

MEDICAL EDUCATION

McMaster University Medical School: The Little School That Could - And Did

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FOUNDING FATHERS

J. E. Evans	Dean	F. L. Johnson	Ob. Gyn.
J. F. Mustard	Pathology	A. Zipursky	Pediatrics
J. Anderson	Anatomy	N. Epstein	Psychiatry
W. J. Walsh	Medicine	D. L. Sackett	Epidemiology & Biostatistics
W. B. Spaulding	Medicine	R. Hall	Biochemistry
E.J.M. Campbell	Medicine		
C. B. Mueller	Surgery		
P. Cockshott	Radiology		

PART I – THE BEGINNINGS¹

The new McMaster Medical School with no classrooms, no courses, no lectures, no exams and no grades was a total departure from conventional medical education wisdom. Its predominate instructional concepts were problem based and self-directed learning in a tutorial setting.^a Considered consistent with adult learning rather than the categorical and encyclopedic style of youth learning, it was a modification of the “Case Study” method used in business schools, particularly Harvard. The preclinical curriculum was a series of patient-centered biomedical problems (BMPs) derived from the entire domain of medicine.

By late 1965 John Evans had been selected as founding dean, promised \$25-million and a 370 bed hospital. A world-wide search assembled twelve “founding fathers” who were attracted to an opportunity to create something new. The collective interests, past personal experiences and interactions within the group resulted in this unusual program; one that a few early potential faculty recruits felt was too radical and unworkable. More interested in student learning than a formal curriculum, the fathers felt that lectures were useless as learning tools, and formal courses inappropriate in structuring the learning of medicine. End-of-course examinations that tend to drive student learning were

believed unsuitable to assess the performance of neophyte physicians, and grades unable to convey co-operative behaviour, interpersonal skills or professional competence.

The result could probably have happened only during the 1960s, a decade dominated by a youth culture that had endured neither the deprivations of a Depression or the excesses and brutality of a World War but knew the prosperity and unbridled materialism of post-war years. It brought the Peace Corps, the feminist movement, communes, flower children, the Woodstock music festival, free love, civil rights activism, a drug culture and an anti-war movement on almost all American college campuses. The youth of the sixties saw the educational system as stultifying, and an undisguised desire for student liberation permeated campus life.

The Education Committee

One of the first - perhaps the most significant - actions at the medical school was the formation of a four-man Education Committee that was responsible for all education and evaluation activities. It was designed as a program concerned more with student learning than with the prerogatives of a departmentally structured curriculum.

The most visible and famous of the innovations declared: no courses of study, no lectures, no examinations and no grades. Tutorial teaching and problem based learning

became the features most copied by other schools. The program was three years in length and one fourth of the time was designated as elective time that could be spent anywhere - the only stipulation being approval of a faculty advisor. The two preclinical years utilized paper problems (biomedical problems - BMPs), while the third year presented "real patients" as problems in a series of clerkship rotations.

The problem sequencing began with generic concepts such as infections, inflammation, cancer, growth and repair. Patient-centred problems of illness, sickness and wellness were created. Students were expected to focus on basic mechanisms that underlay diseases, e.g. the anatomy and physiology of cardiovascular illness would be learned in the context of an individual who presented with heart failure or shortness of breath. Not all students learned the same thing, nor saw illness in the same dimension; thus, in the tutorial setting, it was easy to discern the self-directed nature of learning. There was no attempt to direct which facet of a problem should be discussed by a tutorial group.

Tutors and the Tutorial

The "tutorial", adapted from the English tutorial systems of Oxford and Cambridge, became the setting for learning. Five students and one tutor meeting two or three times each week for the six weeks would discuss problems drawn from a prepared list. The setting was expected to enhance interpersonal behavior and communication skills as well as impart medical information. The role of the tutor was that of a "helper in learning" rather than one who "tells all", and the student who could say to colleagues "I don't know, help me", was the superior learner.

In the absence of formal examinations, evaluation of student performance was done by the tutor who was expected to know how much each student knew, his/her ability to use the library, manner of learning and interpersonal reactions. This obligated a change in traditional faculty/student attitudes for it required tutors to participate and partner in student learning, as well as evaluate and judge how much was learned. This dual "partner and evaluator" role proved impossible.

Admissions

In the belief that the practice of medicine was more than a biochemical or physiologic affair, a science background was not deemed necessary. Entry requirements were three undergraduate years, a B- or minimal grade and no requirement for biology, chemistry or physics. Interpersonal skills such as gentleness, tolerance and an ability to communicate were emphasized. In a small internal 1983 study, a group of students who possessed high grades and a science background (the science stream) were compared to a group admitted on the basis of "personal qualities". By the middle of the final year the two groups were indistinguishable.

Special consideration was given to applicants having field experiences as volunteers, social workers or other international interests. Rarely, applicants were admitted with less than one year of university education. The admission of aboriginal peoples was facilitated with the expectation of a return to native communities.

The Curriculum

Even though students saw patients by the second week of school, the formal curriculum consisted of paper problems presented in six-week units. Initially, the problems were biomedical, i.e. illness, sickness and wellness. However, within a few years problems expanded to include normal and abnormal behaviours, and then population illness, elder care, trauma, epidemics and group behaviour to introduce concepts of statistical inference.

Faculty Structure and Matrix Management

Department chairs were appointed for a fixed term of five years with one renewal. Their role was more of a personnel manager than leader whose position was won by virtue of personal clinical expertise or research fame. The chair supervised promotion, determined rank and pay, and recruited appropriate personnel.

"Matrix management" was an attempt to systematize interdepartmental activities under a "program" with an appointed director. The matrix had a vertical structure of departments and a horizontal structure of programs containing individuals from several departments in the expectation that a formalized program would improve understanding and co-operation. Matrix management was difficult to reconcile with departmental prerogatives and conventional ideas of faculty order. Removal of departmental boundaries and the creation of interdisciplinary working groups was a worthy objective, but departmental attachments proved stronger than programs. It did, however, provide a framework for the allocation of resources and personnel among the several participating hospitals of Hamilton.

The most successful program is the Program for Educational Research and Development (PERD) that enlists individuals from many departments with interests in the educational process. It continues to serve as a faculty resource in issues of education and has become a vibrant educational research center. The matrix provided a basis for recruitment of research individuals from several disciplines and its programs survive with varying degrees of success.

Continuous Renewal

With innovations in teaching methods, curriculum design and academic structure, the only constant at McMaster is change. The obligatory renewal of deans, department chairs, program directors and committee chairs permit the school to keep pace with changes in the practice of medicine and new

techniques in the education of medical students. Continuous renewal initiated in 1967 became and remains the order of the day in 2008.

PART II – MCMASTER AT FORTY

At forty, the child of the hippie generation is alive, well, expanding and changing. Biomedical research has become the dominant force, although interest in education and educational research remains strong. There is a research budget approaching \$300-million per year.

The School of Medicine became affiliated with other schools to form a Faculty of Health Sciences that includes Medicine, Nursing, Midwifery, Rehabilitation Science (occupational and physical therapy), undergraduate and graduate degree programs in biomedical and health sciences. In 2000, a baccalaureate degree in health sciences was established to replace the modified LAS requirements that accommodated premedical students. More than 1,200 students are enrolled in studies leading to a Bachelor of Health Sciences degree that satisfies the prerequisites for admission to all medical schools in Canada and most in the United States. The baccalaureate and masters degree nursing programs enrol 1,430. There are currently almost 4,000 students in the Faculty of Health Sciences.

Medical School Enrolment

The medical school class has increased from 20 first-year students in 1969 to 148 per year, and by 2008, two regional campuses in nearby Niagara and Waterloo regions will increase the class size to 176.

Applications for the 176 places exceed 4,800 per year; 80% come from Ontario. Since the first graduation in 1972, 3,200 students, of whom 63% are women, have received medical degrees. More than half practice with a university affiliation.

Post-graduate (residency) positions register 658 residents in 48 specialties from approximately 3,550 applications per year. The 1,500 that come from Canada, whose total medical school output is 2,000 per year, give testament to the quality and desirability of McMaster's clinical training.

The medical school faculty is composed of 630 full-time and 1,140 part-time physicians, supported by 880 full-time and 210 part-time staff. There are 55 fully endowed professorial chairs.

SOME THINGS HAVE CHANGED

Admissions

Admission requirements have been tightly refined. Three years of university study is now basic, and a grade of approximately A- necessary. There is still no requirement

for courses in biology, chemistry or physics. The special provisions permitting consideration of extra-academic activities in lieu of formal education have been discarded. Twelve percent of applicants present with advanced degrees. The aboriginal admissions policy providing opportunities for members of the First Nations is the one exception to regular stream requirements, and 2-4 such students per year are admitted.

The personal interview of early years proved unsatisfactory and has been replaced by a multiple mini-interview (MMI). Candidates pass through twelve stations where they are presented with scenarios that require a discussion of issues such as ethics, the Canadian Health Care System, communications or interpersonal collaboration. Since its development, the MMI has been copied nationally and internationally.

Evaluation

Tutors were ill-equipped to judge a student's knowledge and "student self-assessment" was also found to be an inaccurate estimate of either skills or knowledge. Despite this, end-of-unit examinations that are thought to drive student learning only toward passing the exam have been consistently opposed.

Three assessment tools now support the evaluation process. First is a small multiple-choice test known as the "Personal Progress Index," drawn from the entire domain of medicine and not related to any specific unit, phase, topic or discipline. From a bank of 2,500 questions, 180 are drawn and administered three times per year to all students in school, and is sufficiently broad in scope to discourage studying for it. Scores improve as students learn more in the field of medicine. There is no pass/fail standard and a student cannot fail because of the test, but it allows early identification of students in academic trouble. The PPI uses classmates as the reference group and those in the lowest 5% on two subsequent exams are selected for review and, if deemed necessary, remediation.

Clinical skills are assessed at annual intervals by a series of events that allow observation of the interaction with simulated patients.

A final addition is in tutorial sessions where respect, responsibility, communication skills and self-awareness are evaluated. It is possible to observe rudeness, lack of punctuality, judgmental behaviour, failure to complete assigned tasks or other deficiencies in professional behaviour.

Change is continuous as new developments in evaluative techniques are introduced, but what remains steadfast within the faculty are the initial premises of no grades and no student ranking.



McMaster University, Faculty of Health Sciences first medical graduating class, 1972

L-R Top Row: Dr. William Spaulding, Dr. Fraser Mustard, Dr. John Evans, Dr. William Walsh, Dr. Howard Barrows

L-R Second Row: John Sellors, Stanley Rodier, Arthur Leader, Peter Lapsley

L-R Third Row: Richard Haber, Ralph Bloch, Stephen Foster, Jack Franaszek

L-R Fourth Row: Peter Milder, John Cunnington, David Storey, Philip Maurice, Andrew Padmos

L-R Bottom Row: Werner Meirer, Sheila Golini, Russell Emerson, Silvia Szachiniewicz, Robert Ross, Robert Jones

Photo care of Archives of Hamilton Health Sciences and the Faculty of Health Sciences, McMaster University. FHS Public Relations Dept. Photograph Collection.

SOME THINGS HAVE REMAINED ALMOST THE SAME

Of the six most significant educational innovations originally implemented, five (all except evaluation) have survived to the present day.

Appointment to committee and departmental chairs for a five year term with one renewal remains unchanged. A disadvantage is that an external search for chairs has become more difficult and new blood from other schools is seldom infused. The benefit is a faculty that easily accommodates former chairs to profit from their wisdom and experience.

Problem Based Learning and the Tutorial

The two centre-pieces - the tutorial and problem based learning - have remained intact. The tutorial, composed of a

tutor and five to seven students who meet two times a week for two or three hours per session, has proven to be a powerful tool for socializing and developing professional behaviour. The obligation to learn from and adapt to another's peculiarities provides an opportunity for the display of either high-principled or impolitic behaviour, and a list of behaviours considered to be professional (respect, responsibility, communication skill and self awareness) has been introduced.

Problems used for PBL are no longer presented on paper but are now in an electronic format that permits the display of actions, behaviours, signs and symptoms. Problems are clustered into groups that reflect general concepts such as homeostasis, host defence, control of movement, reproduction and growth. There has never been faculty or student

pressure for standard courses such as anatomy, physiology, pathology, etc.

More than 150 medical schools have adopted many, but not all, of McMaster's initial concepts and educational innovations. Problem based learning (PBL) and self-directed learning have been the most copied.^b PBL is an instructional technique easily adapted to almost any academic curriculum, including formal courses with end-of-course examinations.

The tutorial is central to an educational effort that expects mutual support. It is a social context for learning in which students learn to learn from each other. The absence of grades remains a foundation stone in the educational culture as a strongly held principle and is basic to the proper functioning of a system that emphasizes co-operative rather than competitive learning.

Sessions for the entire class now link the tutorial sessions to material of the unit, giving a vocabulary and overview of concepts to be addressed. At conclusion, experts present a wrap-up overview that relates basic information to problems that have been addressed. Tutors are given encapsulated information about each problem to keep discussions focussed, and have been given overt responsibility to guide

the students. They may even suggest references to help the group function - an idea untenable in those exciting early years of discovery learning.

FINALE

The essence of forty years at McMaster is best captured by a senior (teacher-of-the-year) professor who will eagerly describe his pleasure in involvement with medical students as they recognize their own abilities in the process of discovery learning. He feels that "all students need is space, time, opportunity and a few signposts along the road". †

FOOTNOTES

- a. In the introduction to his book¹ Spaulding wrote: "In the mid 1960s McMaster University gave birth to a medical school so different it sent ripples of astonishment throughout the educational world [there were] new approaches that were to have a profound effect on medical education. The result was a new kind of medical graduate and one of the most innovative medical schools in the world".
- b. McMaster's medical curriculum provided ideas, inspiration and help to the Harvard Medical School when it designed its well-publicized "second pathway".

REFERENCES

1. Spaulding, W.B. Revitalizing Medical Education. McMaster Medical School, The Early Years. 1965-1974. Hamilton, Ont. B.C. Decker, Inc. 1991

Author Biography

Dr. Mueller served as the inaugural chair of the Department of Surgery in the Faculty of Health Sciences from 1967 – 1972. Prior to 1967, he made significant contributions academically and professionally at Washington University and the State University of New York. Once arriving at McMaster University in 1967, his dedication to education led him to become a founding father of what is now known as the Michael G. DeGroote School of Medicine. Dr. Mueller was a strong advocate and contributor in the advancement of the problem-based and group-oriented learning dynamic the school is currently based upon. Dr. Mueller retired in 1983 and since then has been named professor emeritus in addition to receiving honorary degrees from McMaster, Blackburn College and the State University of New York.