1 Course Details

1.1 Calendar Description

This course will explore a variety of issues related to the scientific ideals and practical realities of health sciences research and its clinical applications. Topics will include critical thinking, critical appraisal of the medical literature, the principles of evidence based medicine, and selected issues related to scientific integrity.

Pre-Requisite(s): 7.50 credits including (1 of BIOL*1070, BIOL*1080, BIOL*1090)
Restriction(s): BIOM*4210

1.2 Course Description

Systematic assessments of the quality of published clinical research typically indicate that only about 20-30% of randomized controlled trials (RCTs) are free of important errors, and that a similar proportion are highly flawed and essentially misleading. It is therefore important that the graduates of healthcare programs be equipped with skills to assess RCT quality prior to incorporating their findings into clinical practice. Unfortunately, professional programs and most undergraduate and graduate programs provide limited education on how to evaluate these studies, and as a result many physicians, veterinarians, dentists, and other healthcare providers lack the ability to recognize whether a trial they read is relatively sound or likely to be misleading. The good news is that you don’t need to be a statistician or epidemiologist to be able to detect many of the common errors in the medical literature. By the end of this course, you will have markedly improved your ability to distinguish the good from the bad.

Even when good scientific evidence has been identified, it is not necessarily used to guide clinical decisions; the information may not be considered at all, or flawed reasoning may enter into the decision making process. We will explore errors of reasoning that are so well recognized that they have been given names. We will also look at some of the reasons that we are prone to such errors, so we can try to avoid making them.
We will also discuss selected issues related to professional integrity and ethics.

1.3 Timetable

Timetable is subject to change. Please see WebAdvisor for the latest information.

1.4 Final Exam

Exam time and location is subject to change. Please see WebAdvisor for the latest information.

2 Instructional Support

2.1 Instructional Support Team

Course Co-ordinator: Brad Hanna BSc, DVM, MSc, PhD
Email: bhanna@uoguelph.ca
Telephone: +1-519-824-4120 x54534
Office: OVC 1646D

2.2 Teaching Assistant(s)

Teaching Assistant: Michael Sawras BSc, MSc candidate
Email: msawras@uoguelph.ca
Office: Population Medicine

3 Learning Resources

3.1 Required Resource(s)

Thinking, Fast and Slow. D Kahneman, Anchor Canada, 2013. (Textbook)
Available on Ares course reserve, but you will be using it extensively starting day one so it is worth purchasing.
(As of Aug 22 the paperback version was available at Indigo books for $14.40.)

3.2 Recommended Resource(s)

Available on Ares course reserve. An excellent resource for understanding fallacies.

Available on Ares course reserve. Focusses on errors of reasoning in medical research and medical communication, and gives examples.

Unit 2 - The CONSORT Statement 2010 Checklist (Website)
4 Learning Outcomes

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Logic & Reasoning Unit
   - critically evaluate arguments according to five key criteria, and develop good arguments
   - recognize common errors of logic and tactics for avoiding a good argument
   - evaluate potential causes of errors of reasoning with respect to the heuristics and biases associated with our "autonomic decision maker" (Kahneman’s System 1)

2. Critical Appraisal Unit
   - assess the quality of reporting of clinical trials at an intermediate level, based on CONSORT recommendations
   - justify selected scientific procedures for the avoidance of bias
   - understand the differences and interrelationships between a clinical trial, a systematic review, and a body of evidence
   - recognize common ways in which medical research data can be misrepresented in scientific publications

3. Scientific Integrity & Professionalism Unit
   - develop informed opinions about ethical issues related to health sciences research, such as plagiarism, fabrication of data, selective citation of the literature, authorship, peer review, and conflicts of interest
   - be able to analyze the ethics of medical claims and beliefs using the criteria of WK Clifford

5 Teaching and Learning Activities

Lectures

Monday, Wednesday, and Friday  1:30 2:20 pm, MACN 113

Some standard lectures will be given. Some classes will take the form of a discussion of short readings that will be posted on Courselink a couple of days in advance. Some materials associated with class discussions will be posted following the class.

Seminar Presentations

Seminars presented by students in BIOM*3210 and by students taking the graduate critical
thinking course BIOM*6400 will be testable. Notes will be provided shortly after these seminars.

5.1 Lecture

Fri, Sep 7

Topic(s): Course introduction

Logic & Reasoning Unit - Introduction to Kahneman's "Thinking, Fast & Slow" (based on pages 3-15)

► For next class: Read pages 19-30 of Kahneman

Mon, Sep 10

Topic(s): Discussion of pages 19-30

► For next class: Read pages 31-38 of Kahneman

Wed, Sep 12

Topic(s): Discussion of pages 31-38

► For next class: Read pages 39-49 of Kahneman

Fri, Sep 14

Topic(s): Discussion of pages 39-49

► For next class: Skip Chapter 4 and read pages 59-70 of Kahneman

Mon, Sep 17

Topic(s): Discussion of pages 59-70

► For next class: Read pages 71-78 of Kahneman

Wed, Sep 19

Topic(s): Discussion of pages 71-78

► For next class: Read pages 79-88 of Kahneman

Fri, Sep 21

Topic(s): Discussion of pages 79-88
For next class: Read pages 89-96 of Kahneman

Mon, Sep 24

Topic(s): Discussion of pages 89-96

For next class: Read pages 97-105 of Kahneman

Wed, Sep 26

Topic(s): Discussion of pages 97-105

Fri, Sep 28

Topic(s): Introduction to arguments and how we tend to think

For next class: Research the logical fallacy assigned to you, and read The scandal of poor medical research (a single page) by Doug Altman

Mon, Oct 1

Topic(s): Discuss fallacies assigned last day
Discuss Altman’s Scandal of poor medical research

For next class: Research the logical fallacy assigned to you, and read Postmodernism Disrobed, a 2.5-page book review by Richard Dawkins

Wed, Oct 3

Topic(s): Discuss fallacies assigned last day
Discuss Dawkin’s Postmodernism Disrobed

For next class: Research the logical fallacy assigned to you

Fri, Oct 5

Topic(s): Discuss fallacies assigned last day

For next class: Research the logical fallacy assigned to you; think about what you would have to contribute to a scientific project in order to earn authorship on the paper

Wed, Oct 10

Topic(s): Discuss fallacies assigned last day
Discuss scientific authorship
- For next class: Read the 2-page excerpt from Clifford's *Ethics of Belief*

**Fri, Oct 12**

**Topic(s):** Discuss Clifford's *Ethics of Belief*

**Oct 15, 17, 19, 22**

**Topic(s):** Discuss additional scientific integrity & professionalism issues

**Wed, Oct 24**

**Topic(s):** CONSORT Statement introduction: Assessing how clearly a published RCT is described (i.e. quality of RCT reporting)

CONSORT Checklist item assignment

**Oct 26, 29, 31**

**Topic(s):** CONSORT seminar preparation time; no classes scheduled.

*Dr Hanna will be available in his office to answer any CONSORT seminar-related questions you may have.*

**Nov 2 - 26**

**Topic(s):** CONSORT seminar presentations.

**Introduction to GRADE:** A method for assessing how well an RCT was designed and conducted (i.e. assessing the quality of the science).

**Wed, Nov 28**

**Topic(s):** Course conclusion

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### 6 Assessments

#### 6.1 Assessment Details
Heuristics & Biases Quiz (6%)
Date: Wed, Sep 26, 2:20 PM - Wed, Oct 3, 1:30 PM
A Courselink quiz presenting 10 randomly selected multiple-choice questions on Kahneman.

_Students are encouraged not to wait until the last day to write the quiz; no extensions will be provided for technical reasons (computer problems, internet access problems, etc.)_

Group heuristics & biases assignment (12%)
Due: Wed, Oct 3, 11:59 PM
A synopsis of a major idea from one chapter of Kahneman’s book.

Logical fallacy quiz (4%)
Due: Wed, Oct 10, 2:20 PM - Wed, Oct 17, 1:30 PM
A Courselink quiz presenting 10 randomly selected multiple-choice questions on errors of reasoning.

_Students are encouraged not to wait until the last day to write the quiz; no extensions will be provided for technical reasons (computer problems, internet access problems, etc.)_

Group fallacy assignment (10%)
Due: Wed, Oct 17, 11:59 PM
An analysis of a health-related argument that contains a clear example of a logical fallacy.

Group CONSORT Presentations (27%)
Due: November 2 - 26
A group presentation on one CONSORT Checklist item.

Presentation critiques (3%)
Due: November 2 - 26
Submission of feedback on each CONSORT seminar; worth a total of 3% of your course grade.

Your group members will gather briefly following each CONSORT presentation to generate feedback; one person from your group will then submit the feedback on behalf of your group before the end of that class.

(You may not submit feedback on the seminar that your own group presents!)

Final examination (38%)
Due: Scheduled by the Registrar
A comprehensive short-answer & point form examination.

7 Course Statements

7.1 Notes on assessments

On-Line Quizzes

Quizzes are formative assessments intended to help students monitor their understanding of the material as the course progresses. You are encouraged to complete these well in advance of the deadline as _no extensions will be granted for technical reasons_.

Computer and network problems may occur at any time, so if you leave a quiz until the last
minute you take the risk that you will be unable to complete it by the deadline.

**Group Assessments and Working Rules**

Assignments will be completed in pre assigned groups. Group work will be most successful if all team members contribute their fair share and try to have fun. Prior to starting the first assignment, each group should create a list of expectations of all group members, regarding things such as timely arrival at and participation in group meetings, cell phone use during meetings, distribution of tasks, etc.

**Late Assignments**

In the absence of documented extenuating circumstances (medical or compassionate), late submissions will be penalized 10% per day.

**Final Examination**

The final examination will cover all course material. The format will be short answer and point form.

**Department of Biomedical Sciences Guideline for Students with 3 Final Exams in a 48-hour Period**

**Eligibility**

Student eligibility for this process is at the discretion of the Chair. For students with three or more exams in a 48-hour period in the first week of the final exam schedule, including an exam in a course offered by the Department of Biomedical Sciences, the department will offer a second writing of the exam in the second week of the final exam period. This policy does not apply to exams requiring complicated set-up, such as lab exams.

**Process**

The second sitting will be scheduled by the Chair’s Office. All such delayed writings will be offered together only a single day and time to be decided by the Chair and invigilated by the course instructor, if available, and by the course TA (if one is assigned and deemed necessary) or another invigilator. Following completion of the exam, the instructor/TA will mark the final exam and submit the grade to the Registrar within 7 days of the last scheduled day of exams of that semester.

Eligible students can request this privilege by sending an e-mail message by the 40th
class day to the Department Chair (Dr Tarek Saleh). In their request, the student MUST list their complete final exam schedule and a verbatim copy of the following statement:

“This is an accurate representation of my final exam schedule for the current semester as issued by the Registrar’s office. I understand that if I have misrepresented my exam schedule and am granted permission to write the BIOM*3210 exam at the later date on that basis, I will have violated the University’s academic misconduct policy which may result in a grade of zero for the BIOM*3210 final exam. I understand that steps will be taken to verify my course enrollment and final exam schedule.”

Although the Department will make every effort possible to accommodate these requests, circumstances may not allow accommodation in all situations, and so we cannot guarantee that requests will be approved. All email requests will receive a written response from the Chair regarding status of approval.

7.2 Attendance

Participation in classroom discussions will help to prepare students for the assessments. Substantial issues that are discussed in class may be examined and will not necessarily be captured in the posted material, so if you are absent from a class you should ask a classmate for notes.

7.3 Academic Consideration for Missed Assignments

If you are unable to meet a course deadline for medical or compassionate reasons, please review the regulations on academic consideration in the Undergraduate Calendar and discuss your situation with the course coordinator and/or program counsellor.

If the final exam is missed, application for a deferred exam must be made through your program counsellor and the office of the Registrar as outlined in the Academic Consideration and Appeals section of the Undergraduate Calendar. Please see the calendar for more information.

8 University Statements

8.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

8.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The regulations and
procedures for Academic Consideration are detailed in the Undergraduate Calendar.

8.3 Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for Dropping Courses are available in the Undergraduate Calendar.

8.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

8.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance, and not later than the 40th Class Day.

More information: www.uoguelph.ca/sas

8.6 Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University’s policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar.

8.7 Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless
further permission is granted.

8.8 Resources

The Academic Calendars are the source of information about the University of Guelph’s procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.