MIT Workshops on Technology-Enhanced and Open Education
Port-au-Prince, Haiti, August 12-14, 2013
Organizers: Michel DeGraff & Vijay Kumar

We are pleased to announce an advanced pedagogy workshop for Haitian professors who participated in the MIT-Haiti workshops in January 2013. This workshop will be held in Port-au-Prince on August 12-14, 2013. This is the third workshop in a 5-year series whose main goal is to implement faculty- and curriculum-development activities based on Kreyòl-based Open Education Resources for science and math courses, and evaluate the corresponding learning gains achieved in Haitian schools and universities.

This workshop will focus on pedagogy, assessment and evaluation in the fields of math (calculus, differential equations), physics (electro-magnetism, electric circuits and Newtonian mechanics) and biology (biochemistry and genetics). It will build upon the January 2013 workshop experience to give participants more working knowledge of active-learning concepts and focus on curriculum development, pedagogy and assessment. This workshop will provide participants with a strong basis for the creation of (i) lesson plans using active learning resources in Kreyòl, and (ii) assessment tools to measure student learning gains.

Specifically, by the end of the workshop, the participants will be able to:

- Create student learning objectives that use active learning materials in Kreyòl
- Describe best practices for teaching and for student learning
- Create instructional activities for classroom that include active learning
- Use active-learning materials (in biology, math or physics) in a variety of settings and under a variety of conditions
- Create formative and summative assessments that will measure student learning from the active-learning materials
- Describe how they will collect and record data to document student learning from materials
- Conduct a selected portion of a lesson using active learning strategies with workshop participants
- Provide formative feedback to peers

This workshop is designed, not only to enhance the use of active learning methods by participants in their own classroom, but also to prepare the way for an outreach by Haitian participants to other Haitian academics throughout the country.

We will also use this opportunity to achieve a deeper understanding of the syllabus and actual teaching conditions in Haiti, and to further develop details of a long-term evaluation plan in collaboration with our colleagues in Haiti.

The MIT instructors at the workshop are:

Pedagogy, Assessment & Evaluation	Glenda Stump
Biology	Lourdes Alemán, Alison Brauneis and Ruthly François
Physics	Peter Dourmashkin
Math	Haynes Miller

The deadline for registration is <u>Monday, July 1, 2013</u> or when all the slots are filled.

Only professors who participated in the January 16–19 workshop at Le Plaza can register for the August 12–14 workshop.

<u>All participants will be expected to:</u>

1. Complete a pre-workshop survey to be made available online via Survey Monkey. The survey will need to be completed by **Monday, July 1, 2013**. The pre-workshop survey will include three sections:
    a. General participant information
    b. Detailed information about relevant courses
    c. Formulation of an idea for a lesson plan, using active learning and the resources and technology that will be presented throughout the workshop (see description below)
2. Complete a post-workshop survey by **August 23, 2013**
3. Utilize the lesson plan developed at the workshop in a class and provide assessment and evaluation data in a report to be submitted by a deadline to be decided at the workshop.

<u>How to formulate an idea for a lesson plan</u>

Throughout the August workshop, the MIT-Haiti team will be working with you to develop an idea into a lesson plan that you can use in your course. It is very important that you think about the following criteria.

1. Using the list of concepts (see attached list) that the STAR, Mathlets and PhET technologies demonstrate, identify one concept or a small group of related concepts that
    a. fits into the curriculum of a course you will be teaching in the next year, and
    b. you think the MIT technology will help students understand.

2. In preparation for developing a lesson plan using the STAR, Mathlet, or PhET technology in an active-learning environment, answer the following questions in detail:

    a. Which technology StarBiochem, StarGenetics, Mathlet, or PhET, will be used?
    b. What content will students need to know to better understand the concept(s) you've chosen for your lesson plan? Be specific.
    c. What resources (software, handouts, projector, etc.) do you have available or will you need to teach the chosen concept(s) in your classroom?

     d.   Will you be able to devote the needed class time for instruction on the concept(s) you've chosen? How much class time will be required?

Your answers to these questions will be the beginning of a planning process that you will complete during the workshop. In addition to providing your answers in the pre-workshop survey, please bring a copy of your lesson plan idea with you to the first workshop on Monday, August 12, 2013.

Next Workshop: The fourth workshop in this series will be held in January 2014. This workshop will focus on introducing new faculty to the MIT-Haiti Initiative and to active-learning pedagogy, technology tools for STEM and the key role of Kreyòl in the promotion of active learning in Haiti.

List of concepts

StarGenetics Concepts

- How genotype informs phenotype
- Genetic crosses (P/F1/F2, testcross, backcross, dihybrid cross, reciprocal cross, etc.) can be used to inform genetic inheritance and genotype
- Punnett squares are genetic tools that can be used to predict the results of genetic crosses and confirm results of genetic experiments
- Dominant and recessive phenotypes
- Complementation
- Multiple phenotypes for one allele
- Autosomal vs. sex-linkage
- Epistasis
- Linked genes and genetic mapping
- Regulatory genetic pathways
- Chi square analysis

StarBiochem Concepts

- Relation between the structure of a function
- Structure-> Function -> Disease
- Structure-> Medical therapies
- Protein regulation
- Protein evolution

Mathlet Concepts

- Frequency response
- Complex exponential
- Convolution
- Linear phase portraits
- Initial conditions
- Numerical methods
- Vector addition
- Fourier series

- Power spectrum
- Isoclines
- RLC circuits
- Amplitude and phase
- Nonlinear systems
- Derivatives
- Graph features
- Riemann sums

PhET Concepts

- acceleration
- Archimede's principle
- atomic nuclei
- Bernoulli's principle
- Boyle's law
- buoyancy
- capacitance
- chain reaction
- charles' law
- coefficient of restitution
- current
- DC circuits
- elastic collision
- electric field
- electric force
- electric potential difference (voltage)
- electromotive force
- energy dissipation: friction
- equipotential
- fission
- fluid pressure
- force
- gas pressure
- Hooke's law
- ideal gas law
- ideal gas model
- induced electric current
- inelastic collision
- kinetic energy
- Lenz's law
- magnetic flux

- mass density
- mechanical energy
- mechanical transfer of energy
- momentum
- Newton's second law
- Ohm's law
- pendulum
- periodic motion
- position
- potential energy
- potential energy of a linear restoring force
- resistance
- simple harmonic motion
- temperature
- thermal transfer of energy: heat
- velocity