Faculty Learning Communities: A model to promote innovation in Teaching and Learning

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1. Replication occurs faster than congregation (see 30)
Gene me in a chromosome - must not include chromosome
don't understand how tracks spread
don't understand what plasmids are. Not naturally occurring
Hospital is sterile - not a source for Nos
Understanding of sample size "rapid"
Knowledge of
Congregation =
Plasma =
Antibodies
• 2005: External Review of HHMI initiatives
  • Graduate students felt unprepared for their teaching assignments
  • Faculty were often unaware of national STEM education reforms

• 2006: Establishment of CMNS Teaching & Learning Center
  • Establish training in teaching science as an integral part of the standard graduate program
  • Provide a structured platform for science faculty to communicate and collaborate with science education experts
Needs Assessment: Challenges

- Balancing teaching and research
- Engaging students in the classroom
- Developing a teaching style that benefits the students and instructor
- Dealing with procedural challenges
- Developing assessment tools and grading
- Feeling insecure about the topic that they were assigned to teach
The Teaching and Learning Center

- Teaching and learning communities
- Acculturation of new faculty
- Individualized guidance for instructors
- Workshops on teaching and learning
- Training programs for graduate teaching assistants
- Seminars by visiting scholars
Faculty Learning Communities (FLCs)

• Small groups that meet regularly to discuss issues related to teaching and learning
  • Creating/adopting new pedagogies
  • Designing new curricula
  • Assessing the impact of educational reforms

• Encourage faculty to become thoughtful, reflective practitioners of teaching

• Collaboration facilitates large-scale change and reform that is not possible for an isolated instructor
Benefits of Communities
(Cox, 2004; Silverthorn et al., 2006)

- Faculty in FLCs change their teaching by
  - Including more classroom activities
  - Using more and different kinds of assessments
  - Reconfiguring teaching content

- This results in
  - Greater student engagement
  - More opportunities for students to integrate information
  - More positive student evaluations
  - A better classroom environment
Support for Communities

Necessary support varies depending on community goals

- Leadership
- Funding
Support for Communities

Necessary support varies depending on community goals

Leadership:

- Set meeting agenda
- Lead discussion during meetings
- Coordinate work
- Maintain group focus on goals

Reform in teaching and learning science
Support for Communities

When the goal is teaching and learning science: Leadership must involve a science education specialist or discipline based education researcher

- Increase awareness of the science education literature
- Assist with the development of pedagogies and assessment instruments
- Document science education interventions and disseminate in conferences and journals
Support for Communities

Funding:

- Support personnel
- Travel
- Food


UM Community Participants

- Believe it’s important to
  - Relate course material to scientific research
  - Use diverse teaching and assessment methods
  - Provide students with feedback through ungraded, formative assessments

- Self-report the use of more active learning approaches

Marbach-Ad, G. et al. Science Teaching Beliefs and Reported Approaches within a Research University: Perspectives from Faculty, Graduate Students, and Undergraduates. JRST (submitted).
An initiative to foster deep and research-oriented learning of Host Pathogen Interactions
2004 - present

Faculty with shared mission
- Research focus in HPI
- Teaching focus in HPI
HPI Teaching Team—All Ranks and Levels of Experience

Dr. Sarah Balcom. Lecturer. Animal & Avian Sciences
Dr. Spencer Benson. Associate Professor. Genetics and Science Education
Dr. John Buchner. Lecturer. Cell Biology and Molecular Genetics
Dr. Volker Briken. Associate Professor. *Mycobacterium tuberculosis* vaccine research
Dr. Jeffrey DeStefano. Professor. Retroviral reverse transcriptases as related to replication and recombination.
Dr. Najib El-Sayed. Associate Professor. Comparative genomic analyses of trypanosomatid genomes.
Dr. Kenneth Frauwirth. Assistant Professor. Immune function/ linkage of nutrition & infectious disease
Dr. Brenda Fredericksen. Assistant Professor. Mechanisms of pathogenesis of flaviviruses
Dr. Steve Hutcheson, Professor. Biofuels, Psuedomonas and plants
Dr. Vincent Lee. Assistant Professor. Molecular mechanisms of pathogenesis for *Pseudomonas aeruginosa*
Dr. Gili Marbach-Ad. Director of the CMNS Teaching and Learning Center
Dr. Kevin S. McIver. Associate Professor. Pathogenesis of *Streptococcus pyogenes & Francisella tularensis*
Dr. David Mosser. Professor. Director Maryland Pathogen Research Institute. Host defense against parasites / *Leishmania*
Dr. Ann C. Smith. Instructor, Assistant Dean, Office of Undergraduate Studies
Dr. Wenxia Song. Associate Professor. Host responses against bacterial pathogens, *Neisseria gonorrhoeae* and *Campylobacter jejuni*,
Dr. Daniel Stein. Professor. Chair UM Institutional Biosafety Comm. Pathogenesis & host response, *Neisseria gonorrhoeae*
Dr. Patty Shields. Lecturer. Cell Biology and Molecular Genetics
Dr. Kaci Thompson, Director, HHMI Program, CMNS
Dr. Stephanie Yarwood. Assistant Professor. Environmental Science & Technology

Assessment: Katherine C. McAdams

# HPI Courses

## HPI Courses at University of Maryland

<table>
<thead>
<tr>
<th>Course</th>
<th>Enrollment (students/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSCI 223 General Microbiology</td>
<td>600</td>
</tr>
<tr>
<td>BSCI283 Principles of Microbiology</td>
<td>50</td>
</tr>
<tr>
<td>BSCI 412 Microbial Genetics</td>
<td>35</td>
</tr>
<tr>
<td>BSCI 414 Bioinformatics and Integrated Genomics</td>
<td>30</td>
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<tr>
<td>BSCI 417 Microbial Pathogenesis</td>
<td>25</td>
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<tr>
<td>BSCI 422 Immunology Lecture</td>
<td>100</td>
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<tr>
<td>BSCI 423 Immunology Lab</td>
<td>80</td>
</tr>
<tr>
<td>BSCI 424 Pathogenic Microbiology</td>
<td>60</td>
</tr>
<tr>
<td>BSCI437 Virology</td>
<td>120</td>
</tr>
</tbody>
</table>
HPI Teaching Team Approach

Meet regularly – 4 to 5 times each semester
  • Over lunch

Maintain a current agenda
  • Agenda and time line emerges from the team

Devote time to projects
  • At team meetings
  • Between team meetings
  • Full day workshops

Disseminate
  • Publish, attend conferences, invited speakers
HPI Community Initiatives

All projects aimed at deep learning where the context was HPI content, and skills meaningful to science research

• Established learning goals and research oriented skills
• Designed the HPI Concept Inventory
• Assessed student learning, at course and program level
• Determined misconceptions
• Collaborated with others
• Revised our practices

Teaching as a reflective practice
1. The structural characteristics of a microbe are important in the pathogenicity of that microbe.
2. Diverse microbes use common themes to interact with the environment (host).
3. Microbes respond to forces of natural selection. Important responses include changes in virulence and antibiotic resistance.
4. Microbes adapt/respond to environment by altering gene expression.
5. Microbes have various strategies to cause disease.
6. Pathogens and host have evolved in a mutual fashion.
7. The cell wall and the cell membrane affect the bacterial response to the environment.
8. There is a distinction between a pathogen and a nonpathogen.
9. The environment will affect the phenotype (pathogenicity) of a bacterium.
10. Microbes adapt/respond to the environment by altering their metabolism.
11. Immune response has evolved to distinguish between self and nonself.
12. Immune response recognizes general properties (common themes vs. specific attributes: innate vs. adaptive).
13. Immune response memory is specific.
A. Two roommates fall ill: one has an ear infection and one has pneumonia. Is it possible that the same causative agent is responsible for both types of disease?

1. Yes, because both individuals live in the same room and therefore the source of the infection has to be the same.
2. Yes, because the same bacteria can adapt to different surroundings.
3. No, because each bacterium would cause one specific disease.
4. No, because one infection is in the lung while the other is in the ear.
5. I do not know the answer to this question.

B. Explain your response.


Reflective Practice

• What progress are students making in each HPI course?

• Do students retain understanding from one course to the next?

• Can we identify the best order/combination of courses?

• Can we identify impact of course prerequisites (genetics)?

• Do the data show differences related to other variable (e.g., gender, major, ethnicity)?

• What type of change is needed (curriculum, pedagogy)?
Teaching practice revised:
In light of our goals, our findings, national call, and research based methods

• Antiviral Drug Research Proposal
• Case study/lab Activity (Bikini Wax disaster)
• Research Process Design Model for lab courses


From our perspective and experience

Criteria for successful faculty learning communities

- Dedication to a shared interest or mission
- Culture of respect
- Work that is intellectually engaging, valuable, and has impact
- Effective time management with forward moving pace
- Food
From our perspective and experience

Things that help:

- Diversity of team members…including the underlying motivation to participate
- Recognition …campus administration, publications, peers
- Sharing with others …attending national meetings, invited speakers
- Occasional focused sessions/workshops
From our perspective and experience

Value of Faculty Learning communities:

- Professional development
- Mentorship
- Large-scope products
- Faculty recognition
- Community
“….Well, the HPI is support and ideas. You have the support for doing innovation, for doing things differently. Also giving me ideas for doing things, like concept maps. I'd never heard of concept maps before. There were lots of things I'd never heard of before the HPI. So the ideas are important, but I can get ideas from other places. I think more [important] is the support: it's having that meeting one a month and knowing that there are people that think that what you're doing is important. So that's HPI.”
Thank you for your interest
We would be happy to respond to your questions