HPM 225C: Research Methods for Improvement and Implementation Science
Term: Spring 2020
Credits: 4

COURSE SYLLABUS

A. Overview

Course Description
The course objective is to enhance knowledge and skills in improvement science. This course offers learning methods to ensure that innovations and interventions are effective and reliable across the settings and contexts for which they are designed. Our focus is designing practical studies when the intervention(s) and the conditions under which they are being tested are changing over time. The context for these methods is the learning health system and networked learning.

Course learning objectives are to:
1. Understand the contribution of improvement science as a learning method designed to change processes and systems to achieve better outcomes with reliability at scale in healthcare, public health, and other human/population-focused systems and services;
2. Be able to conceptualize an improvement science research problem in terms of questions, conceptual model, experimental design, overall analytic approach, measures, and data display for learning and inference;
3. Apply methods to design an improvement science study in health, education, and other population-focused systems;
4. Understand features of the learning health system.

Prerequisites
By permission of instructor

Instructors
Moira Inkelas, PhD, MPH
Department of Health Policy & Management
minkelas@ucla.edu

Class Days, Times, Location
Thursday 9:00 – 11:50 am [Class meets 9:00 – 10:50 am with the third hour available for group discussions/instructor consultations]
https://uclahs.zoom.us/j/211036288
Password: 842876

Office Hours
Please contact instructor by email for an appointment

Course Texts and Readings
Readings and supplemental resources are listed on the syllabus and posted on CCLE.
Readings for a particular class should be completed before coming to class. Please be prepared to refer to details of the readings. Concrete discussion of the concepts and their relevance to the science of implementation will aid our learning. For application papers, please focus primarily on the methods rather than the subject matter and findings. Please consider some of the following questions as you read the papers: How did the authors approach the problem, methodologically? What if anything was not clear to you about the methods/learning process? How did the authors present their theory(ies)? What is one new concept or insight that you take away from the paper? What could you see applying to your work?

Course Format

This is a seminar-style course that emphasizes discussion, with minimal lecture.

Course Methodology

The course emphasizes not only the analytic tools but also the ways in which we assist stakeholders to use improvement science to address problems that are important to them and the systems in which they work. The methods apply to multiple sectors involved in population health (such as health care, public health, social services, education).

This course provides fundamentals in research design and methods in the real world of innovation and implementation. This course develops the skills to design and implement experiments for learning, including designing feedback systems to measure impact. Students will develop these skills by designing an improvement science project.

HPM 225C is the second in a two-course sequence, following HPM 215B (Advanced Methods for Improvement and Implementation Science), which covers methods for designing and implementing improvement. The course builds upon the Advanced Improvement Methods course developed by the James M. Anderson Center for Health System Excellence, Cincinnati Children’s Hospital Medical Center, and Associates in Process Improvement. The syllabus and selection of readings draw heavily on materials developed by CCHMC and API and are used with their permission.

The course includes lectures, discussion, team activities, and individual projects. This course reflects the principle of learning by doing. Students will develop a research design for an improvement project that will apply the methods acquired in this course. Students will be linked with an appropriate
setting and improvement project or supported to apply the design elements to their ongoing work.

For the applied experience, students will:
- Develop the research design for an improvement project;
- Ensure that the research design, measures and methods address the defined problem.

The course has ten (10) two-hour sessions with the third hour offering time for consulting with one another on design questions and/or one-on-one discussions with the instructor. Class time is spent in discussion and occasional hands-on activities with selected methods. Each session will address similar questions: What problem does the specific topic or method solve, or what insights does it offer? How is the method situated with other methods? How does it apply to specific cases/problems? How does this apply to the student’s own professional goals?

**Prerequisites**

HPM 215B, or permission of instructor

**Course texts**


Due to the virtual format of the course, readings including chapters from texts will be available through CCLE.
| **Classroom Participation & Attendance** | Student participation is essential and will be assessed based on contribution, which includes offering thoughtful reflections on the readings, sharing insights about applicability to real-world problems, and answering and posting questions. |
| **UCLA ADA Policy** | Students needing academic accommodations based on a disability should contact the Center for Accessible Education (CAE) at (310) 825-1501 or in person at Murphy Hall A255. When possible, students should contact the CAE within the first two weeks of the term as reasonable notice is needed to coordinate accommodations. For more information visit www.cae.ucla.edu. |
| **ADA Contact** | Nickey Woods  
Center for Accessible Education  
A255 Murphy Hall  
Phone: (310) 825-1501  
TTY / TTD: (310) 206-6083  
Fax: (310) 825-9656 |
| **Inclusivity** | UCLA’s Office for Equity, Diversity, and Inclusion provides resources, events, and information about current initiatives at UCLA to support equality for all members of the UCLA community. Please communicate with me if you experience anything in this course that does not support an inclusive environment, and you can also report any incidents you may witness or experience on campus to the Office of Equity, Diversity, and Inclusion through their website (https://equity.ucla.edu/). |
B. Departmental Competencies

The following concentration competencies are addressed in this course using the course objectives along with the assessment that will evaluate students’ attainment of these objectives.

<table>
<thead>
<tr>
<th>PhD and MS Competencies</th>
<th>Specific assessment opportunity</th>
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<tbody>
<tr>
<td>Design a research study to evaluate research questions in the areas of health policy, medical care, population health, health services research or related areas.</td>
<td>Completion of study design and presentation in visual gallery in final session</td>
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C. Course Assignments

1. Each student will lead a class discussion of about 20 minutes on one of the **assigned research articles** (listed in the Published Studies section in Readings). These studies are examples of how the session’s topic is handled in an improvement science publication. The purpose of discussion is to learn about how to undertake, and write about, experiential learning. We will discuss what each article “models” as a report on improvement science research – including both strengths, and limitations.

   The goal is not to present the paper, as we assume that everyone has read it in advance. Instead, the goal is to briefly offer your verbal analysis of how the paper handled the SQUIRE guideline domains listed below. Please refer to the SQUIRE guidelines (Ogrinc et al. 2008) – particularly the Methods, Results, and Discussion areas of SQUIRE – as you prepare your insights/reflections and some discussion questions for the class. You should cover the following questions in particular, and for each, consider the extent to which you found the paper followed SQUIRE guidance, or not:

   - Rationale – How did the authors present their theory/ies?
   - Specific aims – Did the paper offer a SMART aim?
   - Study of the change(s) – How did the authors establish if the observed outcomes were due to the changes made to the process/system?
   - Measures – Rationale, suitability
   - Analysis – What methods did the authors use to understand variation in the data?
   - Overall, what could you see applying to your work? What was not clear about the methods/learning process in the paper?

   The group discussion of each paper will also focus on how improvement concepts and tools are applied in the paper.

2. The main course deliverable is the **course project**. The course project enables students to apply the concepts and methods to a real-world problem. Working progressively on a specific topic makes it easier to apply and thereby understand the material. Students who do not have a topic in mind will be offered potential topics.

   This can be either an individual or small group project (i.e., 2 or 3 people). The intent is to allow you to build on your work in HPM 215B, but you may focus on a different project in HPM 225C.
For each session, students apply the theme or method discussed in that specific Session to their topic. These will often be diagrams or other graphical representation of information.

The first application is your project aim, to be completed by Session 2. It should be a statement about what you are interested in solving or addressing: i.e., how good do you want (the system of focus) to be at what, and by when?

The goal is for you to apply the specific concept/tools in your project as we progress through the quarter. Constraints in the environment that is the focus of your work may limit your ability to test a given tool. In such cases, please apply the methods as a thought exercise as we progress through the curriculum. Each week (meaning in preparation for Session 3 through Session 9), please use the same structure to consider how that week’s method applies to your topic. Please write down the following information each week:

1. What does application of the concept/method to your project look like (i.e., do the application, and consider what it offers);
2. What was challenging in applying the concept/method to your project (i.e., for you, for the team that you are working with – in making choices, in understanding the concept, in using the method for the specific problem that you are working on);
3. What more would you like to understand about this concept/method.

Please do this before the session that they apply to. You are not required to turn this in; the goal is to help us all prepare for our session discussions and to help you maintain momentum on your topic. Completing the application of the tool (or at least an initial sketch of it) – such as, measure selection and operational definitions, the format of the SPC charts that would be appropriate for your project – before the class is a good way of testing your mastery of the content and provoking questions for class discussion. Please feel free to share what you prepare with the instructor for feedback, and to use the “third hour” to ask others for feedback or to offer feedback to others. The goal is to use the class discussion to be sure that you understood and addressed the content of the session. You will have a chance to share some of these reflections at the last session (Session 10), when we present the sum total of the work.

By Session 10, you will have a complete set of material. The product for this course is the aggregation of these materials, with an additional synthesis at the end. This last element enables you to reflect on what you learned. The synthesis can be in bulleted format and should include answers to the question of what more would you want to learn about one or more of the themes/methods, if you continued to work on this topic?

The presentation for the gallery should include the following elements, which should generally be one slide per topic with the exception of the “Project measures” and “Graphical display of key measures”:

- Title and partners
- Purpose (problem to be addressed; rationale of why this problem is important; current performance of the system)
- SMART aim
- Population and setting that are the focus
- Design of the improvement – which stage(s) are the focus:
Concept and theory development: Evidence summary, study of other industries, ethnography (Example: Improving Chronic Illness Care Model)

Prototyping: Defining intervention components, predicted magnitude of impact, qualitative testing with patients (Example: Ethnographic observation of adolescents with asthma to generate ideas about segmenting self-care for different types of patients)

Pilot testing of innovations: Testing different versions of interventions (Example: Use of parent-reported measure to improve preventive service delivery)

Detailed testing: Implementing under an increasing range of conditions (Example: Blood Stream Infection factorial)

Dissemination and spread: Track rate of uptake, describe variation in outcomes, develop new support infrastructure (Example: Breakthrough collaborative to improve access to primary care in VA system)

Key driver diagram: Drivers (norms of the future systems), secondary drivers if needed, changes

Project measures: Include outcome, process and balancing measures; show the operational definitions (numerator and denominator) for each measure; periodicity; census or sampling

Study design: Display the factorial matrix for experimentation (overall for the project, or for a specific test of change)

Iterative testing: List the likely areas for PDSA testing; provide an example of one planned or completed PDSA cycles; Provide an example of a projected ramp of PDSAs for one change

Graphical display of key measures: Include a Shewhart chart for each measure; show the plan for annotating charts, updating charts, and establishing the centerline; show your plans for subgrouping; show your plans for stratification

Key uncertainties at this stage: Describe what you have encountered in creating the design that you have laid out; list key questions that lie ahead

Project Gallery

Students will present their course projects in the final session (Session 10). The presentation should be about 10 minutes in length. We will then have about 10-15 minutes per presentation in which students can ask questions or offer suggestions or discussion.

During the final session, using a prompting sheet that the instructor will provide, students will have the opportunity to identify features that they liked (ideas to “steal”) as well as features that they might change or enhance. Each student will identify at least one idea to “steal” and one idea to offer.

Grading

Grades will be based on class participation and performance on the following assignments:

1. Class discussion of methods and articles (20%)
2. Presentation and leading discussion of assigned research article (20%)
3. Development of research design for an improvement science study (30%)
4. Class presentation of project design (30%):

Course Exams Schedule  There are no course exams.
D. Course Policies & UCLA Policies

Message about Academic Integrity to all UCLA Students from UCLA Dean of Students: UCLA is a community of scholars. In this community, all members including faculty, staff and students alike are responsible for maintaining standards of academic honesty. As a student and member of the University community, you are here to get an education and are, therefore, expected to demonstrate integrity in your academic endeavors. You are evaluated on your own merits. Cheating, plagiarism, collaborative work, multiple submissions without the permission of the professor, or other kinds of academic dishonesty are considered unacceptable behavior and will result in formal disciplinary proceedings usually resulting in suspension or dismissal.

Forms of Academic Dishonesty: As specified in the UCLA Student Conduct Code, violations or attempted violations of academic dishonesty include, but are not limited to, cheating, fabrication, plagiarism, multiple submissions or facilitating academic dishonesty:

Cheating: Unauthorized acquiring of knowledge of an examination or part of an examination
- Allowing another person to take a quiz, exam, or similar evaluation for you
- Using unauthorized material, information, or study aids in any academic exercise or examination – textbook, notes, formula list, calculator, etc.
- Unauthorized collaboration in providing or requesting assistance, such as sharing information
- Unauthorized use of someone else’s data in completing a computer exercise
- Altering a graded exam or assignment and requesting that it be regraded

Plagiarism: Presenting another’s words or ideas as if they were one’s own
- Submitting as your own through purchase or otherwise, part of or an entire work produced verbatim by someone else
- Paraphrasing ideas, data or writing without properly acknowledging the source
- Unauthorized transfer and use of someone else’s computer file as your own
- Unauthorized use of someone else’s data in completing a computer exercise

Multiple Submissions: Submitting the same work (with exact or similar content) in more than one class without permission from the instructor to do so. This includes courses you are currently taking, as well as courses you might take in another quarter.

Facilitating Academic Dishonesty: Participating in any action that compromises the integrity if the academic standards of the University; assisting another to commit an act of academic dishonesty
- Taking a quiz, exam, or similar evaluation in place of another person
- Allowing another student to copy from you
• Providing material or other information to another student with knowledge that such assistance could be used in any of the violations stated above (e.g., giving test information to students in other discussion sections of the same course)

Fabrication: Falsification or invention of any information in an academic exercise

• Altering data to support research
• Presenting results from research that was not performed
• Crediting source material that was not used for research

While you are here at UCLA, if you are unsure whether what you are considering doing is cheating, **don't take chances**, ask your professor. In addition, avoid placing yourself in situations which might lead your professor to **suspect you of cheating**.

**Alternatives to Academic Dishonesty**

• **Seek out help** – Meet with your professor, ask for assistance as needed.
• **Ask for an extension** – if you explain your situation to your professor, she/he might be able to grant you an extended deadline for an upcoming assignment.
• **See a counselor** at Student Psychological Services, and/or your school, college or department – UCLA has many resources for students who are feeling the stresses of academic and personal pressures.

If you would like more information, please come see us at the Dean of Students’ Office in 1206 Murphy Hall, call us at (310) 825-3871 or visit their website at [www.deanofstudents.ucla.edu](http://www.deanofstudents.ucla.edu).
E. Course Outline

Session 1
Goals and Methods for Improvement Science

Learning objectives
1. Understand concepts underlying the science of improvement
2. Become familiar with the mindsets and methods emphasized in this course
3. Scientific standards for reporting improvement science
4. IRB considerations
5. Understand course expectations and the topics that will be the focus of the course

Reading for in-class discussion:
   - Chapter 1 - Improvement of quality
   - Chapter 2 - Principles for design and analysis of planned experiments
3. The Health Care Data Guide: Learning from Data for Improvement
   - Chapter 1 - Improvement methodology

Supplemental resources:


What is improvement science? Do we need it in education? Lewis C. Educational Researcher. 44(1):54-61.

Getting the improvement habit. Lucas B. BMJ Qual Saf 2016;25:400–403

UCLA OHRPP guidance: Determining which Activities Require UCLA OHRPP/IRB Review
UCLA OHRPP Flowchart to Determine if UCLA IRB Approval Required For Quality Improvement (QI) Projects:
Quality Improvement or Research Worksheet:

Session 2
Learning from Variation – Statistical Process Control (Part 1)

Learning objectives:
1. Become familiar with types and interpretation of Shewhart charts
2. Learning from variation
3. Establishing and revising limits for Shewhart charts
4. SPC software

Reading for in-class discussion:
1. The Health Care Data Guide: Learning from Data for Improvement
   Chapter 3 – Understanding variation using run charts
   Chapter 4 – Learning from variation in data

Published studies:

Supplemental resources:


Quality improvement research: are randomized trials necessary? Neuhauser D, Diaz M. Qual Saf Health Care. 2007. 16:77-80.


Session 3
Planned Experimentation in Improvement

Learning objectives

1. Understand experimentation in improvement
2. Appreciate design considerations: Replication, randomization, efficient designs for learning
3. Become familiar with factorial experiments

Readings for in-class discussion:

1. Quality Improvement through Planned Experimentation
   - Chapter 2 – Principles for design and analysis of planned experiments.
   - Chapter 3 – Experiments with one factor (pages 63-85)
   - Chapter 4 – Experiments with more than one factor (109-142)
   - Chapter 8 – Using a time series response variable

Published studies:


Supplemental resources:


Study designs for PDSA quality improvement research. Speroff et al. Q Manage Health Care, Vol. 13, No. 1, pp. 17–32


Session 4
Measurement for Improvement

Learning objectives

1. Understand considerations in selecting measures (minimizing burden, family of measures, event and judgment sampling
2. Understanding sample size perspectives in improvement
3. Measurement and analysis of consumer preferences and experiences/Conjoint analysis

Reading:

1. Quality Improvement through Planned Experimentation
   Appendix A - Evaluating measurement systems
2. Health Care Data Guide: Learning from Data for Improvement
   Chapter 2 - Using data for improvement
   Chapter 9 - Drilling down into aggregate data for improvement
   Chapter 11 - Learning from patient feedback to improve care

Published studies


Supplemental resources:


Session 5
Organization factors in the science of implementation

Learning objectives

1. Understand conceptual models of organizations and context that influence improvement
2. Become familiar with implementation science study designs
3. Scientific standards for reporting implementation science results

Reading:


Published studies:


Supplemental resources:


Session 6
Advanced SPC Charts

Learning objectives

1. Understand features and uses of Shewhart charts for low frequency events
2. Apply advanced SPC charts to selected cases
3. Understand special cases of SPC (e.g., autocorrelation)
Reading:

1. The Health Care Data Guide: Learning from Data for Improvement
   - Chapter 5 – Understanding variation using Shewhart charts
   - Chapter 5.1 – Calculating Shewhart limits
   - Chapter 7 – Other Shewhart-type charts (pages 219-231)

Published studies:


Supplemental resources


Session 7
Factorial designs

Learning objectives

1. Understand fractional factorial experiments, and common factorial designs
2. Appreciate how to incorporate background variables into planned experimentation (e.g. blocks)
3. Understand value and features of orchestrated testing designs

Reading:

1. Quality Improvement through Planned Experimentation
   - Chapter 5 - Reducing the size of experiments
Published studies:

Supplemental resources:

Session 8
Learning systems and learning networks

Learning objectives:
1. Understand features of learning healthcare systems
2. Appreciate the structure and features of research networks, including collaborative innovation networks
3. Appreciate how to foster cooperation, co-production, shared scientific commons in networked learning
4. Understand the features of networks and the points of leverage that can be the focus of interventions

Reading:
4. Selected blogs by Michael Seid (Medium)
Published studies:


Supplemental resources:
*Organizing for collaboration: An actor-oriented architecture in ImproveCareNow.* Seid M. Learning health systems. 2019.

*Using goal-directed design to create a novel system for improving chronic illness care.* Fore D, Goldenhar LM, Margolis PA, Seid M. JMIR Res Protoc. 2013;2(2):e43

*See the system that produces the current outcomes.* In Learning to Improve: How America’s Schools Can Get Better at Getting Better.


*Effectiveness of anti-TNFα for Crohn disease research in a pediatric learning health system.* Forrest CB, Crandall WV, Bailey LC et al. 2014;134:37-44.

Session 9
**Population-focused learning systems**

Learning objectives:
1. Understand challenges of fostering scientific thinking for improvement in community change/population health
2. Understand techniques for stewarding learning in a community
3. Appreciate how to foster a learning culture within an agency and with external multi-sector partners
4. Identify methods for managing iterative learning in a complex system

Readings:

Supplemental resources:
The strength of weak ties. Granovetter MS. *American Journal of Sociology*. 1973;78(6):1360-

Session 10
Synthesis and project gallery