Drugs for the Developing World

Course Proposal for the University of Alberta

May 5, 2014

Ravendra Naidoo

naidoo@ualberta.ca
This prospective course aims to give students an introduction to the ways in which universities play a role in developing medicines for the developing world context. We will use the general term ‘medicines’ to refer broadly to drugs, vaccines, diagnostics, and other medical technologies. In this proposal, a curriculum is presented based on feedback from a series of interviews from representatives across the University of Alberta community; in addition, a rationale for why the course should be offered is established.

How is university research translated into new therapeutics and diagnostics that could have significant impact in global health, especially directed at neglected diseases? Neglected diseases (NDs) are infectious diseases such as malaria, leishmaniasis, lymphatic filariasis, Chagas Disease and schistosomiasis, which continue to cause significant morbidity and mortality in the developing world. They are ‘neglected’ because research to understand, prevent, diagnose and treat these diseases is vastly disproportionate to the need; and they tend to affect ‘neglected populations.’ We consider neglected diseases to be the ‘diseases of the global poor’.

Three important questions will be addressed through this course: 1). Why are pharmaceuticals so expensive, that they become unaffordable for the world’s poorest people? 2). Why do we lack sufficient treatments for the ‘diseases of the global poor’? 3). What is the role of scientific research, at our university and in the developing world, to serve the world’s poorest people by helping to alleviate the health problems that can trap people in poverty?

The course proposal was developed with a community service-learning (CSL) component, whereby student groups and other representatives of the University of Alberta community were consulted. Based on a ‘user-development model’ (1), we attempted to test our hypotheses of how the course would be structured against student interests and experience; this was done through a series of interviews that lasted between 45 minutes and one hour. We received great support and interest from the Undergraduate Research Initiative (URI) because of this approach to designing an undergraduate course based on direct feedback from students. Some interviews were also conducted in order to gain pedagogical ideas and advice from notable and award-winning instructors at the University of Alberta.

Similar courses have been offered at other North American universities, that address the unaffordability of medicines in the developing world due to intellectual property barriers, and the pharmaceutical industry’s systematic failure to address the health needs of neglected populations. A short 4-week medical elective course was offered at Cornell University (2) in 2008; it eventually expanded to become a 100-hour global health curriculum that is enrolled by a majority of Cornell medical students. Student-directed seminars were held at the University of British Columbia (UBC) in 2010 (3) and Duke University in 2012. Today UBC’s Neglected Global Diseases Initiative is “responding to a call from students to support the development of a multidisciplinary curriculum in neglected global diseases at the undergraduate level which will provide students with a foundation on the relevant global health issues.” (4)

We believe there is a great opportunity with this course, to educate the next generation of scientists, and leaders in health care and health policy, about the utility that scientific research at universities can play in global health.

**The Role of Universities in Global Health**

Universities play a significant role in global health. Consider the intolerable burden imposed by neglected diseases. One in six people in the world suffer from one or more NDs, according to a 2012 WHO report (5). In Indonesia, about 195 million people,
including nearly 50 million children, live in soil-transmitted helminth endemic areas; and 125 million people are at risk for lymphatic filariasis, through infection by *Brugia malayi* and other species of filarial worms (6). Peter Hotez and colleagues argue that neglected tropical diseases (NTDs) are a potent factor in keeping this subset of Indonesia’s population trapped in poverty (6). Overall, the 26 NDs classified in the 2012 G-FINDER report contribute to 14% of global disease burden (7). Increasing resistance to anti-TB and anti-malarial drugs, and climate change, will exacerbate the ND disease burden.

Yet research and development toward treatments for NDs is disproportionate to the need. Of the 1393 new chemical entities brought to market between 1975 and 1999, only 16 were meant to treat neglected tropical diseases and tuberculosis (~ 1%) (8). According to Patrice Trouiller and colleagues, this is a failure of market economics and capitalism, where “[m]arket prospects and return on investment dictate the pharmaceutical industry’s investments, leaving many medical needs unmet.” (8) A similar study looking between 2000 and 2011 shows that 850 new therapeutic products were registered, but only 37 (~ 4%) were indicated to treat neglected diseases (not including HIV). And of the 336 new chemical entities approved, 4 (~ 1%) were for NDs – 3 of which are to treat malaria (9). Furthermore, by the end of 2011, 1% of all clinical trials ever registered were for NDs; 54% of those trials were publically funded (9). Belen Pedrique and her colleagues at the Drugs for Neglected Diseases Initiative explain that “[d]espite substantial political attention towards the burden of neglected diseases, we detected no evidence of a substantial improvement in research and development activity compared with previous decades.” (9). As mentioned, the 26 NDs identified in the 2012 G-FINDER report contributed to 14% of global disease burden, but attract 1.4% of global health-related R&D expenditure (7).

In fact there is a great inequality in biomedical research, whereby “the production of health research in the world correlates with the market for treatment and not the burden of disease.” (10) Evans and colleagues expected to find some correlation between disability-adjusted life years (DALYs) caused by each disease category and the total number of 2005 research articles (Fig 1). However, this did not occur, and malignant neoplasms (such as cancers) and endocrine disorders (including diabetes) were vastly overrepresented in the research literature relative to their global disease burden. (10)

Local health needs tend to drive research locally; within a country “[f]or each 10 million DALYs lost to a disease…the number of articles published by researchers in that country increased by 73.9%” (10). Developing countries have different health needs and disease profiles compared to wealthy, developed countries. Yet a handful of developed countries produce far more research than the rest of the world combined. Therefore, “existing global health research is less relevant to the needs of poor populations.” (10) Both the globalization of research attention by wealthy countries, and the expansion of scientific research capacity in the developing world are necessary.

Therefore, universities in Canada can substantively play an important role in global health by focusing more research attention to prevent, diagnose and treat neglected diseases. Universities have a legitimate influence on the development of new drugs and health interventions. In 2002, U.S. universities were estimated to have contributed $19.6 billion of value to the “drug development pipeline” (11). And universities hold patents for 10 of 30 HIV drugs approved by the U.S. FDA between 1987 and 2007 (11). A lot of the early stage research for promising new drugs and medical technologies occur at universities, and usually through public funds.

Universities can also do more to promote research for neglected diseases
(NDs) on campus. Duke University committed $30 million to establish the Duke Global Health Institute (11). Also, the Neglected Global Diseases Initiative at UBC acts as a coordinating body to track and promote ND and global health research on their campus (4).

And if early stage research at a university has the potential to impact many people around the world, the institution and individual researchers have power to determine how resultant patents can be licensed. A university can adopt a ‘global access strategy’ where there must be “(1) stipulations for voluntary licenses to generic manufacturers and mandatory sublicensing requirements to alternative manufacturers when access objectives are not being met; (2) clauses requiring the licensee to make products developed from a university innovation available at a reduced cost in developing countries” (11), and more. The University of Alberta has done this, by becoming the third Canadian university to endorse the Association of University Technology Managers’ Statement of Principles and Strategies for the Equitable Dissemination of Medical Technologies (SPS) (12).

Because of the tremendous utility that universities can have in global health, university students should be made aware of it. Students who acquire a genuine concern are in a unique position to impact university policy; they possess a kind of innocence that is actually quite disarming, and is ultimately a very powerful advantage. Students who enroll in this prospective course also have the potential to become leaders in science, health care, and global health policy.

Course Curriculum

We present an example curriculum, modelled off of the Winter 2014 semester. The “Drugs for the Developing World” course is intended for a maximum of 30 students, with the majority coming from the Faculty of Science at a 3rd year undergraduate level, or higher. Students should have a basic biology prerequisite.

The nature and structure of the course has been influenced by our engagement

---

**Figure 1:** 2004 global disability-adjusted life years (DALYs) and 2005 research articles categorized by 19 broad WHO disease and disability categories. From Evans, J.A., Shim, J., Ioannidis, J.P.A 2014. “Attention to Local Health Burden and the Global Disparity of Health Research”. PLoS ONE 9: e90147.
<table>
<thead>
<tr>
<th>January 2014</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td><strong>Introduction to the course - the &quot;Big Picture&quot;</strong></td>
<td>*<em>Introduction to Global Health - where does science fit in?; introduction to undergraduate research, and research opportunities linked to this course (<em>guest talk from the Undergraduate Research Initiative)</em></em></td>
</tr>
<tr>
<td><em>MSF Access Campaign flyer, 2012 (13); Indonesia: An Emerging Market Economy Beset by Neglected Tropical Diseases (NTDs) (6); Watch: &quot;Fatal Neglect (14)&quot;</em></td>
<td><em>Research and development expenditure for poverty-related and neglected diseases: an analysis of economic and epidemiological data (7)</em></td>
</tr>
<tr>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td><strong>Neglected diseases affect neglected populations; Why are neglected diseases called 'neglected'? - the 'Research Gap' - Quiz 1</strong></td>
<td><strong>ND Lecture 1: Malaria (Dr. Stephanie Yanow)</strong></td>
</tr>
<tr>
<td><em>Attention to Local Health Burden and the Global Disparity of Health Research (10); Fostering Canadian Drug R&amp;D for NTDs (15)</em></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>23</td>
</tr>
<tr>
<td><strong>ND Lecture 2: Trypanosomiasis (Dr. Stan Houston)</strong></td>
<td><strong>Emerging issues regarding neglected diseases - drug resistance, climate change - Quiz 2</strong></td>
</tr>
<tr>
<td>28</td>
<td>30</td>
</tr>
<tr>
<td><strong>Market-based drug development; What are patents?; Why do we lack sufficient treatments for the 'diseases of the global poor'? - Quiz 3</strong></td>
<td><strong>The globalization of intellectual property rights; the TRIPS Agreement, Doha Declaration and compulsory licensing; Canada's Access to Medicines Regime</strong></td>
</tr>
<tr>
<td><em>Demythologizing the high costs of pharmaceutical research (16); The drug and vaccine landscape for neglected diseases (2000–11): a systematic assessment (9)</em></td>
<td><em>Implications of the Doha Declaration on the TRIPS Agreement and Public Health (17)</em></td>
</tr>
</tbody>
</table>
### February

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Compulsory licensing and geopolitical pressures (continued); the generic pharmaceutical industry; the Trans Pacific Partnership and other emerging trade agreements - Quiz 4</td>
</tr>
<tr>
<td>11</td>
<td>What is the role of the pharmaceutical industry to make drugs more affordable? - Quiz 5</td>
</tr>
<tr>
<td>13</td>
<td>A win-win solution?: A critical analysis of tiered pricing to improve access to medicines in developing countries (18)</td>
</tr>
</tbody>
</table>

**READING WEEK**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>What are product development partnerships? Recent successes in 'needs-based' drug development; Open-source drug discovery - Quiz 6</td>
</tr>
<tr>
<td>27</td>
<td>Other ways to ‘de-link’ research &amp; development costs from drug prices; Bayh-Dole Act and an introduction to patenting of university-derived research</td>
</tr>
</tbody>
</table>

**DNDi brochure, 2013 (19); Open Source Drug Discovery in Practice: A Case Study (20)****

**Innovation and Access to Medicines for Neglected Populations: Could a Treaty Address a Broken Pharmaceutical R&D System? (21); Commercializing Biomedical Research Through Securitization (22)****

### March

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>How does technology commercialization traditionally occur at the University of Alberta? (<em>guest lecture from TEC Edmonton and/or Alberta School of Business</em>) - Quiz 7</td>
</tr>
<tr>
<td>11</td>
<td>ND Lecture 5: Tuberculosis (panel of Dr. Walter Kipp, Dr. Denis Kumimoto, Dr. Todd Lowry)</td>
</tr>
<tr>
<td>13</td>
<td>ND Lecture 6: AIDS</td>
</tr>
<tr>
<td>Changing university patenting and licensing policy by adopting 'global access principles'; the role of universities in global health</td>
<td>The rise of non-communicable diseases in the developing world</td>
</tr>
<tr>
<td>Changing university patenting and licensing policy by adopting 'global access principles'; the role of universities in global health</td>
<td>The rise of non-communicable diseases in the developing world</td>
</tr>
<tr>
<td>Leveraging University Research to Advance Global Health (11)</td>
<td>WHO Global Status Report on Non-Communicable Diseases, 2010 (23); Access to Cancer Medicine in Low-Resource Settings (24); Convergence of Non-Communicable and Infectious Diseases in Low and Middle-Income Countries (25)</td>
</tr>
<tr>
<td>Collaborative Policy-Making - Project-Setting - Quiz 9</td>
<td>Collaborative Policy-Making</td>
</tr>
<tr>
<td>Collaborative Policy-Making - Project-Setting - Quiz 9</td>
<td>Collaborative Policy-Making</td>
</tr>
<tr>
<td>WHO Roadmap to Overcome the Global Impact of NTDs, 2012 (5)</td>
<td></td>
</tr>
<tr>
<td>Collaborative Policy-Making</td>
<td>Collaborative Policy-Making</td>
</tr>
<tr>
<td>Collaborative Policy-Making</td>
<td>Collaborative Policy-Making - Presentations</td>
</tr>
<tr>
<td>Collaborative Policy-Making - Presentations, Synthesis, Next Steps</td>
<td></td>
</tr>
<tr>
<td>Assessment</td>
<td></td>
</tr>
<tr>
<td>Attendance &amp; Participation</td>
<td>20%</td>
</tr>
<tr>
<td>Weekly In-Class Quizzes</td>
<td>30%</td>
</tr>
<tr>
<td>Collaborative Policy-Making Project</td>
<td>50%</td>
</tr>
</tbody>
</table>
interviews with the university community. We chose to limit the course to 30 students, as many suggested a preference for meaningful discussion and group work. Referencing certain upper-year biology courses she completed, Nicola Gale said, “the best class sizes have been about 30 people”. UAEM students we interviewed also converged on 30 people as a reasonable size, balancing the need for effective discussion with the opportunity to teach as many students as possible.

Through the consultation process we realized that the course should be designed primarily for science students. Students indicated a desire to learn more about the basic biology of neglected diseases; therefore, prospective students would require some biological science background. All of the science students we interviewed suggested that they have had very little opportunity to learn about how scientific research is translated to affect society – particularly in how it can impact global health. McGinn said, “I think it’s an incredibly interesting opportunity for students in science…to get a base understanding of how the world works outside of labs, and why no matter what they are researching, it has implications outside…perhaps it’s an idea that you can have some control over where your research is going and the direction of the university in general just by the research they facilitate”.

The course will start with an introduction to global health and the context of social, economic and environmental determinants of health. Recognizing the importance that health policy, health education, better sanitation, economic development, and many other factors have on the health of a population, where does scientific research fit in? Neglected diseases will be introduced, along with a series of guest lectures by ND researchers. The course will then shift towards addressing drug development and how that process is linked to drug prices, and ultimately drug unaffordability; this includes a discussion on the globalization of intellectual property rights. We will discuss innovative ways to ‘de-link’ R&D costs from drug prices, so that medicines can become more affordable. Then the role of universities in focusing on the health issues of neglected populations, and the global access of university research, will be addressed. Finally, the class will consider the dramatic rise in prevalence of non-communicable diseases (such as diabetes and cancer) in the developing world, and how drug unaffordability again exacerbates health care systems.

The idea for a ‘collaborative policy-making’ block came from several student comments about their desire to have group work and extensive discussion time. Betty Wang has taken courses on the biology of diseases, but is very much interested in economics and politics, and how these issues affect science; “definitely discussion would be useful for the economics and political aspects of the course”. And Taryn Hepburn mentioned an International Relations course (POL S 260) where the class is primarily assessed on a final group presentation. All agreed that tests would not be appropriate because the issues raised in class are “contentious” and not “clear-cut”. However, Dr. Kimberly Ellison cautioned, “you definitely need somebody to lead the discussion sessions”. Nath corroborated that discussion time should be very well structured; “The instructor needs to go through the whole discussion activity in their head”.

Nath suggested that the course coordinator could outline several policy gaps. The class would then be divided into groups and tasked with researching and developing a policy solution. She outlined several steps in how to stage the objective: i.) Identify what the problem is; ii.) Outline some of the attempts already made to solve the problem; iii.) Point students towards the literature (papers, reports, etc); iv.) Have students assess some of the attempts made to
resolve the problem; v.) Encourage students to design their own policy recommendation; vi.) Have students present their analysis and recommendation to the class, followed by a guided discussion to critique the policy recommendation; vii.) ‘Pull it all together’ and attempt to produce one unified class policy proposal.

However, to have this kind of discussion and policy development aspect in the course, running in a parallel with lectures, risks the creation of “two narratives”. This could be confusing for some students, where one narrative is the lectures being presented, and another on the policy project. Therefore, Nath mentioned Linda Trimble’s Canadian Political Science (POL S 220) course. Trimble reserves the final four weeks of her course to engage in focused group work that addresses policy problems; the class is challenged to generate policy recommendations and solutions. Another example of such ‘collaborative policy-making’ in an academic course is a Women’s Studies project at York University. In that course, all students worked towards bettering a Wikipedia entry. “I really find this appealing, because everyone was working towards one objective”. This leads to a “stronger outcome, that everyone can contribute to”, said Nath. In this course, the entire class will vote on one final policy problem to address in the collaborative policy-making block.

Nisha Nath’s suggestions are congruent with the learning objectives of the Undergraduate Research Initiative (URI). The URI works towards the integration of cutting-edge university research in undergraduate teaching. It can be an “instructor-centred” action where students have an opportunity to learn about dynamic UofA research (such as

![Figure 2: Framework for understanding undergraduate research and creative works. From the Undergraduate Research Initiative, University of Alberta.](image)
through the ND guest lectures). Or to the other end of the spectrum, a more “learning-centred” environment where students can start to learn through discovery, pose their own hypotheses, and perhaps create new knowledge and informed actions (Fig 2). The outcomes of the collaborative policy-making block could lead to an opportunity for some students to continue policy development as a summer research project - perhaps supported by a URI stipend. We believe that the unique, interdisciplinary and compelling research ideas that can arise out of this class, should give our students an advantage in securing a research award.

The outcomes of the collaborative policy-making process will be variable, and dependent on the students. The instructor will offer guidance and set a standard of rigour. But it is the students that should collectively determine what issue they want to address, how they would like to address it, how they will organize themselves, what the outcomes will be, and how they would like to be evaluated. A similar, open learning approach was applied in ANAT 402, led by one of our interviewees, Dr. David Begg.

Students motivated to pursue a career in global health, particularly those interested in the role that health and disease can have in trapping populations in poverty, are a target group for this course. Moreover, it would be beneficial for those continuing in biomedical science and health care. When asked if undergraduate students would be suitable to take up this prospective course, Dr. David Begg exclaimed “oh yes, I do. I think undergraduates are idealistic, and the altruism of this effort would be very attractive to people”. Biochemistry student Matthew Mah admits, “a lot of us are in research labs that are popular, and not involved in ND research”. Not many students are aware of neglected diseases, and so the course could offer an important perspective, and an opportunity to connect and perhaps work with ND researchers in the future. Stephanie Wepryk would like to learn about political issues surrounding scientific research, and Nicola Gale regrets that she has “never taken a course about how science affects society”. According to Dominic Igbelina, the course “can spark a fire within students, and about how much power you actually have as a science student”. Finally, Michael McGinn reiterates, “I like the idea of having science and engineering students have the opportunity to understand how their role in society and the world can be utilized for values that they may or may not have...I think it would be a great required course for those with science and engineering backgrounds”.

The proposed curriculum is an outline of the basic topics that should be covered in a course that focuses on the development and access to medicines for ‘neglected populations’. The eventual curriculum is very much dependent on the instructor and the department that chooses to host it. Therefore, the next step is to find champions for the course. The School of Public Health, the Department of Biological Sciences, the Faculty of Science, the Faculty of Medicine and Dentistry, and the sixty-three University of Alberta researchers that hold relevant research interests (Appendix A), should be consulted.
Pedagogical Advisors

Nisha Nath - Department of Political Science

Nisha Nath is a PhD student in the Department of Political Science, and an instructor in ‘Canadian Political Science’ (POL S 220) and ‘The Politics of Gender’ (POL S 350). She is the winner of the Faculty of Arts Graduate Student Teaching Award in 2009. The purpose for interviewing her is based on her experience and excellence in teaching. Furthermore, much of this prospective course deals with policy deficiencies and inequality, which is within the realm of interest of the public policy and political science disciplines.

Although Nisha admitted to not having a background in these specific access-to-medicines issues, she was nevertheless fascinated by the issues I presented to her. She suggested that the course coordinator could outline several policy gaps throughout the course. The class could be divided into groups and be tasked with researching and developing a policy solution. Nisha outlined several steps in how to stage the objective: i.) Identify what the problem is; ii.) Outline some of the attempts already made to solve the problem; iii.) Point students towards the literature (papers, reports, etc); iv.) Have students assess some of the attempts made to resolve the problem; v.) Encourage students to design their own policy recommendation; vi.) Have students present their analysis and recommendation to the class, followed by a guided discussion to critique the policy recommendation; vii.) ‘Pull it all together’ and attempt to produce one unified class policy proposal.

It was on this last point that was most interesting to her. She cautioned however, that with so much plenary discussion proposed, the time needs to be very well structured; it could take a lot of effort on the part of the instructor. “The instructor needs to go through the whole discussion activity in their head”. Furthermore, “two narratives” could develop in the class, which could be confusing for some students - one narrative of the lectures being presented in class, and another on the policy project, which may not be related to the day’s lecture. Therefore, Nisha mentioned Linda Trimble’s Canadian Political Science (POL S 220) course. Trimble reserves the final four weeks of her course to discuss policy problems, and engage in focused group work - to come up with policy recommendations and solutions. Another example of such ‘collaborative policy-making’ in an academic course is a Women’s Studies project at York University. In that course, all students worked towards bettering a Wikipedia entry. “I really find this appealing, because everyone was working towards one objective”. This leads to a “stronger outcome, that everyone can contribute to”. In this case, perhaps the entire class can vote on one final policy problem to address in the collaborative policy-making block.

Nisha suggested that the policy development might not end with the class.
There is potential for some students to continue to engage through the summer, perhaps through activist work.

**Crystal Snyder - Undergraduate Research Initiative**

As the Undergraduate Research Coordinator for the Undergraduate Research Initiative (URI), Crystal Snyder was particularly interested in discussing this course proposal. She exclaimed that it was “really cool” that we were designing a course based on direct feedback from students - on how they wish to learn and engage with the course objectives. The URI is a progressive unit within the university, focused on enhancing the undergraduate experience through engagement with research, in the classroom and through specific opportunities to discover new knowledge. The purpose of interviewing the URI was to explore a potential undergraduate research component that can be extended from the course. The notion of ‘collaborative policy-making’ as an important aspect of the course could lead to an opportunity for some students to continue policy development as a summer research project - perhaps supported by a URI stipend.

A URI stipend supports undergraduate research projects that “really emphasize interdisciplinarity”. Students submit a project proposal, which is then reviewed by an interdisciplinary committee. During the term of the project, the URI provides support to the student, runs seminars, workshops, and organizes social events. At the end, the student is required to submit a final report - not exhaustive in technical detail, but more of a reflection on what they gained from the experience and its impact. Students are then encouraged to present their research, particularly through the URI research symposium. About 15 URI stipends are awarded during the year, and ~ 20 - 25 in the ‘summer round.’

No stipends can be earmarked, or targeted towards specific areas. Therefore, it seems unlikely that the URI may formalize a preference for students of this prospective course. However, through the collaborative policy-making aspect of the course, unique, interdisciplinary and compelling research ideas that can arise out of that process could give our students an advantage. Snyder was also very interested in the idea of bringing in specific guest lecturers to talk about their research on a neglected disease; this could lead to unique ND-related project ideas with such researchers.

The URI is willing to collaborate in some measure. For instance, they would like to help promote this course among students, as it seems to align with many of their stated objectives.

With regard to the ND Research Seed Fund, Snyder provided some information about the University’s USEED crowdfunding platform.

Crystal Snyder also sent a document, the URI’s “Framework for understanding undergraduate research and creative works”; this is a framework for how cutting-edge
university research can be integrated into undergraduate teaching.

**David Begg - Division of Anatomy**

Dr. Begg is a celebrated Professor and instructor at the University of Alberta, who has dedicated some of his career towards improving medical education, through developing innovative ways to teach anatomy and histology. He has won numerous teaching awards throughout a long and fruitful career. When asked if undergraduate students would be suitable to take up this prospective course, he exclaimed “oh yes, I do. I think undergraduates are idealistic, and the altruism of this effort would be very attractive to people”. “[T]he greatest asset would be to trying to change” - as in providing students with an opportunity to be a part of a change in the world.

He believes strongly in group-based work and in facilitating discussion, employed in small group courses such as ANAT 402. "I prefer teaching in a small group, where I act as a facilitator and ask questions and don’t tell people anything...they see time spent in the classroom as somehow different from the rest of life. You know, you leave life behind and you go in the classroom. Then the class is over and you go back to your life. And I struggled for years with, 'how do you bring life into the classroom? How do you make the class just a part of life, like having a lunch, or chatting with friends?'" (26). His subtle and philosophical point is about vulnerability. "And really, the best way to be accepted as a teacher is to be absolutely honest, and be willing to share with your students who you are."

Begg warned it would be difficult to find any professor with any extra time to devote to teaching a course. He suggested the School of Public Health as an ideal home for the course.

**Kimberly Ellison - Department of Medical Microbiology & Immunology**

Dr. Ellison is a well-known instructor in the Department of Medical Microbiology & Immunology (MMI), who has coordinated several courses, including MMI 351, 352, 415 and 426 (Medical Parasitology). Regarding the prospective course, Dr. Ellison said “I would think it would have a broad appeal...it would have important things to say”.

She cautioned that in admitting a large proportion of third-year students into the course, "you may run into trouble with the quality of discussions...you might lose a lot of 3rd year students". Therefore, she stressed the imperative that “you definitely need somebody to lead the discussion sessions”. And, “it might be more appropriate to have an upper undergraduate/graduate course”. But certainly the science portion of the course can be covered fairly easily by guest lecturers. Such lectures are important because "you need to have a biological understanding of these diseases".

Briefly Dr. Ellison discussed the process of getting a course created. One has to submit a course proposal (that includes a
course description, how many credits, how many hours) to the Faculty of interest. Then
the proposal is circulated throughout the Faculty, and is then approved. She said
that “it sounds like it would be something that would fit in the scope of the School of
Public Health”. Or, even the Department of Biological Sciences. She also recommended
that Dr. Kinga Kowalewska-Grochowska and Dr. Stan Houston be contacted about
contributing to the prospective course. Reassuredly, “you might have to try a few
things” when developing the course, and then iterate.

Student Perspectives
Betty Wang and Albert Vu - Interdepartmental Science Students Society

ISSS is the primary student organization that represents Faculty of Science students
to the University administration and the Students Union. They advocate on behalf of
undergraduate science students. Betty Wang and Albert Vu agreed to be interviewed as
representatives of ISSS.

Given an opportunity to register for the proposed course, Albert said, “I think the
topic itself is very interesting, and as a pre-med student - but I would also look at the
structure of the course”. He was concerned that “a lot of science students are not willing
to write an essay - but discussion-based would be much better”. He was concerned
that many science students can go through most of their degree without producing a
major piece of writing, such as a term paper; he believed this might scare off many
potential science students. Nevertheless, “I would like it be offered as an undergraduate
course - a lot of these students are aiming to go into medicine, pharmacy”.

However, Betty exclaimed, “I would definitely take the course...I would take the
course regardless of how it’s structured, because I am personally interested in it”.
Betty has a taken courses on the biology of diseases, but is very much interested in
economics and politics, and how these issues affect science. She favoured a “mixed delivery”, as certain parts should be taught through lectures; however, “definitely discussion would be useful for the economics and political aspects of the course”. She also suggested that we invite researchers on campus to teach guest lectures on a neglected disease that they focus on.

Betty emphasized her concern that this course should be counted as Faculty of Science credit. Some popular science options, such as ANAT 200, do not count as actual science options - and for many students is therefore extraneous to their degree. She also suggested that we “consider offering this course as a science option for arts students”.

Matthew Mah - Biochemistry Students’ Association

Matthew Mah is the President of the Biochemistry Students’ Association for the 2013-2014 academic year. Given the opportunity, he said that it “sounds very interesting, [but] I would consider what kind of prerequisites” the course would require. Furthermore, as an Honours student, he said that he has to be aware of his program requirements, which may limit his flexibility to take the course. However, with respect to biochemistry students in general, he says “a lot of BCSA students do a lot of research” and that they are very research-oriented. There would be a lot of interest among these students to learn what happens after research is done and published, or patented. However, “a lot of us are in research labs that are popular, and not involved in ND research”. Most of his biochemistry colleagues do research in labs focusing on atherosclerosis, or cancer. Not many students are aware of neglected diseases, and so the course could offer an important and new perspective, and an opportunity to connect and perhaps work with ND researchers. Such a prospective course he admits would be a bit advanced; “personally I think it would be more valuable to be a bit higher level of an undergraduate course, like 300-level”. He would also “favour graduate students being in the class”. And he would like to see more students recruited from non-science backgrounds, to make it more interdisciplinary.

In terms of how the course should be taught, he would like the biology portion of the class to be lecture-based, and the policy, economic and political part of the class to be interactive - there should be group discussion and group projects. Quizzes may be useful as assessment, however it would be “scary” to have a large term paper. He favours group projects.

Matthew strongly favours the idea that students who take the course may have an opportunity to work with a ND researcher in the summer - possibly tied in with the ND seed-fund proposal. Perhaps ND research projects could become formalized as a summer course in biochemistry, similar to the summer research in Germany credit (BIOCH 497).
Nicola Gale - Students’ International Health Association (SIHA)

SIHA is a very well known student group on campus that focuses on global health. We anticipate that students already interested in global health would be ideal students to target as ‘early-adopters’ to the course.

Given the opportunity, Nicola said that she would “definitely” be interested in taking the proposed course. “I’ve never taken a course about how science affects society”. How science impacts society was her motivation for becoming a pharmacy student, after her basic science degree in biochemistry. She said that students in public health would be very interested to take this course, as well as Faculty of Arts students who are interested in the economic, political and social issues. However, “I think this course would have been more applicable to me now after taking pharmacy”.

While she does not like group projects, she lamented that all of the science courses that she did take did not have any discussion component. Referencing certain upper-level biology courses she took, “the best class sizes have been about 30 people”. Perhaps an interview with the course coordinator would be necessary, to determine if prospective students would be good contributors to the course. Of particular interest, she mentioned BIOCH 425: Proteomics. In the second-half of that course, students are divided into groups where they develop an experimental proposal - much like a grant proposal. At the end of the semester, professors from the department judge the proposals, to determine whether the research ideas are viable or not. She noted that this class had only 10 - 15 people.

Nicola strongly favoured the idea that the course could be connected to subsequent summer research opportunities.

Dominic Igbelina - Canadian Foundation for AIDS Relief (UofA), Brock Randolph

Dominic Igbelina is the President of the UofA chapter of the Canadian Foundation for AIDS Relief; he has just completed his 2nd year at university. He was joined by Brock Randolph, a student specializing in the Immunology and Infectious Disease degree program.

Given the opportunity, Dominic would take the proposed course as an option. However, he is hesitant that the course may be too advanced, and that undergraduate students may be overwhelmed. He believes a lot of background in biology will be necessary, and doubts Faculty of Arts students would be interested. He believes those interested in global public health would consider this course. Nevertheless Dominic suggests that the course should be broader in scope, and not so specific, to allow undergraduate students a survey of the major issues. Brock chimed in to suggest that business students might be interested in the intellectual property rights aspect of the access-to-medicines issue; and the course may be suitable for 40 - 50 people.
In terms of assessment, Brock says that students should write a final paper. Dominic does not favour an exam; “what are you going to ask in this exam?”

Brock would like researchers on campus that focus on neglected diseases to give guest lectures in the class. Dominic mentioned a bioethics course that is offered at St. Joseph’s College - that perhaps a connection could be made, so that ethics could be discussed in this proposed course.

Closer to the end of the interview Dominic realized, “at first I wasn’t sure, but now after talking about this course, it can spark a fire within students, and about how much power you actually have as a science student...people don’t realize how much power they have”. He mentioned that many of his friends are generally against global poverty, and want to see extreme poverty eliminated. Yet most of his friends, he says, do not have an opportunity or an avenue to make any sort of change. He believes this course, if offered to them, could give them that opportunity.

Taryn Hepburn, Nicholas Jones-Abad, Stephanie Wepyrek - Universities Allied for Essential Medicines

Taryn, Nicholas and Stephanie are members of Universities Allied for Essential Medicines. Taryn is a political science student, Nicholas is a general science student, and Stephanie has graduated with a B.Sc in Immunology and Infectious Disease. Given the opportunity to enroll, Taryn would consider it if there was discussion on geopolitical issues, and how they impact access-to-medicines. As a science student, Nicholas was concerned whether he would have enough economic and political background. Stephanie is excited to take the course, because of the opportunity to learn about political issues; whereas those who are more knowledgeable about political systems will get to learn about biology. Taryn says the course should be an undergraduate course, whereas Stephanie believes it should be “a 400/500 split”. All converged on 30 people as a reasonable size to have discussion, while educating as many students as possible; everyone ultimately came to a consensus that it should be a popular
undergraduate course, as opposed to a specialized, elite course.

In terms of teaching, Taryn favoured seminars where there is an opportunity to mix arts and political science students with biological science students; “there should be a lot of discussion if one is talking about policy”. Contrastingly, Stephanie said she “would much rather attend a lecture”; Taryn agreed that “you really need to have some lectures, because it is such a wide subject”. The group came to a consensus that it could be a Tuesday/Thursday course, where Tuesday would be a lecture, focusing on information delivery, while Thursday would be a guided discussion and policy debate. Taryn mentioned an International Relations course (POL S 260) where the class is primarily assessed on a final group presentation. All agreed that tests would not be appropriate because the issues raised in class are “contentious” and not “clear-cut”.

They were also all enamored with the notion that the course could emphasize the impact that universities and university students could have in the realm of access-to-medicines and neglected diseases. Stephanie concluded, “I think it’s nice to create meaning...you’re not learning these random biology facts”.

Alex Suen - Department of Medical Microbiology & Immunology

Alex is a PhD student in the Department of Medical Microbiology & Immunology (MMI). Given the opportunity, he would like to take the prospective course. However, some skepticism emerged, where he believes that teaching university students about access-to-medicines issues would be “preaching to the choir” - science students understand that science research is important. We engaged in a short debate over some of his perceptions of the pharmaceutical industry. He believes the pharmaceutical industry spends a great deal of money on research & development, and that high prices are necessary to recuperate this enormous expenditure.

He strongly favours community engagement as being a key to affecting policy change. There should be a public open-house requirement, where students give a presentation to the general public. From the perspective of graduate students in immunology, he believes most of his colleagues are mostly focused on science and are not as aware of issues beyond research; however, “there would definitely be some interest from some students”.

Based on his experience as a business and science double major at the University of Waterloo, he suggested that students in the course should look at case studies. In his business courses, they would look at real example of how businesses took a product to market. He suggests that students study specific examples of where intellectual property barriers occurred. Students should then extend these ideas and propose a policy change.

Michael McGinn - Students’ Union, Student Umbrella for Social Justice
Michael McGinn is a University of Alberta Student’s Union councillor, representing students in the Faculty of Arts. He also helped found the Student Umbrella for Social Justice, which is an organization that attempts to coordinate the activities of various social justice student groups on the campus (27).

Though he admits to not having a biomedical or health background, Mike McGinn is very interested in the concept of this prospective course. He recently graduated with a degree in political science. However, given an opportunity, he would “definitely” take the course as he is interested in the political and economic aspects of why systemic issues, such as oppression and inequality, occur. For McGinn, Faculty of Arts students who take this course should be able to understand the basic biology of certain neglected diseases, such as life cycles and how disease is transmitted; this is a reasonable expectation even for students who lack a basic university-level biology background.

“I’m more worried about it either turning off science students from being interested in the [political and economic] aspects” of these issues...I think it’s an incredibly interesting opportunity for students in science to have an opportunity to get a base understanding of how the world works outside of labs, and why no matter what they are researching, it has implications outside...perhaps it’s an idea that you can have some control over where your research is going and the direction of the university in general just by the research they facilitate”. McGinn suggests that certainly various arts students are interested in global poverty and inequality, and this course would address one aspect of that. However he recognizes this may be an important opportunity for science students. “I like the idea of having science and engineering students have the opportunity to understand how their role in society and the world can be utilized for values that they may or may not have...I think it would be a great required course for those with science and engineering backgrounds”.

In that sense, he believes the course should be structured more generally, as a 100- or 200-level course “where science students can get that base understanding...that to me is incredibly important”. But if the large course is going to be more difficult to implement, “then I would say a 15 person seminar-style class” that is more focused, would be appropriate graduate/upper-undergraduate students. Nevertheless it would very much depend on who ultimately teaches and coordinates the course.

Aaron Upright - Alberta School of Business

I first met Aaron through Startup Edmonton’s Preflight program. Prospective technology entrepreneurs were selected and given the opportunity to learn more about technology startups, and how to refine their idea further. Aaron is a business student, but has also continued since Preflight to help develop the University of Alberta’s eHUB and other related student entrepreneurship
initiatives. He has been involved in the development of the new ‘Entrepreneurship 101’ course (SMO 488). The decision to interview Aaron was based on a hypothesis that ‘entrepreneurial’ students, and those interested in the impacts of technology, may find this prospective course compelling.

In Aaron’s opinion, the majority of business students would not be interested in this course; business students are more attracted to corporate business, rather than entrepreneurship and affecting change. This was a surprise to me as my assumption was that many business students were entrepreneurial-minded - and could be appealed to by a certain premise of this course, that science and technology can serve humanity, and challenge global inequality and injustice. One almost has to build the opportunity, then the right students will emerge; those students that have thought about related issues will “come out of the woodwork”. He referred to the reason for Entrepreneurship 101. He believes that entrepreneurs are generally hard to find on campus, and the purpose of that course is to bring such students together to do something worthwhile. Such students may also be ‘early-adopters’ and a target for this prospective course. For the inaugural Fall 2014 course, over 200 applications were made.

Aaron suggested that the course must have some structure, with lectures and ‘modules’; “an open-discussion kind of course would be demotivating”. However, this course needs to be positioned somewhere between a completely project/objective-based course, and an entirely lecture-based course. He was also concerned about how much biology background would be required.

Finally, Aaron was the only student to suggest that a massive open online course (MOOC) be considered. Either a MOOC could be offered along with a more specialized lecture/seminar option. Or, a MOOC should be created first to gauge the amount of interest on campus for “Drugs for the Developing World”. Demonstrating student demand would be a strategic maneuver in increasingly the likelihood that this prospective course be adopted by a university department.
Appendix A – University of Alberta Neglected Diseases and Global Health Researchers Database

Table B1: University of Alberta Neglected Diseases and Global Health Researchers Database

- due to the size of the table, the table can be accessed here:

https://docs.google.com/spreadsheet/ccc?key=0AtssSx26ctW6dEhxahRNhNk9GW

GpLZ3M2e0wyNzlyRw&usp=sharing
References


Acknowledgments

David Zakus
Sue McKenzie-Robblee
Stephanie Wepryk
David Begg
John Blattler
Pratik Chhetri
Kimberley Ellison
Steinbeis Fridolin
Nicola Gale
Dzintars Gotham
Taryn Hepburn
Dominic Igbelina
Nicholas Jones-Abad
Sandeep P. Kishore
Karolina Maciag
Matthew Mah
Michael McGinn
Nisha Nath
Brock Randolph
Crystal Snyder
Prachur Srivastava
Alex Suen
Gloria Tavera
Aaron Upright
Albert Vu
Betty Wang

Faculty of Medicine & Dentistry
Community Service-Learning, Faculty of Arts
Make Poverty History Edmonton
Division of Anatomy
UAEM Alberta

Universities Allied for Essential Medicines, Central Michigan University
Department of Medical Microbiology & Immunology
Universities Allied for Essential Medicines
Students’ International Health Association
Universities Allied for Essential Medicines
UAEM Alberta

Canadian Foundation for AIDS Relief
UAEM Alberta

Weill Cornell/Rockefeller University/Sloan-Kettering Institute
Universities Allied for Essential Medicines, Harvard Medical School
Biochemistry Students’ Association
University of Alberta Students’ Union
Department of Political Science
UAEM Alberta

Undergraduate Research Initiative
UAEM Alberta

Department of Medical Microbiology & Immunology
Universities Allied for Essential Medicines, Case Western Reserve University
Alberta School of Business
Interdepartmental Science Students Association
Interdepartmental Science Students Association