical education.

### **2.5. Success of New Models for Higher and Professional Education**

Consumer pressure and new technical capabilities are producing other models of higher and professional education that will have significant impact on medical education. In 1997 Traub described the exponential growth of “distance learning” programs offered by a range of organizations, some of which are licensed as higher education institutions. Described as “para-universities” they operate without tenured professors, without campuses and without libraries. They do, however, have students, teachers, classrooms, examinations and degree granting programs. The students are primarily working adults. Teachers are predominantly from practice, not academic or research settings. Courses are compressed in time, are often offered in the evenings or on weekends in convenient sites or over the Internet. Examinations for content knowledge are provided via computer in secure sites allowing authentication. Practical examinations are conducted in dispersed practical settings under the supervision of a practice mentor or examiner. The degrees granted are often not in traditional academic graduate career tracks, but are used to directly advance employment.

Corporations (e.g. Motorola in Tempe, AZ and General Motors in Detroit) establish extensive programs like these to efficiently educate and motivate their own workforce. Others are set up as frankly profit-making institutions (e.g. the University of Phoenix in the US) as non-profit independent institutions (e.g. Athabaska University in Canada, and the Open University in the UK) or as profit making sections of traditional universities. Within each of these ownership models the focus remains on improving practice in some field of applied work. During the 1990’s, a decade that saw the closure of traditional colleges and enrollment erosion in many others, the demand for this alternate model continues to grow exponentially. For-profit degree programs continue to proliferate, although to date they have been self-confined to the areas of commerce and technology (e.g. the new Unexus University’s Executive Masters of Business Administration owned and operated by Learnsoft Corp, announced in the February 18<sup>th</sup> 2000 *Financial Post*). The growth cannot be attributed to lower costs as the cost per credit in these programs ranges from \$500 to \$1000 US for a total of \$15,000 to \$35,000 for a degree. This range is higher than the majority of traditional degree programs in similar content. The advantages that attract increasing numbers of students are the shortened training time, the practical focus, the state of the art equipment and the increased interaction provided by the personalized course structures and the technology that supports those structures.

Informatics capabilities have allowed development of another alternate model with implications for medical education: World Wide Web-based access to information with and without interaction. U.S. high tech billionaire Michael Saylor has recently launched one such model. Saylor will establish a free Internet university to offer “an ‘Ivy League’ education online to anyone in the world at no cost” (Ottawa Citizen, March 16<sup>th</sup> 2000). The model is built upon a cyberlibrary of videotaped lectures to be provided pro bono by thousands of leading educators and great thinkers. The Web would also supply FAQ’s (frequently asked questions) and examinations. While agreeing that the technical capacity exists to support this venture, *Science* (2000) questions the willingness of the invited speakers to participate on a pro bono basis as was initially suggested. Even if some sort of licensing or access fee is required to remunerate lecturers, this model offers learners anywhere the opportunity to learn from the best in the world in any field at any time.

Other more focused Web-based information repositories (see the NetWatch section of any *Science* issue) provide graduated levels of information and links to related repositories and topics. Many of these sources offer a range of additional features including on-line chat rooms and monitored listservs that allow users to query experts and other users. How long can it be until some collection of these information sources and services are organized into sequences similar to the content coverage in medical schools? How long after that will it take for one or more entrepreneurial universities or medical schools to recognize a market opportunity and offer a partnership arrangement exchanging its degree-granting capacity for some share of revenues?

## **2.6. Development of Alternative Models for Medical Education**

The development of alternate models for medical education has historically taken an evolutionary course. Early reform efforts are reviewed in Section 4 below.

More recently the Association of American Medical Colleges (AAMC) sponsored two rounds of self-reflection within the North American medical school community designed to develop new models for medical education. If not entirely new, the models were at least supposed to address some of the noted weaknesses and challenges in the current structure for medical education. The first of these attempts, the ACME-TRI (*Educating Medical Students: Assessing Change in Medical Education—The Road to Implementation*, 1993) was largely judged ineffectual in producing the recommended change in medical schools, although there was widespread support for both the analysis and the resulting recommendations for change. The second effort, the Medical School Objectives Project (MSOP) begun in 1996, took a more descriptive approach by inviting a group of 23 medical schools to develop change processes within their own schools consistent with goals set out by the project. The central goal was to establish medical school curricula based on identified learning objectives and responsive to contemporary issues in medicine (AAMC, 1998a, 1998b, 1999). Each school was asked to document its progress and share information through the change process. It was hoped that these 23 individual case studies would yield insights into “best practices” in curriculum change. Review of the posters presented at the 1998 AAMC session by the 23 participating

schools indicates that the change projects undertaken included only modest aspirations for change and no radical departures from accustomed structures and practice. Most projects are efforts to rationalize current curricula by making the curricula more transparent and more accountable across all local stakeholder groups.

Regan-Smith (1998) advocates a more fundamental approach to needed change in medical education with her strong assertion that educational reform efforts in medical schools have, and will continue to fail due to the deleterious effects of the unacknowledged hypocrisy in the structure of present medical schools. For a range of reasons that do not generally include the quality of medical education, medical schools compete to hire researchers and clinicians as faculty members. These reasons usually revolve around staffing research programs or clinical services. The contribution these faculty members will make to general medical education is assumed, but this is not central to their recruitment and selection. The reward structure continues this clear message for faculty about the relative insignificance of education. Promotions in academic rank, salary, office space, staff support and all other tokens of appreciation are awarded for above average clinical income, peer-recognized research funding and publications. Clinicians and researchers are thus understandably conflicted about the time required to teach. Regan-Smith contends, “time spent providing effective education equals time away from research necessary to maintain their careers” (p. 505) concluding that, “(r)esearch’s stranglehold on medical education reform needs to be broken by separating researchers from medical student teaching and from curriculum decisions” (p. 507). DeAngelis (2000) extends this argument to the conflict that clinical instructors have between taking time to teach versus seeing patients more efficiently themselves which would lead directly to increased income. The alternative supported by Regan-Smith is medical education provided by individuals entirely, or at least primarily, focused on education, not research or clinical service. Adopting the Regan-Smith proposition would mean a redefinition in the “three-legged stool” metaphor (research, education and clinical service) that has been reified within medical education since Flexner (see for example, Carey, Wheby & Reynolds, 1993). The three role expectations would remain valid missions for academic health centres as a whole, and perhaps for faculty members over the course of their careers, but not simultaneously. Research, for example, could receive undivided attention in early career stages when the majority of scientists make their contributions. As this early stage winds down (ideas, staff or funding becomes harder to come by), career attention could move to other forms of scholarship.

There is considerable rhetorical support for a rebalancing of faculty roles in higher education. The Carnegie Foundation for the Advancement of Teaching (Boyer 1990) recommended a broader conception of legitimate faculty erudition. The Boyer Commission outlined five types of scholarship to be equally valued, assessed and rewarded in higher education:

1. the scholarship of discovery;
2. the scholarship of integration;
3. the scholarship of teaching and learning; and
4. the scholarship of practice.

The first and last of these (research and clinical practice) are well known and highly esteemed within the current structure of medical education. Efforts have been made within some academic medical school settings (Jones & Gold, 1998) to create a separate promotion track or specific promotion criteria for clinician-educators. Others (Levinson & Rubenstein, 1999) point out the problems with these clinician-educator promotion tracks: often these are non-tenure tracks and some of the requirements modeled on research faculty are not realistic for clinicians (i.e. national or international reputations, publications in peer-reviewed journals).

The middle two types of scholarship do occur in medical schools, but are not valued as highly, and as a consequence are not well supported relative to the attention and funding apportioned to discovery (research) and practice. The scholarship of integration, which produces a novel synthesis of existing information, is hampered by the traditional disciplinary boundaries in medical schools. Even more rare is any sort of rigorous scholarly synthesis between medical school disciplines and disciplines from the arts and humanities.

The third type of scholarship Boyer identified was the scholarship of teaching and learning, belied by the widely shared misconception that anyone can teach. Rice & Richlin (1993) describe three necessary features as foundations for the scholarship of teaching and learning: synoptic capacity, pedagogical content knowledge and learning theory. Only the second of these dimensions might be assumed in recruiting leading researchers and clinicians as medical school faculty. The Boyer Commission on Educating Undergraduates in the Research Universities (1998) continued the emphasis on re-establishing teaching as a valued role for faculty on par with research in tenure and promotion decisions. However, serious attention to the scholarship of teaching and learning is rare in medical schools where most offices of medical education, if they exist at all, are pressed into primarily service functions such as managing the logistics for curricula and assessment functions.

### **2.7. *The Present and the Promise in Informatics***

The breakthrough increase in human capability represented by the Internet and the World Wide Web (WWW) is an ‘intercept jump’ for higher and continuing education. The original concept of a university as a community of scholars was founded on the technical limitations in accessing learned texts. The texts were hand copied, very expensive to produce and therefore very rare. Usually texts were owned and protected by powerful agents in noble families (e.g. the Medici’s in Rome; the succession of dynastic families in China), governments (e.g. King Alfred’s in Winchester) or the churches (e.g. the cathedral school at Paris). Scholars traveled to seek the patronage of those powerful protectors and access to the texts in exchange for translating, copying or illustrating them, and, incidentally, making their contents useful to their patrons. The students came to study with the scholars and thus the communities of scholarship grew up in a few places centered on the existence of learned works. The Oriental traditions were similar, eventually establishing a mandarin class that served the local power base and controlled access to highly prized, manually produced, written information sources. Only those few

individuals chosen to enter these communities of scholars could expect to have access to the texts. Accessing texts from another community of scholars required traveling to their physical location and meeting conditions imposed to join their community.

In contrast, the Web supports access by anyone to the learned works: ancient, modern and everything in between. There is no test of bone fides prior to granting access to this information; all information is available to anyone, at any time, anywhere in the world. Part of the educational appeal of Web supported information is the accessibility during 'teachable moments' when the learner is aware of the need or desires to learn something. Content is available by individuals or small groups as might occur in on the job problem solving.

Faculties in traditional higher education have opposed incorporation of these electronic access methods. At the University of Washington in Seattle, over 900 professors signed a protest letter to the governor and the faculty at York University in Canada went on strike over the use of on-line courses or components (*Science*, 1998). Difficulties with incorporating these electronic methods are almost gleefully well documented by faculty (Cravener, 1999). Faculty have attempted to create guidelines (*Science*, 2000) for these new education models which are noteworthy only in the likely futile attempt to preserve the hegemony of the faculty member as the arbiter of content and the university as the controller of access.

There is a proposal in development by a partnership of the Open University in the UK with at least eight existing traditional medical schools to create a distance learning medical school (Southgate & Grant, 2000). Plans at this time are for the first two years of medical training to be offered via distance methods to students distributed across the country. The students will be organized and supported by local health service facilities (district health councils, general practices and other community facilities), which will also be the source of clinical faculty. Students will move among the localities during the course of their training to experience practice in different settings. Curricular content will be derived from a matrix of the health needs of the UK population (General Medical Council, 1997) and a range of common and important clinical problems. Strong central management is planned, responsible for the educational function (quality control, assessment, staff development and support), the clinical components and the research function. Assessment is envisioned to both show progress toward, and achievement of, competence standards. Maastricht-like computer-based progress tests are suggested. Local staff will do in-training assessment of clinical skill. Observed long cases and structured clinical examinations will occur before the end of the training period to assure that all learners have reached standards necessary for beginning clinical practice. Guided expansion of an assessable personal portfolio will assure development of professional attitudes and professional skills beyond the clinical.

This UK experiment is a timely response to opportunities for large-scale change in medical education. The demand for informatics supported medical education is well articulated (Bacon, 1999), the models exist (Berge & Collins, 1995; McCormach & Jones, 1998), they are well developed, well supported by learner demand in other areas of

higher education and sufficiently efficacious to be promulgated by corporate structures dependent on constantly improving workplace knowledge and skills. There is nothing particular about the content of medical knowledge that makes it immune to transmission by these methods (Hersh, 1999; Barnes, 1998). Pruitt, Underwood & Surver (2000) in collaboration with the National Science Foundation have produced a higher education level biology course that combines text, CD-Rom and Web-based technologies to enable both personalized courses of study with immediate access to the most current information. Continuing medical education has begun experimenting with these technologies (Dillon, 1996). Chan, LeClair & Kaczorowski (1999) have managed interactive PBL formats through the Internet for continuing medical education. As with other innovations in medicine, the use of Web capabilities in medical practice will force their adoption in medical education. Goldstein (2000) suggests that 90% of emergency room visits could become unnecessary with online triage using Internet telephony and interactively linked Web cameras.

### **3. Why Educators should learn to Manage Large-Scale Change**

It is widely reported, and generally believed, that all change in human institutions is incremental. In a seminal essay Lindblom (1959) offered the following explanation for this phenomenon: the reality of policy makers (and by extension academic administrators) is characterized by limited information about present conditions and results, restricted information on available alternatives and their consequences, perceived limitations on possible courses of action and limited support for change. In this context the decision maker “muddles through” successive constrained comparisons between alternatives which are already “familiar from past controversies” (p79). Decisions are made using past experience to predict consequences; therefore similar decisions continue to be made. Little change is ever ventured, and if forced, is approached in small enough steps to allow past practice to be reflected in expected results.

Even within evolutionary change it is useful to distinguish two varieties of change: operational and strategic (Bryson, 1988, 1995). Changes are more operational if they must occur immediately, have impact only within a section of the organization, involve relatively small fiscal risks (10% of organizational budget or less), require few and obvious strategies for resolution, can be managed by lower level administrators, are not politically charged and have few negative consequences if not addressed.

In contrast, a strategic or large-scale change will significantly impact the organization and all related organizations over a multiple year timeframe. Large-scale change is highly politicized, carries significant financial risk (more than 25% of organizational budget), has no immediately clear resolution strategies and, if not addressed adequately, will result in major, long-term, negative organizational results or organizational dissolution.

No change from status quo is easy. Implementing incremental change in medical schools to accomplish the enhancements outlined elsewhere in this volume will require

significant effort within the current structures of medical schools and academic health centers. What if that basic structure has to change? What if the current global struggle to contain burgeoning health care costs result in a severance in the relationship between medical schools and university-based tertiary care academic medical centers? What if the development of the Internet and digitization make medical school classes, even laboratories, comparatively too slow, too expensive, too unresponsive and ultimately redundant? These challenges are large-scale; the type of change addressed in this chapter.

Managing the future of medical education by “muddling through” is no longer acceptable. As medical educators we should model the behavior we teach as preferable in students and practitioners. We describe the ‘reflective practitioner’ as the ideal result of medical schooling; one that reflects on less than satisfactory outcomes, searches for additional information, consciously adjusts approach and monitors results until satisfactory outcomes are obtained. Such an approach could be effectively applied to large-scale change in medical competence definition, inculcation and assessment throughout medical careers. Radically new social expectations for physicians have been documented for at least a decade (Neufeld, 1993; The Hastings Centre, 1996; General Medical Council, 1996; AAMC, 1998c and Anderson, 1999). The significant change in social needs, market opportunities and working conditions for medical graduates should be reflected in their education and training.

If medical education refuses to, or is unsuccessful in managing the large-scale change required by the forces outlined here, then the profession of medicine will lose control of the education structure. The medical profession has already lost control of the medical information base: as of January 2000 there were between 10,000 and 15,000 health related Internet sites (Jupiter Communications, 2000). Reputable institutions and organizations that attest to the accuracy of the provided information by associating access with their own reputations host a growing proportion of these sites. Much like the discipline-based committees in medical schools, information specialists (formerly librarians) are issuing guidelines to assist the public in evaluating health information obtained on the Internet and elsewhere (Murray, 1998). Social conditions and informatics capabilities will continue to evolve affecting medical education as has already occurred in other areas of higher education. Even the practicum period can be out-sourced to a series of appropriate sites and appropriate supervisors. The only legitimate role remaining for the medical profession to meet its social obligations would be in organizing, justifying and operating an examination system to assure competence to practice. The profession would no longer control who presented themselves for examination, nor how their education was achieved. However, by controlling the examination content and process, the practice standard to be demonstrated prior to certification could remain the purview solely of the profession. At least that part of the social contract could be preserved. But this attenuation of medical education need not occur. Medical education leaders could effect significant change across the system that would adequately respond to the forces requiring adjustment in medical education. Leadership and astute change management could reconcile inert conservative and the unbridled radical elements into reasonable reform that both could support, and that could

support medicine social contract. To be successful, however, medical education leaders must become much more successful as change agents than they have been in the past.

#### **4. What can we learn from past reform failures?**

The Flexner model was a fundamental shift for medical education. But even there, only selected aspects of the model were successfully implemented. Flexner's recommendations about integrating basic and clinical sciences, active learning in favor of lectures, and emphasis on problem-solving and critical thinking over memorization were not implemented. These shortcomings were noted at the time (Enarson & Burg, 1992) but not corrected until those elements reappeared in the slow adoption of PBL organized curricula.

The next effort at significant structural change was the Case Western Reserve curriculum of the 1950's. This was an attempt to integrate basic and clinical sciences and introduce the behavioral sciences in the service of medicine. A few medical schools adopted these concepts, but not many and not centrally (Funkenstein, 1971). The reductionist, rational, science focus remained central to the self-definition of medicine and medical schools.

Medical schools were affected only slightly by the social upheavals of the 1960's. Again the 'social ecology' or 'humanist' approaches to medicine were suggested for inclusion in medical school curricula (Pellegrino, 1978). Again, a few medical schools experimented with implementation (Beer-Sheva, Maastricht, McMaster, Michigan State, New Mexico) but no large-scale change occurred in medical education.

These debates and isolated change experiences were eventually reflected in a much-referenced series of reports on the need for paradigmatic change in medical education. These included:

- *Future Directions for Medical Education*, (1982)
- *The New Biology and Medical Education: merging the biological, information and cognitive sciences*. (Friedman & Purcell, 1983)
- *Physicians for the 21<sup>st</sup> Century*, (1984)
- *Adapting Clinical Medical Education to the Needs of Today and Tomorrow*, (1988)

The reports outlined a number of environmental changes impinging on medical education; all of which have grown stronger and more influential with time: exponential growth in the science base of medical knowledge; increasing importance of computer assisted information management in health care, increasingly informed public and increasing demands for patient/ client-oriented care.

During this same period academic leaders exhorted the community to evolve (Jonas, 1984; Roddie, 1986; Bussigel et al, 1986, Weldon, 1986; Light, 1988; Cantor et al, 1991) but provided little guidance on direction or method. Reform was attempted without result

in various ways around the world. For example, Mårtensson described innovations attempted at the Karolinska Institute as “modest, but what has been achieved positively is a climate increasingly in favour of change” (1989: p17). Cuban (1997) documented 80 years of attempted change from 1908 to 1990 without significant reform at the Stanford University School of Medicine.

At the close of that decade Bloom (1988, 1989) published a review of the various attempted curricular reforms in medical education to that date. He concluded that the educational reforms were doomed to fail for two structural reasons:

- (1) the positive results from reform of medical school curriculum in the first years is quickly erased and made pointless by the “brutalizing” effect (quoting Mizrahi, 1986) of hospital-based clinical education, thus nullifying any net change achieved; and
- (2) because research, not education, was the central mission of medical schools.

The structure and demands of the research enterprise in medical schools at the time Bloom was writing, and even more so today, demands full-time attention and commitment to remain sufficiently competitive to attract outside funding at the scale necessary to support the large laboratories, large research staffs and expensive machinery required for cutting-edge science. Bloom quotes personal correspondence from Stevens (1988), “medical education has become a minor activity of the American medical school. One could take the view that medical schools need medical students, not so much to teach them but to give the entire apparatus of the school a justification for being”. Ten years later in 1998 Regan-Smith came to the same conclusions.

Our history as ineffectual managers of change is not reassuring about our abilities to shape the needed change given the mounting pressures on medical education. Is there an alternative to “muddling through” other than the ever-popular position with head in the sand, avoiding all responsibility, and focusing on reactive strategies to minimize personal inconvenience? There is, if we take a proactive position toward change in medical education and actively employ our training as clinicians and as researchers to the study and application of the accumulated knowledge about change management. As in clinical practice and research, we need to be familiar with both the relevant theory and results in practice. The next section categorizes and reviews current change theories illustrated by examples from medical education.

## **5. Management of Change Models**

A great deal has been written about change management. The literature varies in tone, scope and scientific rigor because well known contributors come from such varied backgrounds: academia (e.g. Rosabeth Kanter, 1988), for-profit policy consultants (e.g. Osborne & Gaebler, 1993); human resource consultants (i.e. Smye, 1993) and front-line managers (e.g. Andrews et al, 1994). Viewed as a mass the literature on change management is a contradictory morass of exhortive prose with only occasional attempts at evaluation or validation of claims made. Epistemological evidence in this field comes

from reported case studies, some merely anecdotes. Still, there is value in understanding the range, assumptions and potential of the different approaches to managing change.

Mintzberg, Ahlstrand & Lampel (1998) produced an integrated compilation and critique of planned change models (labels have been altered here to improve recognition at the cost of de-emphasizing parallels between them). The first three are described as prescriptive, focused on how change should occur rather than how it actually happens. The last six have been derived from descriptions of how change actually occurs.

### **5.1. The SWOT Analysis**

Selznick (1957), Chandler (1962) and Andrews (1987), developed the SWOT analysis (strengths, weaknesses, opportunities, threats) to guide change processes. The theory guides data collection and displays the results in a 2X2 grid (strengths and weaknesses crossed with opportunities and threats). Changes likely to be effective are indicated by the intersections of measured strengths and perceived opportunities. This approach assumes that each analysis will be exclusive to its setting and time; each change process is considered as unique. Little or nothing will therefore be applicable from a SWOT analysis performed in one medical center to any other medical center. The principle criticisms of this approach are the assumptions of certainty about the data, the analysis and the stability of the operating environment.

The curricular reform at the University of Michigan medical school (Davis & White, 1993) and the larger changes at Emory University medical center (Saxton et al, 2000) both involved a formal SWOT analysis in the early stages.

### **5.2. The Planning Approach**

This model builds on SWOT analyses by developing detailed implementation plans as a response to SWOT conclusions (Ansoff, 1965; Steiner, 1979; Lorange, 1980). These plans are carefully detailed in increasing levels of specification: goals, objectives, budgets, action items, timelines and feedback loops to monitor progress. In full implementation this model requires full time planners quite separate from those responsible for the work of the organization. This is also one of the principle weaknesses: the division between planning and operations. A second significant limitation is the rigidity that sets in with detailed change specifications. The carefully constructed road map may quickly become irrelevant to actual evolution in needs and opportunities.

Many academic health centers in North America were structured along this model with fulltime planners during the past years when funding was more plentiful (Andrews, 1994).

### **5.3. *The Analysis of Position***

Following detailed analysis of military and marketplace descriptions, this approach posits a fixed number of generic change strategies to be selected from to suit any organizational situation. Selection of appropriate strategies is viewed as a deductive process based on an analysis of the “competitive position” of the organization. This group of theories presumes that organizational environments are generic, or at least sufficiently similar to allow strategies perceived to be successful in one situation to be applied in other situations judged to be analogous. Michael Porter (1980) became a well-known proponent of this approach to change management when the governments of Poland and Russia engaged him to advise on their large-scale change to market economies. The orientation of this model is towards economic and territorial goals and does not account well for other social or political objectives such as education, group cohesion or population health.

Medical schools and academic health centers that perceive their context as a zero-sum competitive marketplace are using this type of change theory. The suggestions outlined by Griner & Danoff (2000) for reform in academic health centers derive from positional analysis.

### **5.4. *Entrepreneurial Management***

This model focuses change strategy on the leader and his or her ‘vision’. Vision is defined as a personal construct within the leader based on their intuition, judgment, wisdom, experience and insight. Leaders develop or change their vision through the three-stage process (unfreeze, change, refreeze) described by Lewin (1951). Drucker (1970), Collins & Moore (1970) and Bennis & Namus (1985) have all written descriptions of this change management type. Specific change plans are not articulated in this model, leaving the details vague to be adapted by the leader on the fly in the course of moving the organization in the direction of the vision.

Charismatic leaders are more successful with this change management approach because this model requires the leader to inspire others to implement his or her vision. This model is most successful in organizations with simple power structures, such as a single owner (e.g. Richard Branson’s Virgin companies), a startup organization (e.g. McMaster medical school) or effectively leaderless due to considerable turmoil (e.g. Apple Computer immediately prior to the second reign of Steve Jobs). The strength of this model is also its greatest weakness: the dependence on the visionary leader. Others within the organization may resent such dependence and such concentration of power. Furthermore, visionaries are often particular to specific situations, i.e. specific industries, specific time periods, specific personal contexts. When the situational variables change, the vision, the entrepreneurial change style, and the leader him/herself may be inappropriate.

Giardino et al (1994) describe a change process in clinical skills assessment and evaluation from this perspective and advocate this approach for other reforms in medical education. Aspects of the curricular change at Sherbrooke medical school (Des

Marchais, 1992), particularly the initiation, were clearly entrepreneurial change strategies.

### **5.5. Applications of Cognitive Science**

Well described by Makridakis (1990) and by Huff (1990), this group of change management theories explains how change makers reason through the choices they make. Knowing how choices are made, assert these theorists, better informs future choices and avoids pitfalls in thinking. Cognitive theory is employed in analyzing how people reason (e.g. biases in the use of analogies and metaphors that can distort decision-making), the effect of biasing action (e.g. articulating a plan tends to bind the speaker to that plan) and biases due to cognitive style. Although there are many measures of cognitive style available (Curry, 1999), one of the most widely used is the Myers-Briggs instrument (Myers, 1962).

Other writers in this type of change analysis examine change agent information processing as individuals or in groups within an organization undergoing change. Following Simon's (1957) and March & Simon's (1958) theories of cognitive psychology applied to information processing within organizations, these analyses are justified by a belief that specific, knowable mental structures (also referred to as frames, schema, concepts, scripts, mental models or causal maps) organize and process information. Knowledge and use of these mental structures provide predictability to decision makers forced to operate in the real world with less than perfect information. This cognitive science model is faulted primarily because so far it is only descriptive, providing little prescriptive assistance to change agents.

Harris' (1993) descriptions of the deliberative curriculum inquiry process applied to support reform in medical education curricula illustrate the cognitive science approach to change management. Gruppen (1997) advocates for reform in ambulatory care education following cognitive science concepts.

### **5.6. Applying Learning Theory**

This model enjoyed much attention in the popular press (Senge, 1990) as well as in the academic press (Argyris, 1991) during the 1990's. The central ideas, however, can be traced to Lindblom (1959) who described policymaking in government as a set of incremental and fragmented decision/ reaction/ learning steps. The Tuckman (1965) stages of group development (forming, storming, norming, performing) are stages in group learning. Quinn (1980) described a reason for incremental change, and then codified this logic into prescriptions for rational incrementalism based on stages of learning (Quinn, 1982). Nonaka & Takeuchi (1995) emphasized the importance of converting tacit knowledge into explicit knowledge within individuals, work groups and the organization as a whole to enable the acquisition, creation, accumulation and exploitation of knowledge. Argyris & Schön (1974, 1978) distinguished single loop organizational learning (learned improvement in an action, response or intervention) and double-loop learning (change in both the underlying construct or variable and the

associated response or action). Dick & Dalman (1990) outlined an 'information chain' to describe the relationship among organizational learning and action stages, and recently extended the theory to include actions in planned change (Dick, 1996).

The learning approach to change is criticized because it may seem expensive and inefficient: it looks like trial and error, which is not usually perceived as quality management. Because it is impossible to predict which learning strategy might be effective in producing change, many are started at the same time, observed, evaluated, learned about and modified. All this takes participants' time and organizational resources. Much of the organizational learning process will be confusing to participants, destabilizing to the organization and frustrating to those in leadership positions because the learning has to occur before the change can begin. However, the learning approach is well suited to professional organizations operating in complex environments with diffuse power bases and ill-formed problems. In these circumstances change management often defaults to a process of collective learning by trial and error because there is no central authority to impose an analysis, a vision or an alternate change strategy.

Boverie & Blackwell (1993) describe use of the Tuchman model to assist faculty through an organizational change. Both the ACME-TRI (1993) and the MSOP (AAMC, 1999) projects of the American Association of Medical Schools were learning theory based change efforts.

### **5.7. Political Power Techniques**

Change formation in this model is shaped by power and politics both inside an organization and between an organization and its external environment (Macmillan, 1978). Change is managed inside the organization through political processes such as persuasion, bargaining and, occasionally direct confrontation among parochial interests and shifting coalitions. Change is managed across organizations by controlling, co-opting or cooperating with other organizations (Baldrige, 1975). This is accomplished through strategic maneuvering and political collectivizing strategies such as forming networks and alliances.

Political approaches to change are notable in periods of significant power restructuring and in situations, such as universities and professional organizations, composed of complex, highly decentralized experts with essentially equal power and strong vested interests. The principle critique of the power approach is that it tends to ignore the content of arguments and the integrating effects of learning and leadership.

The model developed by Gale & Grant (1997) for the Leverhulme Trust and published as an AMEE Medical Education Guide is an illustration of the power approach to change management. The external, formative evaluations as part of the change process at Sherbrooke medical school (Des Marchais & Bordage, 1998) was a deployment of political power technique in change management. They used carefully selected and briefed prestigious outsiders as evaluators to focus faculty preparations and participation. The status of the evaluators also gave extra weight to their recommendations. The story

of Harvard Medical School's effort to modify its curriculum (Tosteson, Adelstein & Carver, 1994) is an example of applied political power in the service of change. The complete lack of, or unsuccessfully applied, political power techniques clearly contributed to the failed curricular reform at Otago, New Zealand (Schwartz, Heath and Egan, 1994).

### **5.8. *The Cultural Analysis***

This group of theories focuses on the attributes of organizational culture that preserve organizational stability and success. Culture is defined as those features shared by members. Critical cultural features are usually values, beliefs, traditions, habits, stories, and symbols, which might include buildings, titles and products. These same cultural features can actively resist change and render an organization impermeable to even evolutionary adaptation. Cultures are generally stable, closely tied to individual identities and therefore extremely hard to change. These cultural analyses are more often used to explain why organizational cultures vary in terms of imperviousness to particular changes or change in general. A large number of these cultural change analyses were documented by Norwegian scholars (e.g. Rhenman, 1973 and Normann, 1977) but the method was eventually popularized in the 1980's by the comparative analyses of Japanese and American corporate cultures (Deming, 1986).

Mennin & Kaufman (1989) present a cultural analysis of barriers to change in medical education. Schwartz, Heath and Egan (1994) identified mostly cultural factors in their analysis of the failed curricular reform at Otago, New Zealand.

### **5.9. *The Environmental Imperative***

There are some approaches to change that view the organization as essentially passive, with only reactive options in response to events that occur in the organizational context. Context features such as stability, complexity, market diversity and hostility are analyzed to inform choice of appropriate responses and/ or appropriate leaders (Miller, 1979, 1988).

As an aid to building commitment to change Harris (1993) calls for a series of descriptive studies of the effects on the immediate economic, political, social and cultural environment of medical school's curricula. Schwartz, Heath and Egan (1994) attribute one source of their failed curricular reform to environmental instability.

### **5.10. *Combined Approaches***

A logical conclusion to any review of change management theories is to recommend a combination approach. Both the organization and its context should be analyzed and that information used to suggest transformations necessary to achieve desired results. Organizations should be viewed as stable and in equilibrium with their environment for periods of time until something changes in the organization or the environment that requires the organization to reconfigure. This process of 'renewal' requires guidance to

be efficient and should utilize any of the techniques listed above, as they are appropriate to the situation (Dickhout, Denham & Blackwell, 1995). The challenge then is to match technique to circumstance (Beatty & Ulrich, 1991). Functional overall change strategies must support initiation from anywhere in the organization: from the bottom, or middle (Beer, Eisenstat & Spector, 1990) or from the top down (Kotter, 1995). Combined approaches offer more likelihood of sustained change than any one method.

There has been some use made of combined strategy change management in medical education. Mårtenson (1989) indicates awareness of, but did not deploy a range of techniques in his description of a modest change in an established medical school, the Karolinska Institute in Sweden. He suggested the following as necessary elements of change strategy in medical schools: analysis of the external environment, analysis of the internal culture, detailed planning as well as application of the basics in power manipulation. Shahabudin & Safiah (1991) report use of political power techniques and applications of learning theory in the institutionalization process for a curriculum change at the Universiti Kebangsaan in Malaysia. The Sherbrooke School of Medicine conversion to PBL was primarily an entrepreneurial driven exercise (Des Marchais et al, 1992; Des Marchais, 1996), but had recourse to a range of political power techniques at a few key points in implementation (Des Marchais & Bordage, 1998). The case study of curriculum change at Michigan Medical School (Davis and White, 1993, see also the chapter in this volume by these same authors) outlines use of SWOT analysis, planning, and the deployment of political power to implement changes. Reflecting on the evidence as compiled across eight American medical schools, Lindberg (1998) describes a preferred change process that begins with entrepreneurial management (primacy of vision), then utilizes the learning approach, and includes elements from the political power approach. Reviewing the same schools, Kaufman (1998) describes preferred leadership in terms of the entrepreneurial and political power approaches. Saxton et al (2000) followed a classic SWOT analysis with an intensive planning effort and reported use of a range of political power techniques to alter member behavior in planned directions.

Evidently then, change agents in medical education have had difficulty sorting among all the change theorists and consciously choosing strands from across the theories as required in their circumstances. A method is required that provides change agents and decision-makers with sufficient distance from the situation to allow awareness, reflection, generation and weighing of alternatives, testing alternatives in the context, renegotiating of alternatives, and re-testing. If this cycle is repeated sufficiently the eventual decision-making and implementation becomes a great deal easier, because it will be a simple ratification of change so much experimented with as to be considered already in place. Yet, the ideal process must have enough forward momentum to avoid being filibustered or mired in endless inconclusive trials and pilot projects.

A process that meets these specifications has been developed and tested in large-scale change projects (Curry, 1998). Facilitated deliberative inquiry (FDI) presents a real alternative to the “muddling through” approach by requiring both articulation and confirmation of central values and objectives, and their relative weightings, across key

stakeholders. The method also requires generation of a range of alternative solutions or directions, and then provides guidance on process to match up alternatives with weighted values and objectives. FDI can also be used to match specific problems or challenges with techniques chosen from among the change management models.

## 6. Conclusions

The world in which professionals practice, and especially the ‘helping professions’, has changed radically within one generation. In response, we as educators of the professions have a range of responsibilities: to current and future generations of professionals and to society at large. First of all to the next generation of professionals we must fairly represent the context into which they must fit as practitioners. What do they actually need to know, to be able to do and what attitudes are appropriate (requisite K, S & A). We must develop efficient and effective curricula to inculcate this needed K, S & A, and assessment structures that assure these capabilities exist at the point of entrance to practice. Our analysis of needed K, S & A, the curricula, the assessments and the organizational structure that delivers all this must address the forces presently distorting medical education. The current dissatisfaction with medical schools will be diminished when a new equilibrium is reached regarding the medical scope of practice issues, the changed physician workforce and the altered social forces. These solutions will doubtless involve informatics capabilities in a significant way and will likely incorporate at least some aspects of the newer models for higher and professional education.

To the current generation of practitioners we must fairly represent the context into which they must fit as practitioners and how that has changed from what they are used to and were trained for. We must develop curricula effectively designed for practitioners (individuated, accessible, dispersed across time and location) to inculcate this needed K, S & A, and the change adaptation process. We must create assessment structures that allow the individual practitioner, his or her professional bodies, and the licensing bodies to be assured that these changed competencies have been achieved.

To society we own a duty to study and articulate changes in the social contract the profession has with society and to take responsibility to initiate change in all educational structures that bear on that changed contract. This will include systems of curricula, assessment, credentialing and licensing as well as the organizational structure of medical schools, practical training and continuing education.

Taking any one of these responsibilities seriously requires significant change in the present organization, structure and content of medical education. So medical education leaders must be in the change management business. To be effective we must avoid ‘bandwagon thinking’ and mindless hopeful adoption of changes initiated elsewhere. The objective of useful change management must not be to recommend, or facilitate any particular change. A more appropriate enduring solution is to build “flexible organizations responsive to environments, organizations with reserves of

expertise and resources to sustain long-range problem solving.----(W)e must be in the business of creating organizations with built-in capacities for assessing needs and creating viable alternatives” (Baldrige & Deal, 1975:7). This chapter has reviewed a number of approaches to large-scale change that have at least some history of application in the professions. Facilitated Deliberative Inquiry (FDI) is a combined approach that guides coordinated identification and use of selected change management theories and techniques. Having used the FDI approach as a consultant to change processes over the past decade I can attest to its utility.

Bottom line:

1. Regardless of what you are told, the reason for change avoidance is never about money. Amazing things can happen when people want to change something. Lack of money won't stop it; a little extra money makes it a lot easier; too much money acts as a distraction.
2. Get help. Don't try to change the world by yourself. Some of your help will come from inside the organization, but a lot more is available. Learn how to use consultants effectively, and find one you can trust to be there personally, and for the long haul if needed.
3. Change is a marathon, not a sprint. Take care of yourself. Know the source of your energy, your spirit. Take pains to constantly renew the supply. Protect and nourish those sources.
4. Regardless of how dark it seems on occasion: have courage, faith in your abilities, and persevere. The sun will rise again tomorrow.

## **8. Areas Needing Further Research**

Most of the evidence supporting change management theories, including the FDI method, is anecdotal. It would be useful if change managers would be more conscious of their choice and application of any selected change theory or technique. They should more carefully monitor and describe implementation to note deviations or necessary modifications and results obtained over time. This research design could involve an ongoing change process archivist/ historian/ anthropologist to compile a detailed description of events including the reflective mental processing of participants. This effort would be aided by increased use of process assessment through the course of the change intervention to monitor the evolution in components, understandings, goals, methods and behavior.

## 9. Appendix 1: Check-List for Change Agents

1. Be very sure you need to implement a large-scale change.
  - 1.1. Seriously tackle the question of why something needs to change. What is the real problem you are addressing? What are the root causes of that problem?
  - 1.2. What else could be done to address those issues inside the current structure?
  - 1.3. Check to see if this sense of needed change is a shared perception. Who is committed to it? Who will help? Who opposes?
  - 1.4. Know that undertaking any large-scale change will focus the organization on internal matters almost exclusively, which may be counterproductive or dangerous for the organization.
  
2. Move quickly from a shared sense of need for change to concrete description of possible futures.
  - 2.1. Define change objectives in terms of the already accepted mission.
  - 2.2. Set up reflection and deliberation about the mission of the faculty, the school, and the profession. Make this more than a rhetorical exercise.
  - 2.3. Facilitate articulation and public sharing of beliefs and values.
  - 2.4. Structure the change process to mirror these virtues.
  - 2.5. Induce reflection on the relation of the organization's structure and operations with the above avowed values and beliefs.
  - 2.6. Actively work on "imagine the institution otherwise". This is the 'change story'.
  - 2.7. Make these alternate visions concrete. What would be necessary to have each one be actual? All alternative structures under consideration must rapidly become tangible, at least in description, so that people can see the potential 'workability' of the innovation and their exact place in it. Changes implied for vertical hierarchies and horizontal support structures must be made clear. In each possible new scenario: How will individuals and groups make decisions, sustain and continue the change desired, interact with each other and with learners? How will accountability work for individuals, for work products and for results? What support systems will be necessary? What has to change in skill building, performance management systems, and information systems?
  - 2.8. Design the innovation to be implemented. The change must be do-able with available resources and without performance trade-offs in critical indicators.
  
3. Broadly define the 'community' of involved stakeholders.
  - 3.1. More than faculty and students are involved in any significant change.
  - 3.2. Views from interested and affected 'outsiders' crucial to the institution are also critical to real innovation.
  
4. Negotiate for sufficient political support. Structure to protect that support.
  - 4.1. At least one powerful patron (i.e. the Deans) must be involved.
    - 4.1.1. The target change must also be part of the patron's personal agenda.

- 4.1.2. This support of a powerful patron must be visible, and periodically renewed in public for all to see.
  - 4.1.3. The patron must be protected:
    - 4.1.3.1. Use a structure that allows the power players (the Dean, the Provost, the President) some distance from the specifics of the changes tried.
    - 4.1.3.2. Hire or designate a ‘change leader’ who will provide ‘day to day’ direct leadership. This individual must have delegated authority to match this responsibility.
    - 4.1.3.3. While continuity is comforting to all involved, the change leader can be changed if he/she proves inept or a poor skill match to requirements.
  - 4.2. Consider cloning your leadership and patrons. The Dean job now has evolved to at least four roles: cheerleader, resource hunter & gatherer, political godfathering, and three types of academic leader (discipline side, research side, and care provision side). Excellent performances in all these roles will be necessary to initiate, sustain and complete any significant change. Some role sharing with other individuals may be helpful both to the incumbent and to the change process.
5. Build the ‘critical mass’ for change. Supportive critical mass is needed in each important stakeholder group: students at each level, basic science faculty, clinical faculty, researchers, administrators, employers, practitioners and funders. The identification and co-optation of an opinion-leader in each target constituency is critical to building critical mass.
- 5.1. If these opinion leaders are not immediately obvious by observing the behavior of the constituency then conduct a cultural analysis to identify them. Note that there is an important difference between an opinion leader and an elected or appointed leader.
  - 5.2. Once identified develop these opinion leaders into “change team leaders”. If the opinion leader is unwilling, develop one of his/ her ‘lieutenants’ (that is one effective way to bring the opinion leader around to supporting the change).
    - 5.2.1. A change team leader should be personally fully committed to the change and the change process
    - 5.2.2. A change team leader must dependably defend and advocate for the change and the change process
  - 5.3. Negotiate some extra money to pay for this new role on an ongoing basis as long as needed.
  - 5.4. Structure to hear from and get information to all stakeholder groups
    - 5.4.1. This can be accomplished through the FDI process.
    - 5.4.2. With, or more importantly without, the FDI ‘roll-out’ process, invest in and implement a strong two-way communications plan. This might involve newsletters, blast e-mail, telephone trees, town hall meetings, frequent sessions with each stakeholder group or constituency, regular attendance at public events (i.e. lunch in the cafeteria routinely at the same time and same location; all talk to be about the change process and content)

6. Develop internal expertise in necessary areas (capacity building)
  - 6.1. Develop & operate an effective/ efficient secretariat function to regularly “capture the story” and make that available for reflection.
  - 6.2. Use consultants to bring in expertise as needed, but
  - 6.3. Make sure the consulting contract is constructed around capacity transfer, not dependence
  - 6.4. Use consultants catalytically. A good consultant can help analyze problems, develop new solutions, and bring in new information, new ideas, and different points of view. They can help working groups and communities develop the K, S &A and the confidence to try new approaches. An experienced consultant can coach leaders (change leaders and their patrons) on how to structure for and support change. Consultants are useful to have a shoulder to cry on in the tough patches and as a scapegoat to fire if blood sacrifice is required.
  - 6.5. Steal ideas with impunity. First investigate thoroughly the up and downsides of any promising idea. Find out what worked and didn't; what they wish they had done; what they learned. If it still looks good, ask the originator for support in importing the idea to your situation. Most people are thrilled to be considered a model.
  
7. Establish a reward system to recognize individual investment in change.
  - 7.1. Be creative here. Not all rewards are very expensive.
  - 7.2. Negotiate interim or experimental, time-limited change in the promotion and tenure process and criteria in order to use these promotions as part of the change process and reward system.
  - 7.3. Use extra bonus money to carefully reward needed behaviour change.
  - 7.4. Find opportunities to present workshops or presentations on your change process, goals and accomplishments. Use these paid trips outside the school to reward needed behavior and to co-opt opinion leaders. The effects are particularly spectacular if the trip is international.
  - 7.5. Acknowledge the people behind the behavior, helpful or not. Thank people publicly and privately. Remember birthdays. Write ‘Thank-you’ notes often. Celebrate success: small steps as well as big wins.
  
8. Manage the fear and despair
  - 8.1. No one should delude himself or herself that logic and well-reasoned argument will make the change acceptable or get it implemented.
  - 8.2. Even if dysfunctional, people are attached to their current systems. The existing processes, procedures, mechanisms are all well known and well aligned with existing power structures.
  - 8.3. Any serious proposal to make a noticeable difference in any aspect of the existing structure will be greeted with suspicion, hostility and defensive aggression.
  - 8.4. Some of this will be personalized into attacks on you as the individual with the temerity to bring up the new ideas. Your credentials will be attacked. Your

- credibility will be attacked. Your sanity will be attacked! No wonder the transfer problem is so tough! No wonder most of us give up most of the time.
- 8.5. All this negativity is a result of fear and despair that must be actively managed to allow change development, testing and implementation.
    - 8.5.1. An important component in the management of fear and despair is to support, teach, and coach faculty, administration and other stakeholders (including students) in the practical skills and techniques involved in large-scale change.
    - 8.5.2. A second antidote to fear and despair is having in place the structures (i.e. FDI & a communications plan) that allow all players to have input at all times. Fear is diminished if participants and constituencies have an ongoing and dependable way to revise/ reconsider/ revamp each piece of the change until the pieces fit, the fear abates and the implementation produces the sought for results.
    - 8.5.3. Legitimize ‘research’ in the change focus. This means extending a true experimental attitude towards trying different solutions, and hypothesis testing around the questions and problems. With this attitude it is OK to not be entirely successful in the first number of attempts. As long as each effort results in learning and improvement for the next attempt, and experimental attitude will help continue support for the trials.
  9. Keep the change fresh and exciting in order to keep the process going.
    - 9.1. Organizational structures put in place to initiate, sustain and implement change must be flexible and continuously re-created to be responsive to changing needs/ fears/ demands
    - 9.2. Be prepared to change the work structure, the names of committees and the participants on work groups.
    - 9.3. Change the metaphors, not the direction nor the goals nor the pace.
    - 9.4. Use formative evaluations, conducted by inside and by outside agents to periodically re-catalyze and re-focus reflection and renewal
  10. Utilize principles of cognitive dissonance to solidify support for the change direction and specifics.
    - 10.1. Ask wavering or lukewarm individuals to help present overviews on the change at national and international meetings.
    - 10.2. Tell the change story frequently, repeatedly, in and outside the organization. Cast the story in concrete terms to allow people to imagine themselves in the altered scenario and find that at least tolerable.
    - 10.3. Create opportunities to “show-off” new ideas, new solutions, and contemplated or actual changes. The more prestigious the setting, the better. National & international venues are best, but even local innovations showcases should be utilized or created. Organize press coverage (facilitate photographs) or publications and display the results prominently.
    - 10.4. Join formally and participate actively in organizations that support the change you are trying to make. These may be groupings of other similar organizations trying to change (i.e. the Network of Community-Oriented Educational

Institutions for Health Sciences, or the Generalists in Medical Education), other organizations beyond the profession dedicated to change and change management (i.e. COACH) or even reform wings of traditional professional organizations. Go yourself and actively encourage broad faculty participation.

11. Larger scale, scope and depth of change make change in any one facet easier. Consider the effects your intended change will have on related bodies or agencies. They may be moving in parallel directions and could bolster local support if tied into your change.
  - 11.1. Accreditation systems, criteria, procedures
  - 11.2. Practicum or residency training
  - 11.3. Credentialing systems
  - 11.4. Funding systems
12. Benchmarks from outside the organization will not be totally applicable or relevant. Each organization must identify and create its own future with its own resources. The principal utility of outside materials/ benchmarks is to act as proof that change is possible and that there are more than the local current practices to consider.

## 10. Suggested Readings

1. Andrews, H. et al (1994) *Organizational Transformation in Health care*. San Francisco: Jossey Bass. This is an exercise in the applied learning theory: Total Quality Management.
2. Beckhard, R and Pritchard, W. (1992) *Changing the Essence: the art of creating and leading fundamental change in organizations*. San Francisco: Jossey-Bass. This volume describes entrepreneurial, 'vision'-based change.
3. Bennis, WG et al (1976) *The Planning of Change*. New York: Holt Rinehart Winston. This is one of the original overviews of change theory.
4. Bennis, WG (1989) *Why Leaders Can't Lead*. San Francisco: Jossey-Bass. This is an undisguised lament for entrepreneurial change management.
5. Kets de Vries, M. (1991) *Organizations on the Couch: clinical perspectives on organizational behavior and change*. San Francisco: Jossey-Bass. An example of cognitive science applied to change management.
6. Mintzberg H, Ahlstrand B & Lampel J (1998). *Strategy Safari: a guided tour through the wilds of strategic management*. New York: The Free Press. A modern review of change theories.

7. Mohrman, AM et al (1980) *Large-Scale Organizational Change*. San Francisco: Jossey-Bass. This volume combines elements of various change theories.
8. Osborne, D and Gaebler, T. (1993) *Reinventing Government: how the entrepreneurial spirit is transforming the public sector*. New York: Plume. Written for application in the public sector, this popularized approach starts with SWOT and moves to entrepreneurial change management.
9. Smye, M. (1993) *You Don't Change a Company by Memo*. Toronto: Key Porter. This is essentially a cultural analysis approach to change management.
10. Wilkins, A. (1989) *Developing Corporate Character: how to successfully change an organization without destroying it*. San Francisco: Jossey-Bass. This volume describes 'vision'-based change as managed from the middle if necessary.

## 11. References

- AAMC (1999). (Association of American Medical Schools) The Medical School Objectives Project. *Academic Medicine*, 74 (1)
- AAMC (1999, in press). *The Medical School Objectives Project. Report III: Contemporary Issues in Medical Education: Integrating Spirituality, End of Life Issues and Cultural Issues into the Practice of Medicine*. Washington DC: Association of American Medical Schools
- AAMC (1998a). *The Medical School Objectives Project. Report I: Learning Objectives for Medical Student Education: Guidelines for Medical Schools*. Washington DC: Association of American Medical Schools
- AAMC (1998b). *The Medical School Objectives Project. Report II: Contemporary Issues in Medicine: Medical Informatics and Population Health*. Washington DC: Association of American Medical Schools
- AAMC (1998c) *What Americans Say About the Nation's Medical Schools and Teaching Hospitals: Report on Public Opinion Research, Part II*. Washington DC: Association of American Medical Schools
- ACME-TRI Report. (1993). Educating Medical Students: Assessing Change in Medical Education—The Road to Implementation. *Academic Medicine*, 68 (6) Supplement.
- Adapting Clinical Medical Education to the Needs of Today and Tomorrow*. (1988). New York: Josiah H. Macy Jr. Foundation.
- Anderson, MB. (1999) In progress: reports of new approaches in medical education. *Acad Med*. 74:562-618.
- Andrews, H. et al (1994) *Organizational Transformation in Health care*, San Francisco: Jossey Bass
- Andrews, K.R. (1987) *The Concept of Corporate Strategy*. Homewood, IL: Irwin
- Angell, M. (2000) Is academic medicine for sale? *NEJM* 342(20):
- Ansoff, HI. (1965) *Corporate Strategy*. New York: McGraw-Hill.
- Argyris, C. (1991) Teaching smart people how to learn. *Harvard Business Review*. 69(3) May-June:99-109.

- Argyris, C & Schön, DA (1974) *Theory in Practice: Increasing Professional Effectiveness*. San Francisco: Jossey-Bass.
- Argyris, C & Schön, DA (1978) *Organisational Learning: A Theory of Action Perspective*. Reading, MA: Addison Wesley.
- Bacon, NC. (1999). Modernizing medical education. *Hosp Med*, 60:54-6.
- Baldrige, JV. (1975) Rules for a Machiavellian change agent: transforming the entrenched professional organization. .Chapter 19 in *Managing Change in Educational Organizations*, (Eds) Baldrige, J.V. & Deal, T.E. Berkeley, CA: McCutcheon
- Baldrige, J.V. & Deal, T.E. (1975) Overview of change processes in educational organizations. Chapter 1 in *Managing Change in Educational Organizations*, (Eds) Baldrige, J.V. & Deal, T.E. Berkeley, CA: McCutcheon
- Barnes, BE. (1998). Creating the practice-learning environment: Using information technology to support a new model of continuing medical education, *Acad Med*, 73:278-281.
- Beatty, RW & Ulrich, DO. (1991) Re-energizing the mature organization. *Organizational Dynamics*. Summer: 16-30.
- Beckhard, R and Pritchard, W. (1992) *Changing the Essence*, San Francisco: Jossey-Bass
- Beer, M; Eisenstat, RA & Spector, B. (1990) Why change programs don't produce change. *Harvard Business Review*. Nov-Dec: 158-166.
- Bennis, W.G. et al (1976) *The Planning of Change*,.New York: Holt Rinehart Winston
- Bennis, W.G. (1989) *Why Leaders Can't Lead*, San Francisco: Jossey-Bass
- Bennis, WG & Namus, B. (1985). *Leaders: Strategies for Taking Charge*. New York: Harper & Row.
- Berge, ZL & Collins, MP. (Eds). (1995) Computer mediated communication and the online classroom. Cresskill, NJ; Hampton Press.
- Bloom, BS. (1999). Internet availability of prescription pharmaceuticals to the public. *Ann Intern Med*. 131: 830-833.
- Bloom, S.W. (1988) Structure and ideology in medical education: an analysis of resistance to change. *Journal of Health and Social Behavior*, December: 294-306

- Bloom, S.W. (1989) The medical school as a social organization: the sources of resistance to change. *Medical Education*, 23: 228-241.
- Blumenthal, D; Campbell, EG; Anderson, MS; Causino, N & Louis, KS. (1997) Withholding research results in academic life science: evidence from a national survey of faculty. *JAMA*, 277: 1224-1228
- Bobula, JD. (1980) Work patterns, practice characteristics, and incomes of male and female physicians. *J Med Ed.* 55: 826-833.
- Bodenheimer, T (2000) Uneasy alliance: clinical investigators and the pharmaceutical industry. *NEJM* 342(20): 1539-1544.
- Boyer, E.L. 1990) *Scholarship Reconsidered" Priorities of the Professorate*. Princeton N.J.: Carnegie Foundation for the Advancement of Teaching
- Boyer Commission on Educating Undergraduates in the Research University (1998) *Reinventing Undergraduate Education: a blueprint for America's research universities*. Stony Brook N.Y.: State University of New York
- Bryson, J.M. (1988) *Strategic Planning for Public and Nonprofit Organizations*. San Francisco: Jossey-Bass
- Bryson, J.M. (1995) *Strategic Planning for Public and Nonprofit Organizations*. San Francisco: Jossey-Bass
- Bulger, RJ (1998) *The Quest for Mercy*. Charlottesville, VA: Jennings
- Bulger, RJ (2000) The quest for the therapeutic organization. *JAMA*, 283(18): 2431-2433.
- Business & Health*. (1998) DataWatch: Rx coverage and consumer ads: a costly combo. October: 68.
- Bussigel, M; Barzansky, B. & Grenholm, G. (1986) Goal coupling and innovation in medical schools. *Journal of Applied Behavioral Sciences*, 22, 425-551.
- Cabot, H. (1915) Medicine: a profession or a trade. *The Boston Medical and Surgical Journal*, Nov 4<sup>th</sup>: 685-688
- Cantor, J.C; Cohen, A.B., Barker, D.C., Shuster, A.L., & Reynolds, R.C. (1991). Medical educators' views on medical education reform. *JAMA*, 265, 1002-1006.
- Carey, RM; Wheby, MS and Reynolds, RE. (1993) Evaluating faculty clinical excellence in the academic health science center. *Acad Med* 68:813-817.

- Chan,D; LeClair, K, & Kaczorowski, J. (1999). Problem-based small-group learning via the Internet among community family physicians: A randomized controlled trial. *MD Computing*, 16(3): 54-8.
- Chandler, AD. (1962) *Strategy and Structure: Chapters in the History of the Industrial Enterprise*. Cambridge: MIT Press.
- Collins,O; and Moore, DG. (1970) *The Organization Makers*. New York: Appleton-Century
- Cooper, CL; Rout, U & Faragher, B. (1989) Mental health, job satisfaction and job stress among general practitioners. *BMJ*. 298:366-370.
- Cravener, PA. (1999). Faculty experiences with providing online courses: thorns among roses. *Comput Nurs* 17: 42-7.
- Cuban, L. (1997) Change without reform: the case of Stanford University School of Medicine, 1908-1990. *Am Ed Res J*, 34(1): 83-122.
- Curry, L. (1991) Patterns of learning style across selected medical specialties. *Ed Psych*. 11(3&4):247-277.
- Curry, L. (1998) *Blueprint for the Future: Educational Enhancement Project Report and Recommendations*. Washington DC: The Liaison Committee for Podiatric Medical Education and Practice
- Curry, L. (1999) Cognitive and learning styles in medical education. *Acad Med*. 74(4): 409-413.
- Davis, WK & White, BA (1993) Centralized decision making in management of the curriculum at the University of Michigan Medical School. *Acad Med* 68(5): 333-335.
- Day, P. (1982). *Women Doctors: choices and constraints in policies for medical manpower*. Project Paper #28. London: King's Fund Centre.
- DeAngelis, CD (2000) The plight of academic health centers. *JAMA*, 283(18): 2438-2339.
- Deming, WE. (1986) *Out of the Crisis*. Cambridge: MIT Center for Advanced Engineering Study.
- Des Marchais, JE et collaborateurs (1996) *Apprendre à Devenir Médecin: Bilan d'un Changement Pédagogique centre sur l'étudiant*. Sherbrooke, Québec: Université de Sherbrooke.

- Des Marchais, JE & Bordage, G. (1998) Sustaining curricular change at Sherbrooke through external, formative program evaluations. *Acad Med*, 73(5): 494-503.
- Des Marchais, JE; Bureau, MA; Dumais, B & Pigeon, G. (1992) From traditional to problem-based learning: a case report of complete curriculum reform. *Med Ed* 26: 190-199.
- Dewey, J. *Monist* (1898) 8, 335.
- Dick, B. (1996) *Managing Change* [On line] Available at <http://www.scu.edu.au/schools/sawd/arr/change.html>
- Dick, B & Dalman, T. (1990) *Values in Action: applying the ideas of Argyris and Schön*. Brisbane: Interchange.
- Dickhout, R; Denham, M & Blackwell, N. (1995) Designing change programs that won't cost you your job. *The McKinsey Quarterly*. 4: 101-116.
- Dillon, CL. (1996). Distance education research and continuing professional education: reframing questions for the emerging information infrastructure. *J Cont Educ Health Prof*. 16:5-13.
- Drucker, PE. (1970) Entrepreneurship in business enterprise. *J Bus Policy* I(1):3-12.
- Dumelow, C; Littlejohns, P and Griffiths, S. (2000) The inter-relationship between a medical career and family life for hospital consultants: an interview survey. *BMJ* 320: 1437-1440
- Enarson, C. & Burg, F.D. (1992) An overview of reform initiatives in medical education: 1906 through 1992. *Journal of the American Medical Association*, 268: 1141-1143.
- Evans, RG & Stoddart, GL. (1990) Producing health, consuming health care. *Soc Sci Med* 31(12): 1347-1363.
- Financial Post*. (2000) Advertisement: Get your Executive MBA Online. Friday, February 18<sup>th</sup>: D8, columns 2 & 3.
- Finocchio, LJ, Dower, CM, McMahon T, Gagnola CM and the Taskforce on Health care Workforce Regulation. (1995). *Reforming Health care Workforce Regulation: Policy considerations for the 21<sup>st</sup> century*. San Francisco: Pew Health Professions Commission
- Flexner, A.(1910) *Medical Education in the United States and Canada: a report to the Carnegie Foundation for the Advancement of Teaching*. Bulletin no. 4. Princeton, N.J.: Carnegie Foundation for the Advancement of Teaching.

Friedberg M; Saffran, B; Stinson, TJ; Nelson, W & Bennett, CL (1999) Evaluation of conflict of interest in economic analyses of new drugs used in oncology. *JAMA*, 282: 1453-1457.

Friedman, C. P. & Purcell, E. F. (eds) (1983). *The New Biology and Medical Education: merging the biological, information and cognitive sciences*. New York: Josiah H. Macy Jr. Foundation.

Funkenstein, D.H. (1978) *Medical Students, Medical Schools, and Society during Five Eras*. Cambridge,MA: Ballinger.

*Future Directions for Medical Education: a report of the Council on Medical Education*. (1982) Chicago: American Medical Association.

Gale, R & Grant, J. (1997) AMEE Medical Education Guide No. 10: managing change in a medical context: guidelines for action. *Med Teacher*, 19(4): 239-249.

General Medical Council. (1996) *Tomorrow's Doctors: Recommendations on Undergraduate Medical Education*. London: GMC

General Medical Council. (1997) *The New Doctor*. London: GMC

Giardino, AP; Giardino, ER; MacLaren, CF & Burg, FD. (1994) Managing change: a case study of implementing change in a clinical evaluation system. *Teaching and Learning in Medicine*, 6(3): 149-153.

*Globe and Mail*. (1999) Statscan study shows doctors raking it in, Thursday, December 2.

Goldstein, D. (2000) *e-Health care: Harness the Power of Internet e-Commerce and e-Care* as quoted in 'Online relief for health care overload', *Financial Post*, Monday May 1<sup>st</sup>: E1

Grant, J & Marsden, P. (1992) *Training Senior House Officers by Service-based Learning*. London: Joint Centre for Education in Medicine.

Gray, C. (1980) How will the new wave of women graduates change the medical profession? *CMAJ*, 123: 798-801.

Griner, PF & Danoff, D. (2000) Sustaining change in medical education. *JAMA*, 283(18):2429-2431.

Gruppen, LD. (1997) Implications of cognitive research for ambulatory care education. *Acad Med* 72(2):117-120

Harris, IB (1993) Perspectives for curriculum renewal in medical education. *Acad Med* 68(6): 484-486.

*Hastings Centre Report*. (1996) The Goals of Medicine: Setting new standards. Special Supplement, Nov-Dec.

Heins, M; Smock, S; Martindale, L; Jacobs, J and Stein, M. (1977) Comparison of the productivity of women and men physicians, *JAMA*, 237 (23): 2514-2517.

Hersh, W. (1999). A world of knowledge at your fingertips: The promise, reality and future directions of on-line information retrieval. *Acad Med*, 72:240-243.

Hippisley-Cox, J; Allan, J; Pringle, M; Ebdon, D; McPhearson, M; Churchill, D & Bradley, S. (2000) Association between teenage pregnancy rates and the age and sex of general practitioners: cross sectional survey in Trent 1994-7. *BMJ* 320:842-845.

Huff, AS (Ed). (1990) *Mapping Strategic Thought*. Somerset, NJ: Wiley

Hylka, SC and Beschle, JC. (1995) Nurse practitioners, cost savings and improved patient care in the Department of Surgery. *Nurse Economist* 13(6): 349-354.

Inglehart, J. (1997) Forum on the future of academic medicine: Session 1 – Setting the stage. *Academic Medicine*, 72 (7): 595-599.

Jadad, A. (1999) Promoting partnerships: challenges for the internet age. *BMJ* 319:761-764.

Johnson, FA & Johnson, CL. (1976). Role strain in high-commitment career women. *J.Am. Acad. Psychoanal* 4(1):13-36.

Jonas, S. (1984) The case for change in medical education in the United States. *Lancet*, 2, 452-454.

Jones, RF and Gold JS. (1998) Faculty appointment and tenure policies in medical schools: a 1997 status report. *Acad Med* 73:212-219.

Jupiter Communications (2000) as quoted in ‘Online relief for health care overload’, *Financial Post*, Monday May 1<sup>st</sup>: E1

Kanter, R.M. (1983) *The Change Masters*, New York: Simon & Schuster

Kaufman, A (1998) Leadership and governance. *Acad Med* 73(9) supplement: S11-S15

Kehrer, BH. (1976) Factors affecting the incomes of men and women physicians: an exploratory analysis. *J Human Resources*, 11(4): 526-545.

Kets de Vries, M.(1991) *Organizations on the Couch*, San Francisco: Jossey-Bass

Koch, LW; Pazaki, SH and Campbell, JD. (1992) The first 20 years of nurse practitioner literature: an evolution of joint practice issues. *Nurse Practitioner*. 17(2): 62-71.

Kotter, JP. (1995) Leading change: why transformation efforts fail. *Harvard Business Review*. March-April: 59-67.

Larkin, M. (1999) US online pharmacies strive for respectability. *Lancet*, 354: 782.

Levinson, W; Tolle, SW & Lewis, C. (1989). Women in academic medicine” combining career and family. *N. Engl J Med*. 321(22):1511-1517.

Levinson, W and Rubenstein, A. (1999) Mission critical: integrating clinician-educators into academic medical centers. *N. Engl J Med*. 341(11):840-843.

Levit, E.J. (1973) *Evaluation in Continuum of Medical Education*. Report of the Committee on Goals and Priorities of the National Board of Medical Examiners. Philadelphia, PA.

Levy, S. (1999) Most community pharmacies question value of DTC Rx ads. *Drug Topics*, December 6<sup>th</sup> : 87.

Lewin, K. (1951) *Field Theory in Social Science* New York: Harper and Row

Lewin Group (2000) *The Impact of the Medicare Balanced Budget Refinement Act on Medicare Payments to Hospitals*. Falls Church, VA: The American Hospital Association.

Light, D.W. (1988) Toward a new sociology of medical education. *J. Health Soc. Behav.* 29 (December), 307-322.

Lindberg, MA (1998) The process of change: stories of the journey. *Acad Med* 73(9) supplement: S4-S10

Lindblom, CE. (1959) The science of “muddling through”. *Public Admin Rev* 19:79-88.

Lorange,P. (1980) *Corporate Planning: an Executive Viewpoint*. Englewood Cliffs: Prentice Hall

MacLeod, S.M. (1997) Change and the academic health science centre: 1997 perspective. *ACMC Forum*, August:3-5.

Macmillan, IC. (1978) *Strategy Formation: Political Concepts*. St. Paul, MN: West

Makridakis, S. (1990) *Forecasting, Planning and Strategy for the 21<sup>st</sup> Century*. New York: Free Press

- March, JG & Simon, HA. (1958) *Organizations*. New York: Wiley
- Mårtenson, D. (1989) Educational development in an established medical school: facilitating and impeding factors in change at the Karolinska Institute. *Medical Teacher*, 11(1), 17-2
- McCormach, C.& Jones, D. (1998). *Building a Web-Based Education System*. Toronto: Wiley.
- McLellan, F. (1998) The Internet. *Lancet*, 352 (Supplement II): SII39-SII43.
- Medical Post*. (1998) National Survey of Doctors. December
- Mennin, SP & Kaufman, A. (1989) The change process and medical education. *Med Teacher*, 11(1): 9-16.
- Miller, D. (1979). Strategy, structure and environment: context influences on some bivariate associations. *J Management Studies*. 16(Oct):294-316.
- Miller, D; Droge, C & Toulouse, J. (1988) Strategic process and content as mediators between organizational context and structure. *Academy of Management Journal*. 31(3):544-569.
- Mintzberg H; Ahlstrand, B & Lampel, J (1998). *Strategy Safari: a guided tour through the wilds of strategic management*. New York: The Free Press
- Mitchell, A; Pinelli, J; Patterson, C and Southwell, D. (1993) *Utilization of Nurse Practitioners in Ontario*. Executive Summary (discussion paper). Hamilton, ON: McMaster University School of Nursing.
- Mizrachi, T. (1986). *Getting Rid of Patients: Contradictions in the Socialization of Physicians*. New Brunswick, NJ: Rutgers University Press
- Mohrman, A.M. et al (1980). *Large-Scale Organizational Change*, San Francisco: Jossey-Bass
- Murray, S. (1998) Separating the wheat from the chaff: evaluating consumer health information on the Internet. *Bibliotheca Medica Canadiana*, Summer 19(4): 142-145.
- Myers, IB. (1962) *Introduction to Type: a description of the theory and application of the Myers-Briggs Type Indicator*. Palo Alto, CA: Consulting Psychologists Press.
- Neufeld, VR et al. (1993). Demand-side medical education: educating future physicians for Ontario. *Can Med Assoc J* 148:1471-1477.

Nonaka, I & Takeuchi, H. (1995) *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*. New York: Oxford University Press

Normann, R. (1977) *Management for Growth*. New York: Wiley

OECD (1999) as quoted by Kettle, J. in Your money or your life. *The Globe & Mail: September 2: B4*.

Osborne, D and Gaebler, T (1993). *Reinventing Government*, New York: Plume

Ottawa Citizen. (2000) Billionaire donates \$1000M for free online university. Thursday, March 16: A14, columns 2, 3, 4 & 5.

Pardes, H (1997) The future of medical schools and teaching hospitals in the era of managed care. *Acad Med* 72: 97-102

Pardes, H (2000) The perilous state of academic medicine. *JAMA*, 283(18):2427-2429.

Parle, JV; Greenfield, SM; Skelton, J; Lester, H & Hobes, FDR. (1997) Acquisition of the basic clinical skills in the general practice setting. *Medical Education* 31: 99-104.

Pellegrino, E.D. (1978). Medical Education. *Encyclopedia of Bioethics*, Vol. 2: 863-870. New York: Free Press.

*Physicians for the Twenty-First Century: report of the Project Panel on the general professional education of the physician and college preparation for medicine*. (1984). Washington DC: Association of American Medical Colleges.

Pirisi, A. (1999) Patient-directed drug advertising puts pressure on US doctors. *Lancet*, 354: 1887.

PJ (1999) Internet pharmacy. *Pharmaceutical J.*, 263: 841.

PJ (2000) On-line pharmacy offers NHS dispensing service. *Pharmaceutical J.*, 264: 201.

Porter, ME. (1980) *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. New York: Free Press

Powers, L; Parmelle, RD and Weisenfelder, H. (1969). Practice patterns of women and men physicians. *J Med Ed*, 44: 481-491.

Pruitt, NL; Underwood, LS & Surver, W. (2000). *BioInquiry: making connections in biology*. New York: Wiley

Quinn, JB. (1980) *Strategies for Change: Logical Incrementalism*. Holmwood: Irwin

- Quinn, JB. (1982) Managing strategies incrementally. *Omega: Intr J Management Sci* 10(6):613-627.
- Regan-Smith, M.G. (1998) Reform without change: update, 1998. *Academic Medicine*, 73 (5): 505-507.
- Relman, A. (1980) Here come the women. *NEJM*, 302 (22): 1252-1253.
- Rhenman,E. (1973). *Organization Theory for Long-Range Planning*. London: Wiley
- Rice, R.E. & Richlin, L. (1993). Broadening the Concept of Scholarship in the professions. In *Educating Professionals: responding to new expectations for competence and accountability*. Curry, L. & Wergin, J.F. (Eds) (pp279-315). San Francisco: Jossey-Bass
- Roddie, I.C.A. (1986) A critique of fashion in medical education: some thoughts on the GPEP Report. *N.Y. State J. Med.* 86, 421-428.
- Saxton, JF; Blake, DA; Fox, JT & Johns, MME (2000) The evolving academic health center: strategies and priorities at Emory University, *JAMA*, 283(18):2434-2436.
- Selnick, P. (1957) *Leadership in Administration: a sociological interpretation*. Evanston: Peterson
- Schwartz, PL; Heath, CJ & Egan, AG (1994) *The Art of the Possible: Ideas from a Traditional Medical School Engaged in Curricular Reform*. Dunedin, New Zealand: University of Otago Press.
- Science* (1993). *Medical Research: Alternative Views*. Letter to the Editor from R. Lamm American Association for the Advancement of Science (AAAS), 262, December 3: 1497
- Science* (1998). News Report. American Association for the Advancement of Science (AAAS), 285, June 26: 2019
- Science* (2000) Pedagogy First, Technology Later. American Association for the Advancement of Science (AAAS). 287, January 28: 543
- Science* (2000) Free Online University? American Association for the Advancement of Science (AAAS). 287, March 24: 2111
- Senge, PM. (1990). *The Fifth Discipline: The Art and Practice of the Learning Organization*. New York: Doubleday
- Shahabudin, S. H. & Safiah, N. (1991). Managing the initial period of implementation of educational change. *Medical Teacher*, 13(3), 205-211.

- Simon, HA. (1957) *Administrative Behavior*. New York: Macmillan
- Smye, M. (1993). *You Don't Change a Company by Memo*, Toronto: Key Porter
- Southgate, L & Grant, J. Opportunities and Dreams: plans for a networked medical school & foundation course for medicine. Available at <http://www.asme.org.uk>
- Steiner, GA. (1979) *Strategic Planning: What Every Manager Must Know*. New York: Free Press.
- Stelfox, HT; Chua, G; Rourke, K & Detsky, AS (1998) Conflict of interest in the debate over calcium-channel antagonists. *N Engl J Med* 338:101-106.
- Taub, J. (1997) Drive-Thru U. Higher education for people who mean business. *New Yorker*, October 20<sup>th</sup> & 27<sup>th</sup>: 114- 123
- Tosteson, DC; Adelstein, SJ & Carver, ST (Eds) (1994) *New Pathways to Medical Education: Learning to Learn at Harvard Medical School*. Cambridge, MA: Harvard University Press
- Tuckman, BW (1965) Developmental sequences in small groups. *Psych Bull* 63: 384-399
- Weldon, V. V. (1987). Why the Dinosaurs Died: Extinction or Evolution? *J. Medical Education*, 62 (February), 109-115.
- Wilkins, A. (1989) *Developing Corporate Character*, San Francisco: Jossey-Bass
- Wilson, A; Fraser, R; McKinley, RR; Preston-Whyte, E & Wynn, A. (1996) Undergraduate teaching in the community: can general practice deliver? *Br J Gen Pract.* 46: 457-460.
- Wilson, M. (1979) The status of women in medicine: background data. Paper presented at the Mary E. Garrett Symposium at Johns Hopkins University School of Medicine, October 9-10.
- Woodward, CA; Cohen, ML & Ferrier, BM. (1990). Career interruptions and hours practiced: comparison between young men and women physicians. *Can J Public Health.* 81:16-20.
- World Health Organization. (1996) *Integration of Health care Delivery*, .WHO Technical Report Series #861. Geneva: WHO
- Zoeller, J. (1999) Rushing the net. *American Druggist*, 216 (3):50-55.