Building curricula from competencies: approaches & practical tips from an instructional design perspective

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Backward Design

- Begin with the end in mind
- Develop a plan to assess competencies
- Plan learning activities

Traditional Model

- Begin with learning objectives
- Plan learning activities
- Develop a plan to assess competencies
Backward Design Steps

#1 Identify Desired Results

#2 Determine Assessment Evidence

#3 Plan Learning Experiences
What should the students know, understand, and be able to do?
Program Policy, Design + Evaluation

- systems thinking
- policy evaluation
- policy, program, project or intervention design
- Quant and Qual data collection
- cultural values and practices to the design or implementation of public health policies or programs
- Needs assessment

Oral and written communication

- cultural competence
- communication for different audiences and sectors
- negotiation and mediation skills
- advocacy
- build coalitions and partnerships
- interprofessional teamwork
- budget and resource management
- policy-making process

Leadership + Advocacy

- leadership, governance and management

ENV HEALTH
causes and trends of morbidity and mortality
primary, secondary and tertiary prevention
public health history, philosophy, and values
biological and genetic factors on health
core functions and 10 essential services
evidence-based science
behavioral and psychological factors on health
environmental factors on health
ecological perspective on the connections among human health, animal health and ecosystem health
how globalization affects global burdens of disease
social, political, and economic determinants of health and health inequities
organization, structure and function of systems across national and international settings
Health equity and barriers to

BIDS
EPI

Epi Methods

Quant and Qual data analysis + collection
Interpretation of Data Analysis
Letting go of...

- Course design based on a book
- Replicating the course you took as a student
- Using the old syllabus as a guide

Saying YES to...

- Competencies
TIPS
How will we determine if the desired results occurred?
Ten Design Elements of Authentic Learning

<table>
<thead>
<tr>
<th>Real-world relevance: Authentic activities match the real-world tasks of professionals in practice.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ill-defined problem: Authentic activities are relatively undefined and open to multiple interpretations, requiring students to identify for themselves the tasks and subtasks needed to complete the major task.</td>
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<tr>
<td>Sustained investigation: Authentic activities comprise complex tasks to be investigated by students over a sustained period of time, requiring significant investment of time and intellectual resources.</td>
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<td>Multiple sources and perspectives: Authentic activities provide the opportunity for students to examine tasks from a variety of theoretical and practical perspectives, using a variety of resources, and requires students to distinguish relevant from irrelevant information.</td>
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<td>Collaboration: Success is not achievable by an individual learner working alone. Authentic activities make collaboration integral to the task, both within the course and in the real world.</td>
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<td>Reflection (metacognition): Authentic activities enable learners to make choices and reflect on their learning, both individually and as a team or community.</td>
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<td>Interdisciplinary perspective: Authentic activities have consequences that extend beyond a particular discipline, encouraging students to adopt diverse roles and think in interdisciplinary terms.</td>
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<td>Integrated assessment: Assessment is not merely summative in authentic activities but is woven seamlessly into the major task in a manner that reflects real-world evaluation processes.</td>
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<td>Polished products: Conclusions are not merely exercises or substeps in preparation for something else. Authentic activities culminate in the creation of a whole product, valuable in its own right.</td>
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<tr>
<td>Multiple interpretations and outcomes: Rather than yielding a single correct answer obtained by the application of rules and procedures, authentic activities allow for diverse interpretations and competing solutions.</td>
</tr>
</tbody>
</table>
## Examples of Authentic Learning

<table>
<thead>
<tr>
<th>Interviews</th>
<th>Document Analysis</th>
<th>Journaling/reflection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video reports/projects</td>
<td>“Teacher” for a day, module or concept</td>
<td>Wikis and other collaborative writing</td>
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<tr>
<td>Oral reports</td>
<td>Case studies</td>
<td>Group problem solving</td>
</tr>
<tr>
<td>Case briefs</td>
<td>Podcasts/Vlogs</td>
<td>Blogs</td>
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<tr>
<td>Photo stories</td>
<td>Product reviews</td>
<td>Lab work</td>
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<tr>
<td>Peer editing/review</td>
<td>Article critiques</td>
<td>Role playing</td>
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<tr>
<td>ePortfolios</td>
<td>Concept mapping</td>
<td>Simulations</td>
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<tr>
<td>Data Analysis</td>
<td>Graphing data</td>
<td>Field work</td>
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<tr>
<td>Infographics</td>
<td>Presentations</td>
<td>Field trips</td>
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<tr>
<td>Debates</td>
<td>Design projects</td>
<td>Research projects</td>
</tr>
<tr>
<td>Ask the “expert”</td>
<td>Group Projects</td>
<td>Problem based learning (PBL)</td>
</tr>
<tr>
<td>Letters to editor/government</td>
<td>Models/constructing objects</td>
<td>Real world problems (finding solutions)</td>
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<tr>
<td>Floor plans</td>
<td>Proposals</td>
<td>Editorials</td>
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<tr>
<td>Timelines</td>
<td>Scenarios</td>
<td>Multi-media creation</td>
</tr>
<tr>
<td>Surveys</td>
<td>Inquiry based Learning</td>
<td></td>
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<tr>
<td>Research data (real data sets)</td>
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</tr>
</tbody>
</table>

Authentic Assessment Ideas

- Systems thinking
- Needs assessment
- Quant and Qual data collection
- Data analysis
-oral and written communication
- Leadership, governance, and management
- Advocacy
- Policy-making process
- Negotiation and mediation skills
- Cultural competence
- Communication for different audiences and sectors
- Interprofessional teamwork
- How globalization affects global burdens of disease
- Ecological perspective on the connections among human health, animal health, and ecosystem health
- Environmental factors on health
- Biological and genetic factors on health
- Behavioral and psychological factors on health
- Evidence-based science
- Health equity and barriers to
- Core functions and 10 essential services
- Public health history, philosophy, and values
- Causes and trends of morbidity and mortality
- Primary, secondary and tertiary prevention
- Social, political, and economic determinants of health and health inequities
# Syllabus Competency Mapping Example

<table>
<thead>
<tr>
<th>Competencies</th>
<th>Learning Objectives</th>
<th>Assignments</th>
</tr>
</thead>
</table>
| 1. Apply epidemiological methods to the breadth of settings and situations in public health practice | 1. Describe the distribution and occurrence of disease in human populations in terms of magnitude, person, place, and time.  
2. Compare strengths and weaknesses of different epidemiologic study designs  
3. Apply knowledge of epidemiological concepts when critically reviewing scientific literature  
4. Select appropriate data sources to answer an epidemiological question  
5. Evaluate strengths and weaknesses of existing data sources  
6. Determine appropriate surveillance data sources for given scenarios  
7. Identify possible sources of bias, confounding, and effect modification and describe methods for minimizing or adjusting for them. | • Descriptive Epidemiology Project and Presentation  
• Surveillance and Data Source Evaluation Assignment  
• Study Design Assignment (include STROBE/CONSORT Evaluation Assignment)  
• Midterm Exam  
• Final Exam |
| 2. Select quantitative and qualitative data collection methods appropriate for a given public health context | 1. Explain the processes used to collect, manage, and analyze data  
2. Identify strengths and weaknesses in questionnaire design  
3. Choose appropriate clinical/laboratory data collection methods to improve precision and reduce bias | • Questionnaire Design Assignment  
• Clinical/Laboratory Data Assignment  
• Midterm Exam  
• Final Exam |
What learning activities and content will lead to desired results?
PUBLIC HEALTH CASE STUDIES

Voluntary or Regulated? The Trans Fat Campaign in New York City

This case takes students behind the scenes in the world of public health policymaking. Students follow the New York City Department of Health and Mental Hygiene, and the process it went through to craft a policy to reduce public consumption of trans fats in restaurants. In 2005, after considerable internal negotiations, the department’s Bureau of Chronic Disease Prevention and Control elected to launch a public awareness campaign aimed equally at consumers, restaurants, and their suppliers. But after a year, the awareness campaign had not budged the rate of trans fat use in restaurants. In 2006, the department decided to resort to regulation, despite the risks of triggering protests of a “nanny state,” not to mention pushback from industry.

When BEST Intentions Go Askew: Arsenic Mitigation in Bangladesh

This case is about a public health response to the widespread arsenic contamination of groundwater in Bangladesh. It examines the lead-up to a 2008 media crisis that confronted a Columbia University clinical trial of a potential treatment for arsenic poisoning. The case raises for discussion the challenges of conducting research in rural, less developed, and culturally insular communities. It also asks how to help communities while studying them—complicated by funding restrictions and a possible skewing of results.
# Course Outlines

This schedule may change as the semester progresses, according to student enrollment and needs.

<table>
<thead>
<tr>
<th>Session</th>
<th>Date</th>
<th>Topic</th>
<th>Reading Assignment</th>
<th>Class Activity/ Due date</th>
<th>Learning Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Introduction Core Functions 10 Essential Services</td>
<td></td>
<td>Due: Group Case Study/Report out (in class activity/assessment) Current event sign up sheet for presentations in weeks 3-6</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Public health history, philosophy, and values</td>
<td>What is Public Health, <em>Jumock</em> B. - Posted to Canvas</td>
<td>Due: John Snow Discussion/active lecture participation</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Interventions Primary, secondary and tertiary prevention</td>
<td>Community-Based Interventions, <em>American Journal of Public Health</em> – Posted to Canvas</td>
<td>Due: Student Current Event presentations</td>
<td>4, 5, 14</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Morbidity and mortality</td>
<td>Measuring the Public’s Health, Thacker et al. <em>American Journal of Public Health</em> – Posted to Canvas</td>
<td>Due: Student Current Event presentations</td>
<td>4, 5, 14</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Quantitative and qualitative research methods</td>
<td><img src="https://www.youtube.com/watch?v=2X-QSU6-hPU" alt="YouTube Video" /></td>
<td>Due: Student Current Event presentations</td>
<td>3, 4, 5, 14</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Organization, structure, and function of healthcare</td>
<td>Public Health and the Health System – Posted on Canvas</td>
<td>Due: Student Current Event presentations</td>
<td>4, 5, 14</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Social, political and economic determinants of health</td>
<td><img src="https://www.youtube.com/watch?v=0H6yte4RXc0" alt="YouTube Video" /></td>
<td>Assigned: Debate/Debrief report/groups assigned (week 9)</td>
<td>10</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Structural bias, social inequities, and racism</td>
<td><img src="https://www.youtube.com/watch?v=GNhmyY6t7yEM" alt="YouTube Video" /></td>
<td>Assigned: Why did Michael die? and Implicit Bias</td>
<td>10, 13</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>Importance of evidence in advancing public</td>
<td>Tools for Implementing an Evidence-Based</td>
<td>DUE: Why did Michael die? Essay</td>
<td>8</td>
</tr>
</tbody>
</table>
EXAMPLE

Foundations of Public Health
Competencies addressed in this course, learning objectives mapped to these competencies, and assignments that assess these competencies:

<table>
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<tr>
<th>Competencies</th>
<th>Learning Objectives</th>
<th>Assignments</th>
</tr>
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<tbody>
<tr>
<td><strong>MPHF6</strong> Discuss the means by which structural bias, social inequities, and</td>
<td>Examine how equity, bias, and racism impact the health of communities.</td>
<td>Complete Harvard Implicit Bias Assessment and</td>
</tr>
<tr>
<td>racism undermine health and create challenges to achieving health equity at</td>
<td></td>
<td>Reflection</td>
</tr>
<tr>
<td>organizational, community and societal levels</td>
<td></td>
<td></td>
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</table>
Complete Harvard Implicit Bias Assessment and Reflection (10 points) –

1. Choose and complete three of the implicit bias assessments at: https://implicit.harvard.edu/implicit/index.jsp.

2. Complete a reflection on your results and answer the following questions:
   • What tests did you take?
   • How did you feel about the test results? Were your results what you expected? Why or why not? (You do not need to share your specific score or your individual results)
   • Why is it important to have a realistic view of your own biases and preferences?
   • How do the issues of bias, equity and racism impact the health of communities?

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<tr>
<th>Competencies</th>
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<tbody>
<tr>
<td>MPHF6</td>
<td>Discuss the means by which structural bias, social inequities, and racism undermine health and create challenges to achieving health equity at organizational, community and societal levels</td>
<td>Examine how equity, bias, and racism impact the health of communities.</td>
</tr>
<tr>
<td>Criteria</td>
<td>Proficient</td>
<td>Competent</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>The Harvard Implicit Bias assessment (4 points)</td>
<td>The reflection paper shares the student's results of at least three implicit bias assessments and clearly states how the issues of bias, inequities, and racism impact health at organizational, community and societal levels. (4 points)</td>
<td>The reflection paper shares the student's results of two to-three implicit bias assessments and states how the issues of bias, inequities, and racism impact health at organizational, community and societal levels. (2-3 points)</td>
</tr>
<tr>
<td>Depth of reflection (4 points)</td>
<td>The paper clearly states how the main theme of the reaction paper affect the students thinking and practice and shares examples to support reaction. (4 points)</td>
<td>The paper clearly states how the main theme of the reaction paper affect the students thinking and practice and shares some examples to support reaction. (2-3 points)</td>
</tr>
<tr>
<td>Grammar, Formatting, and Length (2 points)</td>
<td>The written text contains few or no errors in spelling, grammar, punctuation or sentence structure. The reflection paper is 1-2 pages in length, contains a title, the student's name, and is double-spaced, with a 1-inch margin and 11 point font. (2 points)</td>
<td>The written text contains some errors in spelling, grammar, punctuation, or sentence structure, but these errors do not interfere with the readability. The reflection paper is more than 2 pages in length, and may or may not contain the following items: contains a title, the student's name, and is double-spaced, with a 1-inch margin and 11 point font. (1 points)</td>
</tr>
</tbody>
</table>
Water or air: 5 picture story (20 pts) -

1. Create a collection of 5 photo images that tell a story without using text, audio or video. The five-photo story should be able to tell the story of water or air from a public health lens (ecological determinants of health, social determinants of health, social justice and health equity).

2. Write a 300-500 word essay explaining the images and the effects of environmental factors on a populations health.

The images will need to be printed and placed on a small poster board backing for display. They will be displayed during weeks 15 & 16 on the 3rd-floor commons.
Title: Fukushima Tsunami Meltdown and Water Contamination

Title: Nail Salon and Formaldehyde Safety

Title: Flint Michigan Water Crisis and Learning Issues
Flint Michigan Water Crisis and Learning Issues

In the US, water supply and wastewater systems are regulated by state governments and the federal government. The water-supply infrastructure consists of what is built to pump, divert, transport, store, treat, and deliver safe drinking water. This infrastructure consists of groundwater wells, surface water intakes, dams, reservoirs, storage tanks, drinking-water facilities, pipes, and aqueducts. Many cities have aging water infrastructures and the structures and materials used in piping systems are at the end of their life expectancy.

In 2011, the state of Michigan took over Flint’s finances due to a projected city deficit of $25 million. To reduce the deficit the state announced that a new pipeline would be built to deliver water from Lake Huron to Flint to address a water fund shortfall. In 2014, while the new pipeline was under construction, the city turned to the Flint River as a water source. Soon after the switch, residents said the water started to look, smell and taste funny. Testing by the Environmental Protection Agency (EPA) indicated dangerous levels of lead in the water at residents’ homes.

A class-action lawsuit charged that the state wasn’t treating the water in violation of federal law. As a result, the water was eroding the iron water mains, turning the water brown. Additionally, about half of the service lines to homes in Flint are made of lead and because the water wasn’t properly treated, lead began leaching into the water supply, in addition to the iron.

In response, federal officials worked with state and local partners to improve access to bottled water and water filters and offer blood lead testing to as many children and residents as possible. To assist with the testing initiative, USDA temporarily authorized blood lead screening at clinics for participants in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and the U.S. Public Health Service cleared a backlog of approximately 800 blood lead level screening results and prepared test result notifications for parents and the Michigan Department of Health and Human Services (MDHHS).

These measures were important because childhood lead exposure causes a reduction in intellectual functioning and IQ, academic performance, and problem-solving skills, and an increased risk of attention deficit disorder, aggression, and hyperactivity.
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Fully Met</th>
<th>Partially Met</th>
<th>Not Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental factors/impact</td>
<td>The five-photo story clearly tells the story of water or air from a public health lens.</td>
<td>The five-photo story tells the story of water or air from a public health lens.</td>
<td>The five-photo story does not tell the story of water or air from a public health lens.</td>
</tr>
<tr>
<td>(8 points)</td>
<td>The pictures clearly explain the effects of environmental factors on a population’s health.</td>
<td>The pictures partially explain the effects of environmental factors on a population’s health.</td>
<td>The pictures do not explain the effects of environmental factors on a population’s health.</td>
</tr>
<tr>
<td></td>
<td>No text is needed to understand the story. (8 points)</td>
<td>The title is needed to understand the story. (4-7 points)</td>
<td>Text or explanations are needed to understand the story. (0-3 points)</td>
</tr>
<tr>
<td>Explanation/Essay</td>
<td>The student clearly explained the effects of environmental factors on a population’s health in a 300-500 word essay paper. (8 points)</td>
<td>The student explained a few but not all of the effects of environmental factors on a population’s health and/or the essay paper was more or less than 300-500 words. (4-7 points)</td>
<td>The student did not explain the effects of environmental factors on a population’s health and/or the essay paper was more or less than 300-500 words. (0-3 points)</td>
</tr>
<tr>
<td>(8 points)</td>
<td>The printed pictures are at least 4x7 in size, clear and not grainy, placed in order on a small poster board paper for backing. A short title is included on the poster board. (4 points)</td>
<td>The printed pictures are smaller than 4x7 in size and/or grainy and/or the order of placement does not flow. A short title is included on the poster board but does not reflect the story the pictures tell. (2-3 points)</td>
<td>The printed pictures are smaller than 4x7 in size, grainy and the order of placement does not flow. There is no title on the poster board. (0-1 points)</td>
</tr>
</tbody>
</table>
TIPS
SUCCESS

Faculty understood the END goal and focused on it
Design process 4-8 hours per course
Syllabus development 5-20 hours per course
Collaborative process
Focus on authentic learning activities
Faculty liked the process and are looking forward to the new semester
Thank You

Co-Chairs MPH Redesign: Brandon Grimm and Analisa McMillan

MPH Core Redesign Workgroup: Chandran Achutan, Christine Arcari, Lorena Baccaglini, Aleta Gaertner, Brandon Grimm, Paul Estabrooks, Analisa McMillian, Jane Meza, Kendra Schmid, and Nizar Wehbi.

Core Course Design/Revision Groups:

Biostatistics: Lorena Baccaglini, Kendra Schmid, Lynette Smith, Chris Wichman

Epidemiology in PH: Christine Arcari, Lorena Baccaglini, Paul Estabrooks, Trish LeVan, Analisa McMillan, Lynette Smith

Foundations in PH: Chandran Achutan, Brandon Grimm, Analisa McMillan, Sharon Medcalf and Aaron Yoder

Leadership and Advocacy: Katie Brandert, Brandon Grimm, J.Y Kim, Analisa McMillan, Sharon Medcalf & Nizar Wehbi

Planning and Evaluation: Paul Estabrooks, Analisa McMillan, Shinobu Watanabe-Galloway, Fernando Wilson