

UNIVERSITY OF FLORIDA CENTER FOR PRECOLLEGIATE EDUCATION AND TRAINING (CPET)  
COLLABORATING TO ADVANCE TEACHING AND LEARNING OF SCIENCE EDUCATORS AND  
STUDENTS (CATALYSES) 2017 PROGRAM  
ACTION RESEARCH PROPOSAL

AN INVITATION FOR CHANGE:  
EMPOWERING UNDERSERVED POPULATIONS THROUGH CITIZEN SCIENCE THAT CULLS THE  
SPREAD OF EMERGING PATHOGENS THOROUGH BLENDED LEARNING

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**Abstract:**

Over the past few years, the frequency of pathogenic agents described in the news has escalated to a level that warrants conversation in the classroom. For the 2017-2018 school year, students will develop a public service program that educates the community on emerging pathogens, the number of incidences in their area and where vectors are potentially located using concepts learned from the CATALySES institute. Students will have the opportunity to participate in a citizen science initiative empowering underserved populations within their area by volunteering to educate the public on the spread of emerging pathogens. Through a series of student-made and teacher reviewed lessons, a select part of the community will receive content provided through the University of Florida's Center for Precollegiate Education and Training in hopes of fostering an understanding of the biomedical sciences that promote educational outreach using a blended learning approach. In addition, the strategies used will allow students to practice research skills important to their postsecondary goals and foster computer literacy using state science standards.

**Rationale:**

Nutrition, health and education function as the conduit for empowerment, removing the inherent barriers often associated with socioeconomics. Last year, over 80% of the students enrolled were on free and reduced lunch and it is anticipated that in the 2017-2018 school year there will be an increase in the population served. A fourth factor, a sense of belonging, according to Erikson ( ), is pivotal to the psychosocial development of adolescent youth. Emphasis will be given to school-age children, their parents and the surrounding community. At the request of feeder schools, the identified population will receive input and be provided support through Science, Technology, Research, Engineering, Art and Math (STREAM) instruction. The students will use a modified Comprehensive Product Development Plan- CPDP to evaluate the efficacy of their approach to solving the challenge presented. Supported by educational outreach, this project will laminate the four factors integral to constructive public health initiatives and hopefully impact the community the students live and learn in. The students will facilitate workshops for the public and use statistics specific to South Florida in partnership with the University of Florida's Institute for Food and Agriculture Science.

**Intervention:**

Students will be taught the content through a theme-based unit using interactive labs that utilize tactile, visual and kinesthetic skills to solve medical and socially relevant issues. By analyzing the content as a biotechnologist would, they will take their understanding of the Central Dogma and apply it to real-world issues using tools like PATRIC to locate patterns by isolating genomic islands that may confer an evolutionary advantage to one species over another. They will then use their understanding of emerging pathogens to design and implement a community service project that has a real-world application and that incorporates a public service announcement and workshop for the public.

**Connections to the 2017 CATALySES summer institute:**

The student will review their understanding of the major organic macromolecules through their assigned course, assuming the role of a biotechnologist specializing in a given area. They will then explore topics that link the molecular basis of disease to their host through vectors and environmental change that create pathways for transmission. They will then learn how the skills of a medical biotechnologist are powerful agents in the diagnosis and treatment of emerging pathogens only in conjunction with public health efforts and are considerably more significant alongside community awareness and activism.

Through personal meaning maps the students will measure their own initial understanding of pathophysiology and adjust their graphic organizer as they learn new things. They will ultimately develop a public service project that elucidates specific choices the public can make when faced with protecting themselves and their community from the spread of new communicable agents. By bestowing a sense of constructive purpose within their community the students will feel invested socially and the community will hopefully find value in the lessons learned on how to maintain a healthy environment through conscientious living.

Listed below are descriptions of the activities that will be employed:

- DNA replication, protein synthesis and protein confirmation using a manipulative and the protein synthesis/confirmation handout submitted last year by the author.
- Pipetting by Design → Blood-based Cancer Diagnostics
- Interactive, Personal Meaning Maps
- Zika Biology, Connelly/ Military Applications, / Careers involved in emerging pathogens, Dr. Diclaro
- Public Service Announcement Poster/Podcast activity
- Menacing Microbes
- Introduction to the CPDP & Tracking Patient Zero
- Mutation of a Genome (paper lab)
- Pathogenic Islands Game
- PATRIC lesson by Dr. Jo Marie
- Tracking the Spread of Emerging Pathogens Using Modeling
- Info graphic

### **Data Collection and Analysis:**

Pre and post-test will be given to assess the students' understanding of the content given. Averages will be taken of like classes using the strategy and compared using a t-test. Pre and post surveys will be given to the participants or forums will be utilized to gather their initial thoughts on community outreach.

### **Literature cited: Work-in-progress**

Daugherty, Ellyn. (2007). *Biotechnology – Science for the New Millennium*. Saint Paul, MN: Paradigm.

Maslow's Hierarchy of needs: physical, safety, social, esteem, actualization...

Text material adapted from D. Martin and K. Joomis (2007). *Building Teachers: A Constructivist Approach to Introducing Education* (pp. 72–75). Belmont, CA: Wadsworth.

[https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0ahUKEwjZh9PMmL\\_VAhVKwVQKHVvkBjsQFggsMAE&url=http%3A%2F%2Fwww.cengage.com%2Fresource\\_uploads%2Fdownloads%2F0495570540\\_162121.pdf&usq=AFQjCNEBHsKqgozAcvvyrQpoxABBFv9DSg](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0ahUKEwjZh9PMmL_VAhVKwVQKHVvkBjsQFggsMAE&url=http%3A%2F%2Fwww.cengage.com%2Fresource_uploads%2Fdownloads%2F0495570540_162121.pdf&usq=AFQjCNEBHsKqgozAcvvyrQpoxABBFv9DSg)

Light, Andrew. (March 2003). Urban Ecological Citizenship. *Journal of Social Philosophy*, Volume 34, Issue 1, Pages 44–63. DOI: 10.1111/1467-9833.00164 or <http://onlinelibrary.wiley.com/doi/10.1111/1467-9833.00164/abstract>

Jagers, Sverker & Matti, Simon (20 April 2010). Ecological Citizens: Identifying Values and Beliefs that Support Individual Environmental Responsibility among Swedes. *Sustainability* **2010**, 2, 1055-1079. doi:10.3390/su2041055 or <http://www.mdpi.com/2071-1050/2/4/1055/pdf>

Connelly, Zika Biology (Lecture & activity) - [https://ufl.instructure.com/files/33169819/download?download\\_frd=1](https://ufl.instructure.com/files/33169819/download?download_frd=1)

Heath Corp University - <https://www.healthcorps.org/resources/the-curriculum/>

BLAST - <https://blast.ncbi.nlm.nih.gov/Blast.cgi>

PATRIC - <https://www.cpet.ufl.edu/resources/curricula/biomedical-curriculum-series/identification-of-pathogenic-islands-using-comparative-genomics-based-tools/>

Emerging Pathogens - <https://www.cpet.ufl.edu/resources/curricula/created-by-fellows/emerging-pathogens/>

IFAS- Institute for Food and Agricultural Sciences - <http://mosquito.ifas.ufl.edu/>

### **Additional Reading:**

*Caleb Scoville, George Orwell and ecological citizenship: moral agency and modern estrangement, Citizenship Studies, 2016, 20, 6-7, 830*

*M. Bentley, An ecological public health approach to understanding the relationships between sustainable urban environments, public health and social equity, Health Promotion International, 2014, 29, 3, 528*

*Alex Kudryavtsev, Marianne E. Krasny, Richard C. Stedman, The impact of environmental education on sense of place among urban youth, Ecosphere, 2012, 3, 4, art29*

### **Permission:**

Documentation will be sent home with the first day paperwork notifying the parents about the project and offering continued support through an open forum developed and monitored by the architects of each individual project and its associated liaison.

The results will be averaged to determine the efficacy of the program and therefore no formal permission is needed. If the participants choose to submit their findings to IFAS for review and inclusion in their database, they may be asked to submit additional documentation.

\*\*\*\*\* Biomedical Science / Emerging Pathogens / Public Service Project

LESSON PLAN: \_\_\_\_\_ (Quick Reference)

Teacher Simone Shim-Barnes Date 8/28/17-9/28/2017

Subject Biology / Research/Biotechnology/UTAP Grade Level 9-12 Length of Lesson 21=50 minute pds

I. (Behavioral/Instructional) Learning Objective (s)/Outcomes (SSS):

After the Interactive 'personal meaning map' activity on the impact of stress, pathogens, and nutrition on the body systems the student will analyze the impact of emerging pathogens on the environment and the body systems. The students will then design community service projects that educate the public on emerging pathogens and how they can create a healthier Environment through conscientious living.

II. Subject Matter Content: Factors affecting public health, Biotechnology, informative, argumentative writing, modeling, mapping coordinate systems

III. Instructional Procedures:

a. Set/Lesson Initiating Activity Personal meaning map

b. Core Activities Connect environmental factors to the spread of emerging pathogens using predictive modeling.

c. Closure Activity Design a service project to educate the public on emerging pathogens during a colloquium / forum.

IV. Materials and Equipment: Computers, LCD projector, production paper, menacing microbes, cancer-based diagnostics kit Edvotek micropipettes, internet connection, spreadsheet program, word processing program

V. Assessment/Evaluation: Graphic organizer, public service project, genomic island, predictive map

VI. Follow-up Activities: The students will conduct a workshop for the public / Public health Family Night

VI. Self-Assessment: (On a separate sheet of paper, typed, double-spaced twelve-point font, one page)

TBA

VII. State Standards: SC.912.L.14.6 Factors affecting immunity/public health, SC.912.L.16.10 Biotechnology  
 LAFS.910.RST.2.4 Symbolic Reasoning/Domain Specific Terms  
LAFS MAFS SSS LAFS.910.WHST.2.4 Produce clear and coherent writing...appropriate to task purpose and audience.  
 MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.  
 MAFS.K12.MP.1.1 Model in mathematics.

ESOL or ELL / ESE Accommodation/Enrichment Visual Representation, Peer Pair