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# Drugs, Devices, and Desires: A Problem-based Learning Course in the History of Medicine

*Sarah Levitt, Anne McKeage, and P. K. Rangachari*

## Abstract

Problem-based learning (PBL) is well suited for courses in the history of medicine, where multiple perspectives exist and information has to be gleaned from different sources. A student, an archivist, and a teacher offer three perspectives about a senior level course where students explored the antecedents and consequences of medical technology. Two active learning strategies were used: (a) PBL to explore the historical basis of procedures used to diagnose, prevent and treat a single disease, tuberculosis, and (b) a concurrent inquiry-based component that permitted individual exploration of other medical technologies and demonstration of learning through diverse options (book reviews, conversations, essays, archival research, oral exams). This course was highly rated by students with an overall rating of 9.5 ± 0.7 (36 students from 2008–2012).

Keywords: active learning, self-directed assessments, medical technology, inquiry, student-centered learning

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# Drugs, Devices, and Desires: A Problem-Based Learning Course in the History of Medicine

All formal teaching involves the interactions between students and teachers in institutional contexts such as schools, colleges or universities. The cardinal elements of any course (objectives, delivery, and assessment) may be seen differently from the perspectives of teachers and students. The institutional setting which provides the framework for resources can either help or hinder optimal functioning. In problem-based learning (PBL) these interactions are intensified, since students and teachers cooperate to make learning more meaningful. This student-centered approach encourages students to become active learners by using situations that require them to confront their own learning needs within broad goals set by the faculty (Savery, 2006; Hmelo-Silver & Eberbach, 2012). PBL stands in sharp contrast to subject-based curricula where facts and concepts that have been pre-selected by their teachers are taught to students, and only then are the ideas applied to diverse situations. The practice of PBL seeks to shift the locus of control from teachers to students. In this educational approach, process and content are inextricably linked and thus what is learned stems from how it is learned.

In 1969, the Undergraduate Medical Curriculum at McMaster University sought "to help students become effective problem solvers by enabling them to understand the principles essential to the solution of such problems and by teaching them how to seek out and use the information required for their solution" (Spaulding, 1969, p. 659). Students used ill-structured problems to guide their search for new information and reflected back on their learning. The process encouraged key skills such as information gathering, collaboration, and self-assessment that were all felt to be critical for professional development. The faculty in this model functioned as tutors or guides and employed small group discussions and also guided the study of learning resources—printed, graphic and auditory. The discriminating and effective use of learning resources was itself seen as a crucial learning objective (Neufeld & Barrows, 1975). This method also enhanced intrinsic motivation to learn (Hmelo-Silver & Eberbach, 2012).

Though the value of the PBL approach has been debated—particularly in the context of professional education (Savery, 2006; Sanson-Fisher & Lynagh, 2005)—it can be appropriate to use PBL for courses in disciplines such as social studies and history (Saye & Brush, 2002), where multiple perspectives exist and information must be gleaned from a variety of sources. Studying history is more than mere retention of names and dates and can be seen as a problem-solving activity (Dundis & Fehn, 1999). Here we describe an upper level course in a Health Sciences program, which had a strong historical bias.

A teacher, a student and an archivist write this report jointly. Each of them provides a different perspective that serves to highlight the interactive nature of the learning fostered by this approach. The teacher (Rangachari, noted as PKR) describes the framework

of the course and the expectations. A student (Levitt, noted as SL) who took this course several years ago provides a student's perspective and discusses the impact of the course on her subsequent career. McKeage (noted as AM), an archivist, discusses the crucial role played by educational resources in courses of this sort.

The course was designed to permit students to explore the antecedents and consequences of diverse medical technologies. Though the course itself was in an undergraduate health sciences program, a number of the students had an interest in joining the health professions, making this a reasonable elective course to offer (Dolan, 2010). One of the more distinctive elements of modern medical practice is the reliance on technologies to prevent, diagnose, and treat diseases. In the context of health care, there is some cause for concern since actions could be taken based on their technical feasibility devoid of concern for costs or consequences. The term *technological imperative* refers to the "lure of always pushing towards the greatest feat of technical performance or complexity which is currently available" (Pacey, 1983, p. 79). When applied to health care, the term technology is broader than mere hardware. Rather, technology includes therapies (drugs, biologics), devices, equipment and supplies, procedures (medical and surgical), and organizational and managerial systems that can be used for prevention, diagnosis, treatment, and rehabilitation of patients. The assessment and value of these technologies can be seen from multiple perspectives: those of the makers, the pushers, the watchers, and the users.

The makers are those who design, develop, manufacture, market, and distribute a particular technology. In this course, the term "pushers" did not have a pejorative connotation, but referred to those who encourage the use of these technologies, including not only the manufacturers and marketing personnel, but also physicians, pharmacists and other health care workers. The watchers are members of society that assess the value and safety of a technology. This category includes not only standard regulatory agencies but also critics, journalists, and consumer groups. Finally, all members of the public are potential users as patients—even those who could belong professionally to any of the other groups. There can be considerable overlap between these categories. A physician involved in developing a drug would not only be a maker, but also a pusher and if he became a patient, a user as well. The context defines one's role in this model.

## Methods

### *Description of the Course*

This course, entitled "Drugs, Devices, and Desires," was an upper level 4th year elective course in a Bachelor of Health Sciences program at McMaster University. The 12-week course was completed in the fall term (September to December).

The students who took this course came largely from either the Bachelor of Health Sciences or the Arts and Sciences programs at McMaster University. Both have limited enrollments where students are admitted on the basis of high academic grades from high school and supplementary applications. These programs stress student-centered learning, so by the time they took this course, the students were accustomed to inquiry-based learning and had done other courses which required them to search, analyze and present information. There were no specific prerequisites to enroll, though most students had taken enough biology to be comfortable with the basic science elements in the course. Fifty-two students took this course over a five-year period (2008-2012) .The number of students enrolled each year varied (smallest number being 5 with the largest 18). PKR was the sole tutor each year.

## *Objectives*

The overall objectives of this course were to provide students with an opportunity to explore the complex interactions between different groups mentioned earlier (the makers, pushers, watchers and users) that led to the emergence of specific technologies. It was expected that by the end of the course the students would have explored in detail the technologies that are brought to bear on the management of a particular clinical problem (tuberculosis) as well as would have had the freedom to explore multiple perspectives on a variety of technologies addressing other diseases.

## *Approach*

This course had two major components (a PBL and an Independent Inquiry element) that ran concurrently. Each is described separately.

### Part 1

A PBL approach was used to explore the historical antecedents of procedures used to diagnose, prevent, and treat a single disease, tuberculosis**.** The rationale for this choice was twofold—the global significance of the disease and the rich local context. Hamilton had a Tuberculosis Sanatorium that played a significant role in the provision of health care to patients and a lot of primary information was available in the archives of the Health Sciences Library.

A modified PBL approach was used based on an adaptation of the general principles of PBL to a larger class setting used in earlier courses (Rangachari, 2000). A three-week cycle was followed.

In the first week, all students met in the same room and were given the problem. As in a standard PBL tutorial, there was a "brainstorming phase." The entire class participated. Either the tutor or one of the students acted as the scribe and listed the points that

were raised. These were discussed by the students and later refined into learning tasks. In contrast to the standard model, self-selected groups coalesced around specific tasks. These groups took on the responsibility of providing information to their classmates in a subsequent session. Thus, the composition of the groups varied depending on the tasks that emerged. This self-selection served to foster self-directed learning based on the content that appealed to an individual student. By the end of the course, students had the opportunity to work with different members of the class in contrast to standard PBL tutorials where the groups remain relatively constant.

The second week was a period of consolidation and learning. Students set up their own meeting times to work on their group tasks. The interim class period was used for other activities, such as field visits to the Hamilton Sanatorium or discussions with guest speakers (see later). This part of the three-week cycle was also an opportunity for clarifying issues and discussing matters with the tutor.

In the third week, all groups met to discuss the problem again. Each group was expected to distribute summaries of their reports at least two days in advance so that these could be reviewed by their peers and discussed in the class. At these sessions the emphasis was on discussion rather than mere presentation of material; in fact the use of formal presentations (such as Powerpoint) was actively discouraged. The course design included considerable flexibility to permit for more contentious issues to be discussed at greater length. Once all groups had completed their presentations, a general discussion followed. The written reports were assessed and a group mark was given. A new problem was then taken up and the cycle repeated. Three problems were discussed during the term, each one highlighting a different aspect of a medical technology. The first focused on prevention, the second on diagnosis, and the third on management. By the end of the course, the students had a more comprehensive understanding of multiple aspects of a single disease.

## Part 2

The independent inquiry component that ran concurrently with the first part of the course further emphasized active learning by providing students with an opportunity to deconstruct the antecedents of specific medical technologies from any of the perspectives (makers, pushers, users, watchers) mentioned above. The self-directed nature of this component complemented the PBL aspect of the course. It fostered what Eisner (1985) would term "expressive" outcomes as it gave students an invitation to explore matters of particular interest to them. They were given considerable license to study diverse technologies that spanned the entire gamut of clinical practice and were not restricted to TB or even infectious diseases. Though students could select from a wide range of topics, some structure was provided. They were asked to select items from the following categories: (a)

diagnostic procedures (b) prevention strategies (c) treatments (drugs, surgical procedures, etc.) and (d) organizational systems.

Students had the choice of exploring *multiple* items from the *same* perspective (one of either makers, pushers, users or watchers) or the *same item* from *multiple* perspectives. For example, they could look at diagnostic procedures, treatments, prevention from the perspective of society as a whole or a single patient. Conversely, they could look at a treatment (for instance, a particular drug or surgery) from the perspectives of inventors, patients, regulators, media, etc. The rationale behind this approach was to get students to recognize that technologies are not intrinsically neutral and that perspectives play a significant role in determining whether or not given technologies are used, abused, or misused. Since the course itself had a historical component, students were told that each of these explorations should include at least in part a historical dimension.

### *Assessment of Students*

Evaluation of the PBL component was based on a group report, which was a brief summary (1000–1500 words) of the material gathered by the group, along with annotated references. This was distributed to the class in advance to permit discussion. It was assumed that all members of the group had contributed equally to this exercise. Since three problems were discussed, each student participated in writing three such reports, each valued at 10 marks (total 30 marks for this component of the course).

For the Inquiry component, students were provided a menu of options to select from. These included (a) learning logs (10 marks), (b) book reviews (20 marks each), (c) standard essays (15 marks each), (d) conversations (25 marks), (e) targeted oral exams (25 marks), and (f) archival research (30 marks). Each option had a particular mark assigned to it, so that students could select any particular combination that allowed them to accumulate 70 marks. For example, they could choose two book reviews (40) and archival research (30) to accrue the 70 marks. Alternatively, they could select an oral exam (25) a conversation (25) and a book review (20) or two essays (30), a learning log (10) and an archival research (30). The inquiry projects were a significant component of the course and they were thus given considerable flexibility in selecting the option that best suited their learning style. If students chose options that gave them a greater number of marks, scores were normalized. This approach fostered self-directed learning and gave students an opportunity to be assessed in a format that was most conducive to their style of learning. The options, along with brief descriptors and a marking scheme were provided to them in the course outline. For instance, students were told that since they had been asked to evaluate technologies based on multiple perspectives, "framing conversations" would be a suitable exercise. Students could select individuals (either historical, fictitious) and frame a conversation around a specific item. For example, stu-

dents could have the inventor/discoverer justify his or her invention to a critical group of users or could have a patient demand from a physician the rationale for proposing a particular line of investigation/treatment. These conversations were assessed on content, clarity and corroboration.

These inquiry options with the exception of archival research had been used in earlier courses and detailed descriptions have been published previously (Rangachari, 2006).

### *Assessment of the Course*

A questionnaire was distributed to the students at the end of the course. In a preamble, students were reminded of the overall course objectives and asked to indicate, on a scale of 1–10, the value to their learning of each of the approaches that were used to help them meet those objectives. These included the PBL approach, the PBL summaries, the menu approach, and the specific inquiry options (i.e., book reviews, targeted orals, learning logs, conversations, archival research, standard essays).

In addition, they were asked to indicate the strength of their agreement with two specific statements: (a) "the course gave me a good insight into the complexities underlying the development of modern medical technologies" and (b) "the course provided a valuable learning experience." Lastly, students were asked for their comments on the options as well as on the course as a whole. These evaluations were filled out anonymously and handed in after the course was over.

As mentioned previously, 52 students took this course over the 5-year period. The results shown in Table 1 are gathered from 36 students representing those five cohorts. The scores represent means ± SD. The numbers alongside each of the options is different since only the students who chose those options assessed their value.

| **Items** | **Scores (Means** ± SD) | **Number Responses** |
|---|---|---|
| PBL approach | 8.9 ±1.0 | 36 |
| PBL Summaries | 8.5± 1.1 | 36 |
| Standard Essays | 8.3± 1.5 | 13 |
| Book Reviews | 8.6± 0.9 | 27 |
| Targeted Orals | 9.1± 1.1 | 12 |
| Learning Logs | 8.1±1.7 | 7 |
| Conversations | 8.9±1.3 | 19 |
| Archival Research | 9.3± 0.8 | 20 |
| Insight into Medical Technology | 9.2± 0.9 | 36 |
| Overall Rating | 9.5± 0.7 | 36 |

**Table 1.** Course Evaluation

## Results and Discussion

In the sections to follow, we look at the course from 3 perspectives. First, the teacher's perspective (PKR) is presented, followed by the student's perspective (SL). Then finally, the archivist (AM) presents her perspective.

### *The Teacher's Perspective (PKR)*

#### The PBL component

Tuberculosis was the central focus of the course. Three problems were used, each with a strong historical bias. Designing problems for a course such as this requires consideration of multiple elements. To stimulate curiosity and promote flexible thinking, problems should be open-ended to foster conjecture and promote argument (Hmelo-Silver & Eberbach, 2012), and be consonant with the objectives of the course (Des Marchais, 1996). The problems written for this course were carefully sequenced to ensure that the students explored the technological underpinnings of prevention, diagnosis and treatment of a single disease. Though the problems were tightly focused, they lent themselves to multiple perspectives.

The first problem dealt with the trial of a vaccine on an Indian reserve in Saskatchewan, a western Canadian province. The second problem addressed establishing a program for medical technologists in Hamilton and the third considered a treatment strategy that was pioneered in India in the mid-1950s.

The first problem is shown in Figure 1. Three different cohorts of students tackled the same problem. In each year, the learning tasks defined were related to the disease, the Ferguson-Simes study (1949), the development of the BCG (Bacillus Calmette-Guerin) vaccine, the ethical issues involved in the trial, and the relations between aboriginal peoples and mainstream Canadian health care. Though the specific tasks were worded slightly differently, the same core elements emerged in each year of the course. In a similar fashion, the learning issues that emerged from the other two problems had a high degree of concordance among different student cohorts. The learning objectives that arose out of those problems included the development of diagnostic procedures, the education of medical technologists, public health measures, treatment strategies, the evolution of the DOTS (Directly-Observed Therapy Short-Course) approach, the role of the WHO (World Health Organization) and MSF (Medecins Sans Frontieres), and global problems in the eradication of TB. By the end of the course, the students had considered the technologies involved in TB from multiple perspectives as envisaged in the course objectives.

The group reports were generally clear and succinct. Emphasis was placed on providing annotated references so that other students could readily follow up on the material

## Part 1

Between October 1933 and December 1945, all Indian infants born in the Qu'Appelle Indian Health Unit on the reserves in that region of southern Saskatchewan were considered for a study to determine the effectiveness of BCG vaccination against tuberculosis. Families of comparable status in housing, sanitation and other socio-economic factors were paired and allocated to one of two Groups labeled A and B. All the children born in families belonging to Group A were vaccinated in one year with the children born in families belonging to Group B serving as controls. The situation was reversed the following year. This pattern of vaccinating only one set of infants each year continued for the 12 year period of the study. At the end, there were 306 children in the vaccinated group and 303 in the control group. Their original data (Tubercle 30:5–11, 1949) has been re-fashioned in a more modern format in the table below, suggesting that the risks of getting TB is significantly higher in the non-vaccinated group:

| Tuberculosis Cases | Vaccinated | Not Vaccinated |
|---|---|---|
| YES | 6 | 29 |
| NO | 297 | 274 |

Ferguson and Simes, the authors, noted that "BCG conferred valuable protection in a highly infectious environment."

## Part 2

Half a century later, a historian from the University of Saskatchewan, looked at the trial from the perspective of the subjects of the study. She asked: "How did an isolated, poverty-stricken agency in an equally isolated province come to be the site for a major medical experiment? Who were the subjects and how did they benefit?" Maureen Lux ends her paper with the following sentence "The BCG trial was a success, but unfortunately the patients died."

Canadian Bulletin Medical History 15: 277–95, 1198

**Figure 1.** Sample Problem: A Prairie Tale

discussed. The discussions themselves were very lively. Students gave high scores for the learning value of both the PBL approach and the summaries they had to submit (see Table 1)

### The independent inquiry component

In this component of the coursework, students had the opportunity to explore medical technologies from multiple perspectives and be assessed in diverse ways. The particular choices varied each year, but the scores given to each of the options on the final question-

naire is high (see Table 1), suggesting that they provided students with an overall positive learning experience. Students appreciated the freedom to explore multiple technologies and the opportunity to be assessed differently.

Book reviews were a popular choice. Students were given considerable license to choose both non-fiction as well as fiction. Since the course encouraged students to look at medical technologies from multiple points of view, fiction works offered a rich source. For instance, just in relation to infectious diseases, Thomas Mann's *The White Mountain* and Albert Camus' *The Plague* complemented the real experiences of Betty MacDonald in *The Plague and I*. The contrasting perspectives of patients and the health care system were explored through both novels (Sylvia Plath's *The Bell Jar*, Lisa Genova's *Still Alice*, Mark Salzman's *Lying Awake*), plays (Margaret Edson's *Wit*), and non-fiction works (Anne Fadiman's *The Spirit Catches You and You Fall Down*, Jerome Groopman's *How Doctors Think*, or Susan Sontag's *AIDs and its Metaphors*). The reviews were in general well written and the students wrote thoughtful commentaries linking concepts to the tenets of the course.

Conversations provided a rich opportunity for students to explore multiple perspectives. Again, the questionnaire scores given to this option were high (see Table 1). One student chose to explore "the Pill," from inception to contraception. She stated that her purpose was to outline the evolution of a technology with respect to makers, watchers, pushers and users. Thus, she chose as her protagonists the makers (Gregory Pincus, John Rock, and a representative of Searle & Co.), the pushers (Margaret Sanger and Katherine McCormick who provided the funds and the impetus for the work), the watchers (United States Supreme Court and two journalists), and, as a user, a middle class mother of two. The submission was thought provoking, articulate, and very carefully referenced. It fitted well into the tenets of the course. Other students chose a range of topics, including—amongst others—sanitation, abortion, germophobia, cochlear implants, blood transfusion, cowpox vaccine, oral contraceptives, and heart transplantation. The protagonists in these conversations varied as well. It was obvious that students had spent a good deal of effort in searching the literature to ensure that their facts were accurate.

A novel component of this course was the opportunity to use the archival materials available and the rare book collection of the Health Science Library at McMaster University. This library has a rich collection of archival material and rare books. One student used the documents available from the Mountain Sanatorium to look at a newsletter published by patients interned at the institution. Another student used the oral history collection to study the experiences of Canadian doctors who treated soldiers in a Japanese war camp during the Second World War. Other topics that were explored included Ontario's response to two pandemics (Spanish Flu of 1918/H1N1), the decline of midwifery in Ontario, lobotomies in Ontario, cholera in Hamilton, shell shock in the First World War, and home medicines in nineteenth-century America. This option received the highest ratings.

Students who chose to add comments were enthusiastic about the opportunities, since this was primary research. These reports served to reinforce the central tenets of the course that technologies are not neutral and can be seen from multiple perspectives.

### Guest lectures/field trips

During the interim weeks when the students were preparing their problem summaries, they had the opportunity in class to listen to guest speakers who brought a different perspective. J. Duffin, a noted medical historian discussed her work on Laennec and the development of the stethoscope. Mueller, a surgeon who is in his nineties, had worked with the US forces during World War II and provided the students with a fascinating glimpse into the changes that had occurred in surgical care during the last several decades. A few months before he passed away, Barrows spoke to the class. He described in detail the changes that had been implemented in medical education since the 1950s and his development of the simulated patient approach. Giacaman, a political activist, described her attempts to provide health care in the Gaza strip. Shragge, a cardio-thoracic surgeon described his work with technology assessment and developments in modern cardio-vascular surgery. Maitlin, a practicing radiologist, described his medical journey from Russia to Israel and onto Canada and explored the undercurrents in the development of CAT scanning. These discussions served to amplify and complement several different aspects of the course. Though this was not specifically included in the evaluation list, students made laudatory comments.

## *The Student Perspective (SL)*

I participated in "Drugs, Devices, and Desires" in the fourth, and final, year of my undergraduate education. By the start of the class (September 2009) I had already applied to medical school, but in no way expected that this course would affect my medical education or any further choices about the type of education that I wished to pursue. In retrospect, this course has influenced not only my interests within medicine itself, but also my broader goals with regards to my medical career, the skills I wish to cultivate in myself, and my attitudes towards medication education. In this section of the paper, I will offer a student's perspective on the course and argue that this class provided me with skills and opportunities relevant to multiple disciplines. Through this discussion, I hope to contribute to a larger, ongoing debate concerning the role of medical humanities in medical (and pre-medical) education as well as the significance of the history of medicine, in particular, to aspiring or current medical students.

This course can be seen as a suitable response to Spiro's (2006) call for introducing the idea of medical humanities to future physicians before medical school in order for them to fully capitalize on opportunities within the medical humanities during their

medical education and careers. In this course, students were exposed to disciplines such as the history of medicine, medicine in literature, and narrative medicine. Though not everyone in the class was considering a future as a physician, all of us emerged from the course with a better understanding of the complexities and sociopolitical implications of modern-day health care systems and scientific research, and physicians' responsibility to think critically and play a social role in their communities. No matter what our career goals, all of us benefitted from exposure to these issues, as healthcare has become an increasingly pervasive and important topic of discussion across many different disciplines.

The book review assignments in particular emphasized the prevalence of medical discussions across society and offered examples of the weight that people of all cultures and stations in life place on health care. I completed two book review assignments, one on Sylvia Plath's *The Bell Jar* and the other on *Never Let Me Go* by Kazuo Ishiguro. Though each book addressed very different facets of medicine and medical care, both raised questions of bioethics, of paternalism in medicine, and articulated through its characters the individualistic meanings and values that we all place on our health. The book review assignment required students to engage in broader debates about medicine using literature, secondary research to contextualize our readings, and our own critical thinking to synthesize science and the humanities into cogent, thematic arguments. Through this assignment, we as students were offered perspectives on medicine that most of us had not before considered.

The student-centered approach of this course allowed my colleagues and myself to develop skills that are useful beyond academia, and in particular to the medical student. The course cultivated transferrable skills, such as practice with interdisciplinary teamwork, critical thought and decision-making, and communication both verbally and in writing. To complete our reports for each of the problems, as a group we not only had to read widely to answer the questions we had generated, but also produce a well-written paper that considered multiple perspectives. Often, the members of these groups would come from different academic disciplines, leading to varying approaches that had to be reconciled in order to produce a coherent piece of work. Similarly, modern patient care is decidedly interdisciplinary—treatment requires a health care team of professionals each with their own skills, experience, and perspective that can help improve the patient's condition. Having been exposed to rigorous teamwork in this course, I feel that I can function better in groups both as a member and as a leader.

Belling (2010) notes that, "the value of the humanities in educating new physicians can be defended by demonstrating the need for more complex approaches to knowledge than complete dependence on empirical evidence" (p. 938). This course was a clear demonstration of this point. As students, we would have missed many of the

intricacies of the cases that we were given to explore had we not been encouraged to draw on unconventional, "non-scientific" sources. For example, the major threads of the course were problematic situations regarding the spread and treatment of tuberculosis in Canada. When writing our essays, we naturally looked at the epidemiology and biomedical knowledge of TB, however it was also important for us to go beyond the natural history of TB to look at the history of public health in Canada and the interaction between the young Canadian government and Canadian Aboriginals, as well as reports on research ethics, and the economic implications of the disease. Through this course, I became exposed to and comfortable with using non-traditional methodologies to better approach "medical" questions. I would not have gained this insight from a classic science education.

After my first year of medical school, I took a leave of absence from medical education to complete a master's degree titled, "History of Science, Medicine, and Technology". Throughout my master's degree, I found myself constantly drawing on the skills and understandings gained from "Drugs, Devices, and Desires." For instance, this fourth-year course was my first opportunity in my undergraduate degree to participate in archival research. For this project, I used chaplaincy diaries and documents held at archives in the McMaster's Health Sciences Library to explore an understanding of spirituality as a medical technology. The appreciation I gained for the techniques and uses of archival research through "Drugs, Devices, and Desires" helped smooth my transition from undergraduate to master's level research and enhanced my ability to critically evaluate documents, whether they were primary sources or not.

Moreover, this class introduced me to the exciting field of the social history of medicine. The study of the history of medicine is important to my medical education, because as medical students become more engaged with the idea that they can play a social role as doctors, the history of medicine can be used to demonstrate how physicians have approached this work in the past and is also helpful for informing policy. In my first year of medical school, I learned that one of my fundamental responsibilities in my future role as physician is to be an advocate for my patients. To be effective in this task, I cannot simply rely on the biomedical model that is emphasized in medical education, but must also draw on psychosocial and sociopolitical knowledge of my patients and community as all of these factors ultimately inform healthcare decisions. Historical insights into how physicians have navigated this responsibility in the past will be essential to my success as a doctor, as I will be able to make better-informed decisions. "Drugs, Devices, and Desires" imbued in me a passion for the study and importance of the medical humanities (and in particular the history of medicine). I will pursue these studies throughout my medical career, as these disciplines provide perspectives on medicine that will make me a more understanding doctor and improve my ability to provide quality patient care.

### *The Archivist's Perspective (AM)*

The Health Sciences Library at McMaster University holds historical collections of primary materials that are available for use by students. These resources include rare printed materials on medicine and health care between the seventeenth and the early-twentieth centuries and an archive, which, among other things, holds the records of the Mountain Sanatorium (1906-1960), a tuberculosis hospital in Hamilton, Ontario.

For the past five years it has been my pleasure to introduce students of the "Drugs, Devices, and Desires" course to the historical collections. Through this work, they learn the unique research opportunities rare book collections provide, as well as what types of records archival collections commonly contain, the information often found in those records, and how to effectively use them for their research. Finally, students learn that even photographs, examined closely, can provide a wealth of information available nowhere else.

Not every community has an old tuberculosis sanatorium within its city limits. In fact, historical inquiry often demands travel to sites where resources exist. The students were fortunate in having such a ready resource at hand. As a local, hands-on adjunct to their study of tuberculosis and the evolution of its treatment, I provided a presentation on the history of the Mountain Sanatorium and a tour of the site itself. Most students have been very open to both of these learning opportunities. In fact, several students became so interested in the topics they were researching that they continued on with it after the course was over.

It is important that library collections stay relevant to the ever-changing research interests of their clientele and this is just as true for historical collections. This is extremely difficult to achieve without a budget to buy new items. Electronic versions of early publications provide only the information content of an item, only if the scanning is done well, and often scanning does not allow the student to appreciate the book as a human object. For example, many titles published for medical students are made pocket-sized so they can fit into the jacket of a pocket for ready reference on clinical rounds. Former students annotated many of these items. Annotations in margins and between lines are not picked up well by scanners and yet they are of great interest to the history of medical education. Many clinical texts, if they belonged to a busy clinician, fall open at certain pages or have a heavy wear pattern, which tells students so much about that physician's practice. Scanned copies cannot do this. Physical objects in contrast to digital information are history-rich (Wexelblat & Maes, 1999).

Finally, in order for materials to be digitized and turned into electronic copies, they have to be acquired and preserved by libraries in the first place. The historical collection includes a large collection of medical and health related ephemera. Ephemera, such as almanacs, broadsides, catalogs, trade cards and blotters, were often printed carelessly on

poor paper because they were only intended to be used for at most a year. Consequently these objects are fragile and sometimes very rare indeed. Collections like that of the Health Sciences Library are essential for the preservation of this fascinating material. After digitization all these older materials must continue to be preserved by libraries so that the electronic copy can be replaced after it has become corrupted or inadvertently deleted.

Students in this course learn how to use these often-fragile records with care and respect. They strengthen their ability to have patience and to manage their time effectively since these materials are not accessible via search engine 24 hours a day. These are valuable, transferrable skills for whatever future endeavors these students choose.

## Concluding Remarks

We have described a course that allowed students to explore the development of modern medical technologies. The two learning strategies used complemented each other in fostering student engagement and active learning.

The PBL component was strictly focused on a single disease (i.e., TB) explored in depth. Ill-structured problems that were carefully sequenced were used to stimulate argument, discussion and the sharing of information obtained from a wide range of resources. The independent inquiry projects provided more opportunities for self-directed learning and motivated them to delve deeper into a range of resources. The availability of archival material and a rich historical collection played a major role in enhancing their learning experience through both sections of the course. It was impressive to see that students who came largely from a science background plunged into reading historical works.

There were some limitations. One of the issues that needs to be addressed in history courses is what is referred to as historical empathy (Brush & Saye, 2008; Yilmaz, 2007). This can be regarded as "the ability to view the world as it was seen by the people in the past without imposing today's values on the past" (Yilmaz, 2007, p. 331). This is particularly difficult for students in the sciences where the past is often judged from the views of the present, an attitude castigated as Whiggism (Butterfield, 1965). Given the short time frame of this course, this bias could not be dealt with in depth. All that could be done was make students aware of this problem. In this context, the BCG problem provoked considerable discussion. The attitudes prevalent in society towards native populations were discussed at fair length as well as the prevalent notions regarding study designs and informed consent. Students recognized that despite later criticisms, the actions of Ferguson in conducting his trial of the BCG vaccine in an Indian reserve could be justified given the ethos of the time.

Since 1972, when the MD program at McMaster University graduated its first class, PBL has spread beyond the confines of medical or even professional education in the health sciences. Looking at the situation twenty-five years later, Barrows (1996) wondered whether the expensive and time-consuming effort was worth the trouble. He felt strongly

that it was. He noted that faculty members could see "how students think, what they know and how they are learning" and are able "to work with alert, motivated, turned-on minds in a collegial manner that has no equal" (p. 9). The method, he felt, could be perceived as the solution to many problems in education "such as the current tendency to produce students who cannot think or solve problems and who are bored with education" (p. 10). One of the students who took this course wrote in her evaluation of the course that "you know you've taken a good course when you leave with more (profound and unanswerable) questions than you came in with." That comment would not have surprised Barrows at all. He knew well the power of the approach that he had helped establish.

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