

**PERIODICITIES IN SOCIETAL SYSTEMS BEHAVIORS:
RELATIONSHIPS OF ECONOMIES, GENERATIONS,
AND TECHNOLOGIES TO REFORMS IN
MEDICAL EDUCATION**

A Senior Honors Thesis

by

REVA ELAINE KINRA

Submitted to the Office of Honors Programs
& Academic Scholarships
Texas A&M University
in partial fulfillment for the designation of

UNIVERSITY UNDERGRADUATE
RESEARCH FELLOWS

April 2002

Group: Health and Education

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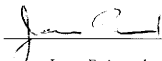
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ABSTRACT

Periodicities in Societal Systems Behaviors:

Relationships of Economies, Generations, and Technologies

to Reforms in Medical Education.

(April 2002)

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As medical educators strive to produce qualified physicians who are able to meet societal needs, the medical education system must continually reform itself to meet the demands of that changing society. Understanding the interactions between medical education and surrounding societal behaviors is essential for improvement of the medical education process. Reforms in medical education provide for constructive adaptation in the educational system's process, content, and organization.

Three societal systems that impact medicine and medical education include generations, economics, and technology. Change occurs periodically within these systems, producing cyclical or pulsatile patterns of behavior. Numerous studies have analyzed generational cycles to describe changes in dominant attitudes and values (Strauss and Howe, Schlesinger), economic waves to describe behavior of economies (Arrighi, Screpanti), and invention-innovation cycles to describe patterns in technological advancement (Devezas, Marchetti). In seeking to discover how medical education responds to such societal changes, this research analyzes past educational reforms in the context of concurrent social environments.

By discovering temporal connections between cyclical behaviors of societal systems and specific reforms in medical education, putative cause and effect relationships may be proposed. As social systems repeat their behaviors, knowledge of medical education's past responses can shed light on current interactions. This type of information can support educators and decision-makers responsible for cultivating medical educational institutions and medical curricula.

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INTRODUCTION

A major problem faced by medical educators is how to appropriately respond to and anticipate changes in society. What conditions will medical schools face, and how can they best train doctors to meet the future health care needs of patients? With societal changes come changes in the environment in which medical schools operate. Medical institutions face new challenges every day.

The main 'products' of medical schools are physicians. In a changing world, physicians work in different settings than they did one hundred, ten or even one year ago. Patient populations have changed and care is administered in new ways. As doctors face new challenges and serve new roles, they must receive appropriate training. Today this might mean learning about non-scientific areas of medicine like ethics and business. Medical schools are crucial in providing this training, to continuing to educate physicians and providing the resources they need to serve their patients and communities well. Thus medical schools must be sensitive to cultural, economic, technological and other changing conditions.

Reforms within medical education are vehicles through which medicine can respond to changes in society. Educational reforms have been and will be essential for the growth and success of medicine in America. Medical educators and leaders seek to exercise foresight and good judgment as they shape medical education. In order to make wise decisions about the future of medical education, they must gain insight into the past and form accurate perceptions of the present. This is not a simple task, and medical educators need resources that inform and guide them in making important decisions.

In its definition, society can include practically any collective human endeavor. It is complex, and impossible to define precisely. This is why researchers divide society into various societal forces such as the economy. By breaking society down into smaller units and analyzing specific societal forces, they can describe the behavior of given forces. For example, economists develop economic models. Researchers gain detailed information as they study specific aspects of society. This depth of knowledge is very useful and necessary, yet it is also necessary to gain a broad perspective that integrates a breadth of knowledge. Thus, understanding comes through a two-fold process. The first is to break something into smaller parts so that it can be analyzed. The second requires the integration and analysis of these parts. Through broad analysis, generalizations can be made, trends can be unearthed, and relationships between the parts can be understood. While generalization inherently invites variations and exceptions to be made, it is invaluable in the process of understanding vast and complex systems. Social system models are the results of analysis of society on broad levels, and are a way to relate information in succinct fashion, making this information manageable for practical application.

Would social system models be of use to medical educators as they seek to understand interactions between medicine and the rest of society? If so, through what process could they be applied to medical education and what information might be learned? The following exploration seeks to address these questions by analyzing historical reforms of medical education in the context of three societal models in economics, technology, and generations. This can greatly benefit medical researchers by providing information about possibilities that lie in the use of social models, and describing how to proceed with their application to medical education reform. A likely hypothesis is that as a social institution, medical education and its reforms will be strongly related to social systems and their modeled behavior.

METHODS

In order to explore the possibilities of using social system modes to understand medical educational reforms, I decided to take an empirical approach, addressing the question through the use of examples. This requires two main processes. First I choose the best examples to use. I identify specific historical reforms in medical education and specific social models to apply to them. Second, I applied models to the reform in some fashion.

Reforms

In choosing specific medical reforms, I looked for reforms that have been well documented, have had tangible effects as evidence of the change, are generally accepted within the medical community as reforms, and have had an impact at the national level. This led me to two major reforms that have occurred in American medical education in the 20th century. The first reform is represented by the Flexner report, published in 1910. This publication was the result of much effort in the medical community to change the institutional organization of medical education in order to improve its quality. Following the publication, and arguably as a direct result, major changes were seen in medical education and the institutions that teach medicine.¹

The second reform is the problem-based learning (PBL) movement that began to spread to medical schools in the 1970's and still receives attention from medical educators today.² Problem-based learning is a teaching philosophy that emphasizes student participation, discussion groups, guided curriculum and development of problem solving skills. This is a change from the 'traditional' teaching method that emphasizes passive learning, lectures, fixed curriculum and memorization. The PBL movement has been a collaborative effort and has developed from many ideas and sources. In 1973 Howard Barrows published the first book describing PBL and its implementation in medical curriculum.³ Both reforms will be discussed in greater detail in the medical reform section.

Social Models

In choosing social system models, I looked for models that describe broad aspects of society, have been established long enough to generate significant discussion in academic communities, and have been described in a simplified and comprehensive manner. Three societal systems that best exemplify these characteristics are the economic long-wave,⁴ technological invention-innovation cycles,⁵ and generational cycles.⁶

Application

During the application phase each of the two reforms were analyzed in the context of each of the three societal models. This was done through temporal analysis in three deepening scopes. Characteristics of each model were identified around the time of the reforms, events and characteristics of the reforms that correlated chronologically with characteristics and events in the models were noted. The three levels of temporal analysis can best be understood through an analogy to the physics of motion. The first level looks at only the actual characteristics or status of the societal model at the time of the reform; this is like describing where an object is located at a specific time. The second level looks at the trends of that model or the direction of change; this is analogous to the vector of the object. The third level looks at the current behavior of the social system in relation to the overall behavior of the model; the final level would be like the object's acceleration.

Through temporal analysis possible interactions between medical education and societal forces as well as putative cause and effect relationships were found. These intriguing interactions could be a springboard for discussion and may lead researchers to explore medical education in new ways.

SOCIETAL SYSTEMS

“Societal system” is a loose term that describes an approach to studying human society. It seeks to understand the overall behavior of social forces and recognizes interdependence between all aspects of society. In many cases, societal systems show changing behavior in a periodic or variable fashion rather than at a constant rate. Rates of change vary, and periods of stability or instability can be observed. Additionally, long-term behaviors of systems often exhibit cyclical or pulsatile characteristics. The difference between cycling and pulsating is a matter of perspective; it depends on where observers place their point of equilibrium, the zero mark. From a cyclic perspective a system will fluctuate above and below an equilibrium point, while a pulsatile perspective sees a base line that the system deviates from and returns to. Relevant models have been developed in many fields ranging from culture and politics to environmental and physical sciences. These models show the long-term trends in the behavior of the targeted social system. People in many fields are becoming increasingly aware of the importance of understanding society and the interactions between different social systems. “World system” analysts are actually trying to develop models that integrate many social models, in order to understand all aspects of society in relation to each other.⁷ The following discussion introduces societal models regarding economy, technology, and cultural identity as understood through generations. The main ideas and phases of each model are discussed, to provide a foundation for understanding the analysis of medical education reforms within the context of each model.

Economic long-wave

The behavior of capitalist economies was described in 1925 by the Russian economist Kondratieff and developed by other economists to reach its current model termed the “long-wave”. The long-wave represents the overall economy of a capitalist society, like that of the United States. Oscillations occur every 50-60 years through four phases: recession, depression, recovery, and prosperity. The long-wave is conceptually based on the idea of self-correction inherent within free economies. The equilibrium point of the economy is somewhere in between the scarcity of depression and the excess of prosperity. As the economy tries to correct for either to little or too much growth, it vacillates above and below equilibrium, thus producing a cyclical behavior.⁵

In 1925, Russian economist Nikolai D. Kondratieff proposed a theory of long-term economic cycling in capitalist economies. He used long term trends of the Wholesale Price index as a measure of the economy to illustrate its behavior. The cycles ranged from periods of economic depression to prosperity and back again to depression approximately every 54 years. His work led to the “assertion that capitalist economies undergo self correcting cycles” so that they will not stagnate in a state either of depression or of overproduction.⁸

As economists developed the ideas proposed by Kondratieff, they used economic measures other than prices to describe the long-term behavior of economies. These economic measures include production as described in Gaston Imbert's doctoral thesis (1959), and debt as "drawn from Fisher's debt inflation model (1933)." By "synthesizing the works of Kondratieff, Fisher, and Imbert" the long-wave becomes a wave that incorporates three very basic and important aspects of economies: prices, debt, and production.⁴ The refinement and development of Kondratieff's economic theory has resulted in the long-wave model of economic cycling. Since the economy is a combination of many factors, the long-wave incorporates these main economic measures to describe the overall economy. The long-wave has received much attention from economists and the business world, and it has been described with great clarity in *Greenspan's Taming of the Wave* by François-Xavier Chevallier, which forms the basis of our discussion.⁴

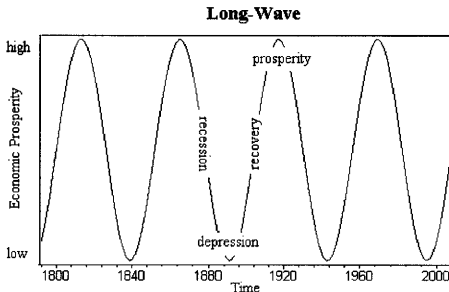


Figure 1. The growth and decline of the overall economy is represented by the long-wave as the economy alternates between periods of relatively high and low economic prosperity. Four phases are labeled: recession, depression, recovery, and prosperity.

The long-wave represents cyclical behavior of economies over periods of 50-60 years. While the precise timing and intensity of the long-wave cannot be determined, there is a very predictable sequence of events. This sequence can be seen as four distinguishable phases in which the economy moves from recession, to depression, to recovery, to prosperity, back to recession, and so on. A benefit of using three economic measures to describe the long-wave is that they provide markers for the beginning and end of each phase. Interestingly, these four phases do not occupy equal amounts of time. Depression and recovery each occupy approximately 10 years each, while prosperity and recession tend to occupy about 20 years each. While there are certain characteristics prevalent throughout each phase, there are also changes that occur within the phases. When placing a medical reform on the long-wave in time, it is important to observe not only the current phase, but also the timing within that phase.

Recession is the phase following prosperity and leading to depression, thus this transitional period is very important to understanding why and how the economy moves toward depressions. In the recession phase there are two distinct halves separated by a peak in prices. The first half of the recession phase, "stagflation", is characterized by inflation; the second half, "bubble years", is characterized by deflation. Production at this time does not actually decline, it simply stops growing, or rather plateaus. Thus, a recession phase can also be referred to as a plateau phase. The slowing down of production is called "negative momentum."⁴

Debt grows throughout the recession phase, slowly in the first half and very quickly in the second half. Debt growth is based on the "increase in the value of financial assets caused by the first signs of disinflation,"⁴ which links debt to prices. Debt suddenly rises much more after the price index peaks and disinflation starts. To summarize, the recession phase begins at a production peak, contains a price peak, and ends at a debt peak. Historically the beginning of a long-wave recession is marked by a negative economic event. For example, the oil embargo, which occurred in 1973, marked the beginning of a recession. While a historical event may initiate and encourage a recession to begin, this event is not the ultimate cause of the recession. Following the long-wave line of thinking, the recession was an inevitable result of the internal forces of the economy as they adjusted for the excessive growth of the previous prosperity wave. Also, the activity of short-term cycles creates mini-recessions and depressions.

Depression is a period during which the economy declines and reaches its low point. The depression phase of the long-wave approximately correlates to periods labeled by the public as depressions. However, the long-wave ignores short-term economic fluctuations such as the business cycle which repeats every 5 years. Thus, public perception of the economy is influenced by the long-wave as well as by more short-term fluctuations. Depression phases are characterized by deflation, falling production, and decreasing debt. A depression phase begins with a debt peak, which "by its very nature...coincides...with a major stock market crash, whose impact on the real economy is devastating."⁴ After its peak debt will fall throughout the depression phase. Prices and production, which began to fall during the recession phase, continue to decline. Production reaches its lowest point at the end of the depression, marking the ending boundary of the depression phase.

Recovery phases follow depressions beginning when the economy bottoms out and rises again. Recoveries are characterized by deflation, increasing production, and decreasing debt. A trough in production at its start and a trough in prices at its end bound the recovery phase. Thus recovery begins just as production bottoms out and begins to rise, and it ends just as prices reach their lowest point but before inflation begins. The recovery phase or "golden age...is generally triggered by a new technological revolution leading to industrial applications," which tends to cause "improvements to the living standards of the average person."⁴ Economic theories often link technology to the economy, which is beyond the scope of this work. The long awaited boom in the economy and new technologies of recovery phases makes them the most fondly remembered economic times.

Prosperity phases are the long periods, about 20 years, of steady economic growth that results from the previous recovery. Inflation, rising productivity, and low debt characterize a prosperity phase. A trough in prices marks the beginning of a prosperity phase, and inflation persists through the entire phase. Production, which began rising in the recovery phase, continues to increase until it reaches a peak. A peak in production forms the ending boundary of the prosperity phase. Debt falls during the first half of the prosperity phase, bottoms out, and rises during the second half. Overall economic growth of a prosperity phase will eventually exceed the point of economic equilibrium, and economic forces will that work to slow down this growth will move the economy back into a recession phase.⁴

Invention and Innovation

In efforts to understand the overall behavior of technologies, researchers have noticed clusters or peaks of innovations alternating with deficits of new technologies.^{9,10,11} Over time, these times of greater and lower levels of innovation create a pattern of pulses in innovations approximately every 50-60 years. This happens to be the same time interval as the economic long wave; a phenomenon that many researchers have explored. Measuring the amount of innovations being generated in a society has been done through several venues including measuring patents issued, new industries created, and the appearance of significant new technologies. The application of a new idea, not based on a preexisting idea, qualifies as an innovation.

Inventions tend to show a reciprocal behavior to innovations, peaking when innovations are at a low and bottoming when innovations peak. To clarify, innovations refer to the application of an idea while inventions refer to the conception and development of the ideas. Inventions created during an invention peak tend to be applied during the following innovation peak. The behavior of both innovations and inventions are accounted for in the four phases of the inventions and innovations cycle. The four defined phases are ignition, gestation, production, and harvest. One cycle tends to last 50-60 years, which is reminiscent of the economic long-wave. Innovations may result in anything from new types of transportation to new philosophical paradigms. The invention-innovation cycle can be applied to practically any field of study from engineering to the social sciences, and therefore this model is important to understanding change in any field, including reforms in medical education.

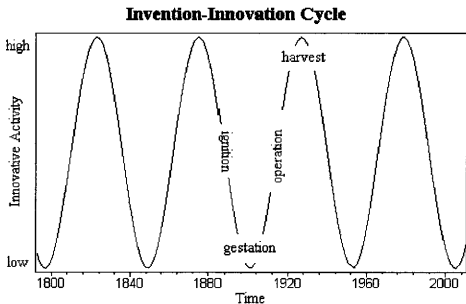


Figure 2. The frequency of innovations is represented by the invention-innovation cycle, which shows alternating periods of relatively high and low innovative activity. Four phases are labeled: ignition, gestation, operation, and harvest.

Ignition is the beginning of a new invention upswing, and this phase corresponds to an innovation downswing. Innovations begin to fall rapidly as the society is enjoying benefits of the new technologies implemented during the previous harvest phase. This decrease in innovations may encourage inventive thinking, as the decline of technological growth becomes apparent. When people think of new technologies and new ways to approach problems, they will often discuss their ideas with other scholars and inventors within their perspective fields. This process of discussion can generate many new ideas, further encouraging the increase of inventions.

Gestation is the development of ideas and correlates with a peak in inventions but few major innovations being introduced to society. A rise in inventions and increased activity in research and development characterize this phase. On the other hand, innovations are few in numbers. This phase serves as a time when ideas are tested and refined, in order to prepare them for application in the society.

Operation is the application of the ideas developed during gestation. New inventions decline as the society turns its attentions to implementing the promising inventions developed during gestation. The operation phase allows the society to build the knowledge bases, skill bases, and infrastructure necessary to support the new technologies that are being introduced.

Harvest occurs when the innovations have been fully implemented and are benefiting society. An innovation peak and an invention trough correspond to the harvest phase. The new technologies are fully realized as the society appreciates and adjusts to them. Because satisfaction with existing technologies is very high, new inventions that challenge the status quo are not encouraged.

Generations

The existence of generations is an idea that is very common in terms of families, and historically people have used generations as a way of measuring time. On a more broad societal level generations refer to a group of people within an age range, who have had common experiences and generally share a common worldview.^{12,13} One familiar societal generation would be the Baby Boomers, people who were born at the end of WWII and who participated in the social revolutions of the 1970's.⁶ A generation is shaped by major events of its time, and it then goes on to shape future generations. Generations have been recognized by scholars as early as Plato. Plato's "theory of the immanent change of the political systems" was based on the birth of a "new generation." The cyclical behavior of generations was identified by Polybus (ca. 204-122 BC) who compared "the evolution of human societies...to the biological cycle of growth, maturity, senescence, and death."¹⁴

Strauss and Howe present a clear and comprehensive model for understanding generations in America in their book *Generations: the history of America's future 1584-2069* (2000).⁶ Their formalized theory of generations identifies four types of generations: reactive, civic, adaptive, and idealist. Any given generation spans about 22 years, which is the average length of one of the four major phases of life: childhood, adulthood, mid-life, and elderhood. Because a new generation is born approximately every 22 years, many generations exist together in the same society within different age groups. Unlike economics or technology, which can be described with clearly defined phases, generations have indistinct boundaries.

Strauss and Howe have noticed that the civic and idealist generations tend to be the dominant in shaping their society. When a civic generation is dominant, there tends to be a secular crisis (war, depression ect.). WWII or the American Revolution are examples of secular crises. When an idealist generation is dominant, there is a spiritual awakening marked by major social unrest, social change and increased interest on the spiritual or religious realm. The social revolution of the 1960's and 70's is an example of a spiritual awakening. Studying a model of generation cycling provides a way to understand major shifts in the culture and perspectives of American society, which invariably affects all social institutions, including medicine.

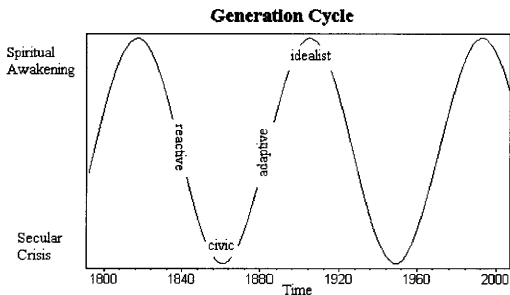


Figure 3. The generation cycle represents changes in the dominant adult generation over time. Four types of generations—reactive, civic, adaptive, and idealist—form within American society in a cyclical manner. Spiritual awakenings occur when idealist generations are dominant, and secular crises occur when civic generations are dominant.

A civic generation is considered to be a group of people born after a spiritual awakening. This group of people will face a secular crisis during their young adulthood such as a war. If the outcome of the crisis is positive, then that experience will empower the generation to become “dominant, outer fixated, . . . heroic and achieving” adults who build “institutions as powerful midlifers.”⁵⁶ Triumphant over the major crisis will also instill faith in the institutions that helped the civic’s to achieve success. Overall, a civic generation will focus its attention on creating and strengthening institutions, and will lead the nation to interact with other countries. The people within this generation will have cohesiveness as a group, which enables them to act effectively to achieve changes. However, most of their actions will work to improve upon the existing institutions rather than change them.

Adaptive generations follow civic generations. As adaptive members are born in the midst of a frightening crisis, they will tend to be “overprotected and suffocated youths.”⁵⁶ When they become young adults the secular crisis is over, causing them to miss an opportunity to prove themselves or be challenged. As a result they become “risk-averse, conformist rising adults” and “indecisive midlife arbitrator-leaders.”⁵⁶ Their most important function is to serve as mediators when the older civic generation clashes with the younger idealist generation. Because they are sandwiched between two dominating generations, they tend to adopt the outlook, agenda, and goals of the more dominating generation. Thus when adaptives are young and civics are in midlife, adaptives look up to the civics and work toward the civic goals. Later, when adaptives are in midlife and idealists are rising adults, adaptives value the younger generation’s goals and supports idealist movements.

Dominant idealists are brought up in a safe, stable environment after the victory over a secular crisis. As children, idealists are valued and cherished by older generations who "indulge" them. When they begin to reach adulthood, they "inspire a spiritual awakening" that leads the nations to focus on its inner-self or spiritual nature. During a spiritual awakening idealists will challenge the existing institutions and traditions, causing major social revolts and revolutions. As an "inner-fixated" generation, idealists value their own selves more than the society as a whole, and the generation becomes very disunited. Their fragmented efforts are very effective in destroying existing institutions, but they are significantly less successful in building new, strong institutions.

Finally, reactive generations follow idealist generations. As they grow up during a spiritual awakening while the society is shifting towards instability and narcissism, reactive children are "underprotected, criticized,...and alienated." This upbringing shapes the reactive persona into an unsure, risk-taking generation. The reactive generation faces the next secular crisis in their midlife along with the next young adult civic generation. During this time reactives provide realistic and practical guidance that serves to lead the younger civic generation to victory. The younger generation then matures into a new dominant, civic generation, thus completing the cycle.

One important assumption of the generation cycle just described is that the secular crisis ends positively. If a secular crisis is initiated when a strong, civic generation, a practical, reactive generation, and a wise, idealist generation are all present, the society will have an advantageous mix of generational types to achieve success. However, if a crisis comes at a different time the society may not be ready to face a challenge. This has happened once in America's history when the Civil War began out of synchrony with the generational model. Also, because the Civil War was between Americans, no outcome could be positive for everyone. After the Civil War, the generation that should have become the next triumphant civic generation instead became an adaptive generation. The generational model essentially "skipped a beat" by not forming a civic generation and continued on with its normal behavior. This exception, or deviance of generations attests to the importance of historical events in shaping a generation.

MEDICAL EDUCATION REFORMS

Flexner Report

In 1910, the Carnegie Foundation commissioned Abraham Flexner to write a report on the conditions of medical schools in America and to offer his recommendations for change. Flexner's recommendations were implemented, resulting in drastic changes in medical education across the nation. The Flexner report was not the sole cause of these changes; there were many factors working together to facilitate change. However, the report did serve as a crucial catalyst for change. Its publication was the event that unleashed all of the pressures within medical education and society, which were building up to a reformation of the American medical education system. The Flexner report is a milestone in the history of medical education and is recognized as the most successful and well-known medical education reform.^{15,16,17} Much of the success of the Flexner report was due to the expediency with which it was implemented. This suggests that the Flexner reform was working with outside influences rather than against them. It is necessary for a reform to have strong driving forces that it can harness to bring about real change.

Prior to 1910, medical educators in America had been slowly working to improve medical education in America. During the 19th century, most medical schools were proprietary schools. These were for-profit institutions, lacked entrance requirements, and provided questionable training to students. Some medical educators were extremely concerned about the state of medical education in America, and looked to German university medical schools as the ideal. The creators of the AMA and AAMC worked to make American medical schools more like the German models. However, these organizations had little power and lacked a strong consensus necessary to take decisive action. One significant victory for those in favor of university-controlled medical schools came with the founding of Johns Hopkins University College of Medicine. Johns Hopkins was significant to the Flexner Report, because Flexner visited the school and used it as his standard for all American medical schools to follow. Thus, Johns Hopkins might be called the first modern medical school in America. Then, in 1905, the AAMC and AMA finally convinced state licensing boards to enforce standards upon the dubious proprietary medical schools.¹⁸ By getting the real power brokers, the state governments, involved in medical education, the AAMC placed an enforcement mechanism in place that Flexner later used to affect rapid and conclusive changes.

Flexner was very involved in education throughout his life, but he was not affiliated with medical education until the Carnegie Foundation invited him to critique medical schools throughout America.⁶ His previous non-involvement in the medical arena and lack of affiliation with any medical institutions allowed him to be an unbiased judge of medical schools. When he published the report, the public trusted his objective opinion, and the report was widely accepted. Also, because of the very public nature of the report, medical schools were forced to take his suggestions seriously. As governmental agencies became involved in the process, medical schools had no other choice than to meet his standards or close their doors. After 1910, Flexner remained closely involved in medical education. His personal efforts to implement the reforms proposed in the report were vital to the reform's success.

When Abraham Flexner was commissioned to write the report in 1909, the explicit purpose of the report was to decrease the number of doctors and turn medicine into a science. In this sense the report was an undeniable success.¹⁹ Moreover, Flexner went beyond the immediate scope of his assignment when he discussed university affiliations, faculty activities, and even his own educational philosophies. In the report, Flexner openly criticized medical schools across the nation and set a clearly defined standard to which they would be held. A unique aspect of the report was that it vocalized ideas that had been simmering within the medical community for years. The creation of the AMA, AAMC, and Johns Hopkins Medical School were all attempts to bring about the very reforms that Flexner recommended. His report popularized medical education reform at a time when the public was prepared to support reforms. With public attention came government involvement that held power to make changes happen.

The Flexner report changed medical education by changing institutions where medicine was taught. It set the standards that medical schools are judged by even today. Flexner demanded that medical schools be run by a university, be affiliated with a teaching hospital, hire full time faculty, provide laboratory experience, and be involved in research, among other things. These changes are credited with making American medical schools the finest medical institutions in the world.¹

Problem Based Learning

Problem-based learning, or PBL as it is commonly referred to, is an educational movement within medical education that has impacted teaching philosophies, curriculum, and learning environments at medical schools nationwide and worldwide. That it has had an impact on medical education is sure, yet the appearance of this effect varies from school to school. PBL, at its heart embodies a new approach and philosophy for medical education and it has proven very flexible in its application. This flexibility is partly responsible for the survival of PBL amidst the chaos of numerous teaching methods. New educational movements within medical education, such as case-based learning, incorporate many of the ideas of PBL.²⁰

The ideas that eventually led to PBL were developed long before PBL became a public movement that spread throughout the medical community. The “distinctive method” of PBL has existed “since the 1950’s when Case Western Reserve University began developing a problem-based course in its medical faculty.”²¹ PBL also “had its origins in simulations of patient problems called problem boxes...at the University of Southern California in 1969.”²² The PBL method made its way closer to the limelight when McMaster University was founded and introduced a PBL curriculum in 1968.²³ As a new institution, McMaster University had an opportunity to embrace a new, experimental curriculum because it had no preexisting traditional curriculum to compete with.²⁴ After four years, when the first class of medical students graduated, PBL had gained the attention of medical educators. Other universities including the University of Washington School of Medicine had already begun to “utilize[ed] problems as the basis of their teaching” in some classes.²⁵ McMaster was unique in its total commitment to PBL and thorough development and analysis of this educational reform. Finally, in 1974, Victor Neufeld and Howard Barrows from McMaster wrote the article that first used the term “problem-based learning” and described the new approach in its complete, modern form.²⁶ The two decades prior to 1974 made up the formative years for PBL as it took its modern shape. The next two decades would make up a normative time period for PBL as it became well known and accepted (in some form) at medical schools across the nation. Many people at several universities participated in the development and implementation of PBL, making it a very collaborative effort.

Howard Barrows has been credited as being "closely associated with the problem-based movement in North America."²⁰ He played an integral role in its development at McMaster University and has written several books and articles devoted to the subject. While the movement is ultimately a collaboration of ideas and effort, Barrows' personal impact on PBL has been significant as he articulated the PBL approach.

Despite its high praise by many medical educators, PBL was slow to be accepted in its full format during the 1970's. During the 1980's six medical schools had created PBL curricular tracks. While medical schools were wary of creating complete PBL tracks, they did begin to incorporate the ideas and concepts of PBL into their curriculum and learning environments.

PBL is based on the idea that problem-solving skills are the most crucial skills a doctor needs to provide good care. This does not reject the need to learn information, but it does recognize that ability to learn and synthesize new information is more important than learning a limited and dated set of information during medical school. With huge amounts of medical knowledge, and the rapid rate growth of medical information, it is necessary that doctors be able to learn throughout their career. PBL attempts to teach problem-solving skills by allowing students to actively solve clinical problems and learn information relevant to the problems presented. PBL created a new learning environment with open discussions, active participation, small groups, and faculty mentors. This environment places learning in the students' control. PBL is vastly different from the traditional method of teaching, which includes lectures, memorizing huge amounts of information, no clinical knowledge until the third year, and little synthesis of material learned.²⁰⁻²⁸ Most medical schools still retain some traditional forms of teaching, but PBL has changed the philosophies and goals of medical schools. Schools now realize the importance of problem-solving skills over the regurgitation of information, and students have more involvement in their education than before.

ANALYSIS

Flexner

The Flexner Report was published in 1910, and this year marks the beginning of the reforms that created the modern medical school. As proprietary, profit-driven medical schools were shut down, universities needed funding to support university based medical schools. Much of the necessary funding was provided by philanthropy. At the time money given to medical schools through philanthropy significantly increased their budgets, and made up a large portion of the schools' incomes. A total of 650 million dollars was used to implement Flexner's reforms.¹⁹ One advantage of donated money was that it was free to be used to improve education as the school saw fit.

In 1910 the economy was in a prosperity phase and near its height. At this point on the long-wave prices were in the middle-high range, production was high, and debt was in the middle-low range. Overall the economy was doing well at this time. A flourishing economy meant that businesses were prosperous, allowing business owners to become wealthy. Successful businessmen would be more able to give money to charitable causes such as medical schools.

Looking at economic trends of the 1910's reveals that the economy was rising at this time seen through rising production, inflation, and increasing debt. These trends would have been encouraging because the economy was moving towards greater prosperity at the time.

On an overall model level, the economy was at approximately the middle of a prosperity phase in 1910. The next recession phase did not begin until 19 years later in 1929. By this time the majority of Flexner's reforms had been implemented. Therefore the following recession phase may not have significantly impacted the application of the Flexner report. Additionally, because the Flexner report was halfway through the prosperity phase, it was about 20 years after the previous depression. For the past 20 years the economy had been steadily improving through recovery and prosperity phases. The past economic growth may have played a part in helping to create businessmen who later invested in medical school reforms.

Technological development could have affected the Flexnerian reforms in several possible ways. First, improvements in scientific knowledge and medical technology would alter the medical field. Medical education would experience reforms in order to adapt changes in medicine. Second, as technologies developed in all fields the society would change, thus requiring a response from medical education. Finally, reforms, which are changes in the way something is done, might also be viewed as inventions themselves. The application of reforms in actual medical schools would then be seen as innovation.

At the time of the Flexner report, both innovations and inventions were at moderate levels. Yet, their trends were moving in opposite directions. The rate of inventions was decreasing and the rate of innovations was increasing. The model shows that the Flexner report occurred approximately at an operation phase. Inventions had peaked shortly before the publication of the Flexner report. Innovations were still relatively low, but increased through the 1910's. Farther back in the past, an innovation peak had occurred in the late 1800's, which included many significant developments in medical understanding and technology. Innovations in medicine had a direct impact on medical education.

As an invention, the Flexner report coincides well with a high level of inventions through society. The ideas encompassed within the report had been developing since about 1890, and this coincided with an invention peak when the development of new ideas is at a high point. The implementation of the Flexner report occurred in synchrony with the application of other inventions during an innovation peak.

The success of the Flexner report may have been affected by the persona of the generations present in the early 1900's. The real power that implemented Flexnerian reforms was the government, whose involvement depended heavily on public attitudes. The favorable and highly publicized nature of the report may have been significant in its widespread effect. How the public perceived medical education and the value that medicine held would have been affected by the overall personas of generations. People involved in carrying out the reform included Flexner, other medical educators, the government, and the public. All of these people were part of society, thus each person belonged to a generation. They were able to enact radical reforms in medical education because reform was part of their persona. Major reforms were witnessed in various arenas, earning this period of history the title "the progressive era."

Flexner and his peers belonged to the Missionary generation. The Missionary generation was known for reform, muckraking reports, and idealism. According to Strauss and Howe, this was a generation of idealists, who dominated American society in the early 1900's. Flexner showed himself to be an idealist. He promoted only the strictest, most ideal (in his mind) model for medical education, the university medical school with full time faculty, research, laboratories, and teaching hospitals. "From the 1880's through the 1940's, the Missionary hand can be seen pushing American ideals and history forward."⁶ The time of medical reform occurred during a period known as the "Missionary Awakening."⁶ During this time the Missionary generation was moving into midlife, and they began to assume leadership positions, which gave them power to enact change. The Missionary generation had the most direct and possibly significant impact on reforms implemented by Abraham Flexner. However the generation preceding the Missionary generation, the Progressive generation, influenced Flexnerian reforms as well.

The Progressive generation, which developed prior to Flexner's missionary generation, was primarily concerned with economic and industrial growth. Theirs was a time when science was used to further the nation. Medical discoveries became applicable to medical practice. The growth and usefulness of science gained the faith of the public, which prepared the public to support funding for research and development. Successful German science proved the practicality of research, thus creating support for research in America by 1900.¹⁸ Flexner made research a critical aspect of every medical school, and pre-existing public support for scientific research allowed his plan for medicine to receive support and funding.

The Progressive generation also developed educational research and theories. Dewey's educational theories, which stressed active learning, had a significant impact on Flexner. Progressive medical educators were concerned with giving students better education. The Johns Hopkins University, developed by Progressives, was the first medical school to have its own teaching hospital. Johns Hopkins Medical School was a prototype of the modern medical school and the model that Flexner hoped every school would live up to. Progressive educational efforts also improved the quality of secondary schools, which produced stronger medical candidates. In 1865 there was a "revolution in higher education in America. The public... began to change its mind" about the usefulness of education and the government made education more accessible to the public.¹⁸ Education was highly valued by Progressives so that there was already significant public support for improving education.

It is undisputed that the Flexner Report triggered the most significant beneficial and long-lasting changes in medical education. It is also credited with helping to make American medical education a world class system. How is its relationship to these social forces important to its development and success? Intriguing questions are clearly aroused by this application of social systems to medical education.

Problem-Based Learning

Problem-based learning (PBL) experienced a rather gradual introduction into the medical community at large during the early 1970's. By 1974 a matured PBL had found its way into an article that used the term "problem-based learning."²³ The 1970's were a time when behavioral cycles of the economy, technology, and generations were reaching turning points. Old phases of behavior were coming to a close and new phases were beginning.

In 1973, an oil embargo marked the beginning of a recession in America.⁵ The overall level of production was very high at the time. But more important than its status was the change in its trend as production stopped rising and began to fall. Prices would also experience a reversal in direction a little later than production. Prices had been rising for the past 40 years, and this inflation continued in the 1970's. But as the 70's came to a close inflation gave way to disinflation. The long-wave model reveals that the economy had been rising since about 1937 when America emerged from the Great Depression. In the 1970's the economy reached its peak and began to fall, reversing trends in production and later in prices. A recession and mild depression would soon follow causing economic hardship for the next approximately 30 years.

Unfortunately for PBL, the economy took a downturn just as this educational movement was gaining momentum. PBL is much more resource-intensive than traditional methods, and is difficult to manage because students have more control over their education. In order to be widely accepted, PBL needed to have hard facts and dependable research to back up its implementation. It may have been that medical schools needed to be completely convinced that PBL would be beneficial enough to merit the extra time and expenses it required. In a period of limited resources, any use of valuable commodities such as faculty time must be justified. Over the past thirty years many studies have been done to understand the benefits and disadvantages to PBL. But this work might have occurred more quickly if the economy had been rising and resources had been readily available. Thus, PBL's close proximity to a recession and following depression may have contributed to its slow and incomplete application as a teaching method.

Within the invention-innovation cycle, PBL occurred during an operation phase. Moderate levels of inventions and innovations characterize operation phases. However, the model shows that rates of innovation are increasing while rates of invention are decreasing. The spread of PBL, following its first publications, occurred during the operation phase and following harvest phase. Harvest phases are periods when the innovation rate peaks and the benefits of new technologies are realized. During a harvest phase the same societal forces that encourage the application of new technologies seem to discourage invention of other radically new technologies.¹¹ This might be due to society's satisfaction with existing technologies during harvest phases. New technologies introduced during this time would have affected the medical field both indirectly and directly. Medical discoveries and new methods of diagnosis and treatment added significantly to the amount of information that medical students needed to master. These changes in medicine may have encouraged or even driven changes in medical education.

During the 1950's and 1960's educational reforms proliferated, which is consistent with the invention peak that occurred during this time. Invention peaks are characterized by the development of new ideas, which can include new educational theories and philosophies. PBL's early development at Case Western Reserve in the 1950's may have been part of a general movement toward educational reform throughout America. When PBL reached its mature form in the 1970's, however, the gestation phase had already past, and America had entered an operation phase. During operation phases, the inventions developed during the prior gestation phase are implemented. If PBL had not finished development during the gestation phase, changes in the society toward implementation (before PBL was fully mature) might have affected further progress of the PBL movement. While being slightly behind other educational innovations may have disadvantaged the progress of the PBL movement, PBL did develop in relative synchrony with other new educational movements in America.

The PBL movement began just as America experienced a major shift in dominant generations. The 1970's were a time when the Baby Boomers were coming of age and beginning to make significant impacts on society. The radical social revolutions of the 1970's included student protests and the civil rights movement. Social movements were a testament of the "spiritual awakening" occurring in America. Spiritual awakenings are characterized by social change and unrest, an internal focus both nationally and individually, destabilization of institutions and the dominance of idealist generations such as the Baby Boomers.⁶ Changes seen throughout society may have influenced changes within medical institutions.

Founders of the PBL movement were members of the Silent generation, mid-life adults during the spiritual awakening. As an "adaptive" generation, the Silent generation worked to transition American society from the GI generation of WWII to the much more liberal Baby Boomer culture. Children were viewed as the promising future of America during the Silent generation's time, and significant efforts were made to invest in children.⁶ The many educational reforms implemented in the 50's and 60's may be results of increasing faith in America's youth. PBL itself is a testament to a positive view of younger generations because it tries to improve education, focuses on the student's skills rather than facts, and gives students more control of their education. Baby Boomers held a wholly different view of children; they saw the generation younger to them as irresponsible and rebellious. As the Baby Boomer view took hold in society, educational philosophies like the PBL movement would have met more resistance.

PBL experienced a very slow birth and was incorporated into medical schools with caution. As a philosophy, PBL has had huge impacts on medical schools throughout the nation and world. Yet, the implementation of ideas introduced by PBL has been unique for each medical school. Some schools shifted their entire curriculum to PBL methods, other schools partially incorporated PBL into their programs, and certain schools have developed new curricular reforms influenced by PBL. The relationships between medical schools and economic forces, technological changes, and cultural changes could have affected the development and spread of PBL. Looking at the behavior of economic, invention-innovation, and generational models during the time of the PBL movement raises fascinating associations.

SUMMARY

The question proposed at the beginning of this work was: could societal systems models be used to understand interaction between medical education reforms and society? Exploration of both the Flexner report and the problem-based learning movement increasingly leads towards an affirmative answer. Yes, the application of social systems to reforms in medical education, through temporal and comparative analysis, can increase understanding of social influences and provide a springboard for new discussion.

The use of social systems provides several advantages for studying reforms within medical education. Social systems provide a context where events in medical education can then be placed. Gaining a view of the context surrounding an event allows the observer to understand other events in other areas of society that have indirect, yet significant impacts on the event being analyzed. Once the context has been understood well, putative cause and effect relationships are found. Researchers can then explore these relationships through many avenues of study. Perhaps one of the most obvious, yet most significant benefits to using societal systems models is that they simplify complex information. Gaining a command of the interactions between medical education and societal forces is essential to achieving the best educational system possible. Yet, as information grows as enormous speeds this task becomes increasingly difficult. Models can aid leaders involved in medical education in understanding and appropriately responding to changes in society. In many fields, especially the business world, people are increasingly aware of the importance of social influences, and the social models being developed today can provide valuable tools to medical educators as they endeavor to lead medical education in new directions.

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VITA

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